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*"To the solid ground
Of Nature trusts the mind which builds for aye."*—WORDSWORTH.

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NOTICE.

In consequence of the greatly increased cost of production it has been found necessary to raise the price of NATURE to 9d. The Subscription rates are now as follow:—

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ARISTOTELIAN SOCIETY.

PROGRAMME FOR THE SESSION 1918–19.

All the ordinary Meetings of the Society will be held at 22 Albemarle Street, W. 1, at 8 p.m.

1918.
November 4. President's Inaugural Address: "Some Judgments of Perception." Dr. G. E. MOORE.
December 2. "Rabindranath Tagore's *Personality*." Principal F. B. JEVONS.
,, 16. "Synthesis and Discovery." Professor JOHN LAIRD.
1919.
January 6. "Mechanical Explanation and its Alternatives." Mr. C. D. BROAD.
February 3. "The Philosophy of Giovanni Gentile." Professor J. A. SMITH.
March 3. "Our Knowledge of Other Minds." Mrs. N. A. DUDDINGTON.
,, 17. "The Scope of the Scientific Method." Mr. A. E. HEATH.
April 7. "Value in relation to Emotion." Mr. A. F. SHAND.
May 5. "The Stereoscopic Character of Knowledge." Professor J. B. BAILLIE.
June 2. "Platonism and Human Immortality." Very Rev. Dean W. R. INGE.

A Congress of the Aristotelian Society, in conjunction with the *Mind* Association and the British Psychological Society, will be held in July. Full particulars will be announced later. The programme will include the following:—

Paper by Hon. BERTRAND RUSSELL, "Is Introspection a Source of Knowledge?"
Symposium: "Time, Space, and Material: Are they, and, if so, in what sense, the ultimate data of Science?" To be opened by Professor A. N. WHITEHEAD.
Symposium: "Is there 'Knowledge by Acquaintance'?" Miss BEATRICE EDGELL, Dr. G. E. MOORE, and others.
Symposium: "Can Individual Minds be included in the Mind of God?" DEAN RASHDALL, Professor J. H. MUIRHEAD, Dr. F. C. S. SCHILLER, and the BISHOP OF DOWN.
Symposium: "Instinct and the Unconscious." To be opened by Dr. W. H. R. RIVERS.

G. DAWES HICKS, Hon. Secretary.

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Mr. A. R. HINKS, M.A., F.R.S., the Gresham Lecturer in Astronomy, will deliver a course of four lectures on

THE NEW STAR IN AQUILA.

Lecture I. History of the Discovery.
,, II. The Early Observations.
,, III. The Interpretation of the Observation.
,, IV. Probable Future of New Star.

On Tuesday, Wednesday, Thursday, and Friday, November 5, 6, 7, and 8, at six p.m. *Free to the public.*

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PUBLIC HEALTH DEPARTMENT,

62 CHANDOS STREET, CHARING CROSS, W.C. 2.

Two Lecture-Demonstrations on the Principles and Practice of Dark-Ground Illumination (particularly in relation to Venereal Disease) will be given by Mr. J. E. BARNARD, P.R.M.S., on Thursdays, November 14 and 21, at 5 o'clock. Fee £1 1s.

WALTER SMITH, Secretary.

UNIVERSITY COLLEGE, NOTTINGHAM.

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THURSDAY, OCTOBER 31, 1918.

A HISTORY OF CHEMISTRY.

A History of Chemistry. By Prof. F. J. Moore. Pp. xiv+292. (New York: McGraw-Hill Book Co., Inc.; London: Hill Publishing Co., Ltd., 1918.) Price 12s. 6d. net.

IT is difficult to find excuses for a new "History of Chemistry" which starts from ancient times and brings the story down to the present day. All that can be usefully said about the alchemists and the early chemists before Lavoisier has been repeated many times in the various histories by Thomas Thomson, Kopp, Ernst von Meyer, Wurtz, Thorpe, and others, besides the innumerable special essays such as those of Thorpe and the Memorial Lectures of the Chemical Society. Teachers agree that the study of history in every department of thought is valuable to the student and indispensable to everyone who wishes to understand the present position and how it has been arrived at in each division of physical and natural science. It appears to the present writer that the process of tracing the evolution of ideas in science is most likely to be accomplished best by one who is contemporary with the discoveries which have led to advance and has taken part in discussions arising therefrom. One or two historians in every generation or about every thirty or forty years would be able to record correctly the progress which has been made in his own time. The history of science is not exactly comparable with the history of human affairs, which demands the lapse of a certain amount of time before a true valuation of events and movements becomes possible.

Every writer of a new book, however, doubtless assumes that his work has merits of its own, and it may be at once admitted that this is true of Prof. Moore's "History." But the preface which he has provided makes no reference to previous writers, and is worded as if he thought the task he had undertaken was entirely new. "The aim," he says, "has been to emphasise only those facts and influences which have contributed to make the science what it is to-day." The same claim in similar words has been put forward by many another writer on the same subject. Undoubtedly the book has some features of its own, and the last two chapters, which respectively trace the rise of physical chemistry and set forth, though briefly, the present state of knowledge of radioactive substances and the influence of such new knowledge on conceptions of the Atomic Theory, bring the story down to the present day.

The matter is rather severely compressed, for to include within the space of 271 octavo pages an account of chemical ideas from the times of the Greek philosophers down to the latest conclusions concerning the elements from X-ray spectra and atomic numbers implies a power of discrimination and concise expression, qualities which are not lacking in the author. The book is written in a brisk and lively style, and the personal biographical touches interpolated here and there ought to serve to whet the appetite for more and lead the student to make excursions into the literature usefully set forth at the end of each chapter. It has to be borne in mind that the lectures, of which the book is the outcome, were addressed to the senior students at the Massachusetts Institute of Technology, the concentration of the text rendering it much less suitable for readers not already familiar with the fundamental facts and principles of the science.

The author shows a sound judgment in setting forth the relative positions and merits of notable persons who figure in the history of the science and about which difference of opinion has been expressed in the past. "Little attention has been paid to questions of priority. A great discovery is usually preceded by a multitude of earlier observations. . . . From the historical standpoint the discoverer of a great truth is usually the one through whose efforts it first becomes available to the race." This remark in the preface is very just. It has always been acknowledged, for example, that oxygen was discovered by Priestley in 1774, and that the same element had been isolated from several sources by Scheele before that time, but the credit of publication belongs to Priestley. There was a tendency at one time in France to ignore Priestley, and in England to disparage the work of Lavoisier on the ground, by no means certain, that he did not "discover" oxygen independently of Priestley. Anyone who has read carefully the "Opuscules," which contain his observations on the calcination of metals and the consequent absorption of a portion of the air in contact, must perceive that this long course of experiment was undertaken with a definite purpose in view, and that the conclusions at which he arrived were independent of anything he may have heard from Priestley about his experiments on mercuric oxide.

The chapter on the periodic law again sets forth briefly all the earlier speculations concerning relations among atomic weights, and arrives at the conclusion that the principle of periodicity was discovered by Lothar Meyer at nearly the same time as and independently of Mendeléeff. Chap. xx., entitled "The Rise of Physical Chemistry," points out that this aspect of chemical science is not exclusively of modern origin. It began as soon as quantitative methods were established in all directions, and the foundations were laid by Lavoisier and Berthollet, and consolidated by the work of Gay-Lussac, Dulong and Petit, Regnault, Bunsen, Kopp, and others. The chapter gives evidence of the influence of Ostwald on the views of the author, who was among his pupils.

A word must be added about the illustrations with which the volume is abundantly supplied. They are all well meant, and many are interesting, but the portraits given are of very unequal merit, and some of them are, to speak frankly, quite bad —those of Mendeléeff and Fischer, for example. It may also be remarked that where the series of condition of a peace which is more than an armistice must be found in a democratic form of government. The subsequent steps will be arbitration tribunals, disarmament, and an international parliament. These seem far enough off at present, but it is important to make up our minds whether we really desire them, and if not, why not. Prof. Jastrow's wisely written book—careful and restrained throughout—makes for illumination.

The Strategic Geography of the Great Powers. (Based on a Lecture delivered during 1917 to Officers of the Grand Fleet and of the British Armies in France.) By Dr. Vaughan Cornish. Pp. viii+114. (London: George Philip and Son, Ltd., 1918.) 2*s.* net.

WITHIN the compass of a small volume Dr. Vaughan Cornish has tried, not unsuccessfully, to crowd many ideas. He describes the great States of the world as regards their sources of men and materials, and the lines of communication by which force can be concentrated. His point of view is often fresh and always geographical. The distribution of the British Empire is described, not by continents, but by oceans. The old system merely emphasises the gaps in continuity of the Empire. Dr. Cornish's method indicates an appreciation of the ocean as a highway linking together the component parts of the Empire. But land routes may also be of importance. In his treatment of Asia Dr. Cornish insists on the strategic value of southern Turkestan and northern Afghanistan as the eventual crossing-place of the chief lines of traffic from Moscow to Delhi, and from Constantinople, Cairo, and Bagdad to Pekin.

The volume has small coloured maps of Europe, Asia, and the world. The last, on a Mercator projection, would have been a better illustration of the chapters if it had been on an equal-area projection. Dr. Cornish's work is an excellent introduction to the geographical conditions of national security, and should be widely read.

B.S.A. Musketry Score Book for Use in the General Musketry Course. Instructions for Short Lee-Enfield Rifle and Enfield Pattern 1914 Rifle, Using Mark VII. Ammunition. By E. J. Smyth. Pp. 47. (London: Forster Groom and Co., Ltd., 1918.) Price 3*d.* net.

THIS excellent little book is a combination of a book of instruction and a score record. It contains clear instructions for the sighting to be employed at higher ranges after making a group at 100 yds., so that the error of the rifle may be obtained without the long experience with the individual rifle which is desirable but cannot always be obtained. The instructions for the short Lee-Enfield rifle and for the Enfield pattern 1914 are placed together, but are indicated by distinctive borders so that no confusion can arise. The book should prove particularly useful to every Volunteer in order to enable him to know the behaviour of his own rifle on the completion of his musketry course. It is also a most useful guide to the course itself.

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.*]

The Perception of Sound.

As I had the privilege of being consulted by Sir Thomas Wrightson during the later years of his "Inquiry into the Analytical Mechanism of the Internal Ear," and advising him as regards the physical nature of the cochlea and the arrangement of its parts, I may be allowed to try to clear up the various objections formulated by Prof. Bayliss (NATURE, October 17, p. 124), as they chiefly concern matters relating to anatomy or physiology. When Prof. Bayliss looks again at the title of Sir Thomas Wrightson's work, which I have quoted above, he will see that he is in error in supposing that the Wrightson theory deprives the cochlea of the analytical function postulated by Helmholtz. Helmholtz's theory presupposes that the cochlea contains an extensive series of resonators for resolving a sound complex into its component waves; Sir Thomas Wrightson's theory presupposes that the cochlea is a machine designed for the purpose of analysing sound complexes and of registering its component waves as nerve impulses. I fear it is a loose statement of mine on p. 159 of the Appendix to Sir Thomas Wrightson's book that has misled Prof. Bayliss; there I have written that "the *final* analysis must be done in the cortex of the brain even if Helmholtz's theory is true." That I still believe to be the case.

Prof. Bayliss demurs to the opinion I have expressed that no theory of the mechanism of the ear can be regarded as satisfactory that fails to explain the form and the arrangement of its various parts. I have found that to be an absolutely infallible law as regards every part of the animal body concerned in movement. In every bone, joint, muscle, tendon, and ligament which has been investigated the result has been the same—the material of which each is made has been found to be so placed, so shaped, and so arranged as to carry out the particular function which has been assigned to it. Whether we accept Helmholtz's explanation of the mechanism of the internal ear or Sir Thomas Wrightson's, we are dealing with a machine concerned in movement, and it is, therefore, legitimate to infer that its parts are designed to subserve its various movements. The only structural feature of the cochlea explained by Helmholtz's theory is the gradual increase of the basilar membrane from its proximal or fenestral end to its distal or helicotremal end. The elaborate structure of the organ of Corti and the conformation of the canals of the cochlea are left unexplained, whereas in Sir Thomas Wrightson's theory all these matters receive a rational explanation. On the Helmholtz theory we must believe that the rabbit is provided with a more delicate analytical machine than man, and the sloth with a more elaborate one than the most tuneful bird. Nay, we are certain that if Helmholtz's explanation had been the right one, Nature could have secured the necessary mechanism in a much simpler way, namely, by providing the auditory hair-cells with processes or cilia of the requisite qualities and dimensions to serve as sympathetic resonators.

I now come to a very important and very difficult objection that has been raised by Prof. Bayliss. Sir Thomas Wrightson's theory certainly presumes that the fibres of the nerve of hearing are capable of carrying

5000, 20,000, 40,000, or more impulses per second. He rightly says we have no experimental evidence that a nerve can convey at the utmost more than 500 impulses per second. He quotes the investigations of the late Dr. Keith Lucas, but Keith Lucas was careful to point out ("The Conduction of the Nerve Impulse") that his work had been necessarily confined to the motor nerves of muscles, and was clearly of the opinion that his results were not transferable to sensory nerves, "particularly in the case of light and sound." Indeed, on Helmholtz's theory we infer, and are justified in the inference, that certain fibres of the auditory nerve must be capable of carrying at least 18,000 impulses per second—if we accept that number as the upper limit of our range of hearing. In Sir Thomas Wrightson's theory it is necessary to presume that every hair-cell is capable of generating, and every auditory fibre of conducting, at a rate which may vary from 60 per second to 80,000 per second. I anticipate that the internal ear will provide psychologists with the most delicate means of investigating the manner in which sensory stimuli are produced by mechanical means.

Instead of Helmholtz's theory being in conformity with Müller's law, and Sir Thomas Wrightson's at variance with it, I am of opinion that the opposite is the case. In consequence of having adopted the theory of resonators, Helmholtz had to make the further assumption that the auditory differed from every other sensory nerve—such as those of touch, taste, and smell—in that its fibres were specialised into 15,000 or more units or groups, whereas in ordinary sensory nerves there is no such specialisation, every one of its fibres being capable of serving the same kind of function. The only exception is the optic nerve, in which Young and Helmholtz postulated at least three kinds of units or fibres. The recent investigations of Dr. F. W. Edridge-Green and of Dr. R. A. Houston tend to prove that there is no need to postulate a functional differentiation in the fibres of the optic nerve, and similarly the Wrightson theory does away with the necessity for presuming that the auditory nerve contains 15,000 sets of fibres which are functionally distinct.

No reference was made by Sir Thomas Wrightson to experiments which had demonstrated that animals subjected to a prolonged repetition of a note of a high vibrational frequency suffer a degeneration at the narrow, proximal or fenestral end of the organ of Corti—just the area which we may presume would be affected if the theory of Helmholtz were true. Nor was allusion made to the less certain results obtained at the opposite end of the organ by prolonged repetition of notes of low frequency. From the measurements and data which I placed before Sir Thomas Wrightson, he estimates that in all stapedial movements pressure falls simultaneously and equally on all parts of the basilar membrane, but of this I am not convinced, conceiving that notes of high frequency, especially where the waves rise sharply to their maximum intensity, will fall chiefly on the proximal or narrow end of the basilar membrane, whereas notes of low frequency, rising slowly to their maxima, will fall chiefly on the distal or wide end of the membrane. If such is the case, then it is not necessary to invoke Helmholtz's theory for their explanation. The explanation is not a new one, having been put forward by Prof. Max Meyer, of the University of Missouri, a number of years ago.

There are also the cases observed by aural surgeons where tone-gaps or islands occur in the gamut of hearing. These cases receive an apparent explanation on the Helmholtz theory. I think it will be found that such cases represent defects in the auditory system corresponding with colour-blindness in the visual system, both representing disorders, not in the peripheral, but in the central, parts of the auditory and visual systems. I would direct particular attention to a statement made by the late Keith Lucas on the last page (p. 102) of his posthumous work on "The Conduction of the Nervous Impulse":—"*On the basis of this analysis we have pictured the central nervous system as a network of conductors having different refractory periods, communicating through regions of decrement, easily fatigued.*" A network of conductors having different refractory periods presents the exact mechanism needed for the sorting out of the millions of impulses which reach the auditory centres along the fibres of the auditory nerve. Sir Thomas Wrightson has shown that, however complex the sound, each component part is registered by the hair-cells as the complex passes through the inner ear. Keith Lucas's speculations open up the possibility of a central machine for assorting the impulses according to their time-intervals.

I, for one, am particularly glad that Prof. Bayliss has taken an interest in this matter, because his knowledge of that borderland which lies between physics and physiology peculiarly fits him to adjudicate on the claims of the Helmholtz and of the Wrightson theories of the internal ear. A. Keith.

Royal College of Surgeons,
Lincoln's Inn Fields, W.C.2.

Epidemic Influenza.

Prof. Hewlett's interesting article in Nature for October 24 may justify the statement of a few facts collected during the last quarter of a century. Dealing with the Registrar-General's returns for London and considering twenty deaths per week as epidemic if this number or more is maintained for successive weeks, there have been twenty-eight epidemics since the reassertion of the complaint in 1890. Of these there have only been two, in the years 1910 and 1911, with fewer deaths than 100. The only years in the epoch without influenza being epidemic are 1896 and 1901. The most serious epidemics since 1890 occurred in 1891, 1892, and 1899–1900, in each of which there were in London upwards of 2000 deaths. In recent years the most serious epidemic occurred in 1908 with a total of 1061 deaths, but the summer and autumn epidemics of the present year bid fair to be at least as severe.

The two epidemics of the present year differ very materially from all the other epidemics since 1890 with respect to the age-death. The Registrar-General has introduced a slight change in the returns from 1911, which prevents 40 being uniformly adopted as an age-limit for death. Taking all the epidemics from 1890 to 1916–17, the deaths at ages from 0 to 20 years were 12 per cent. of the total number; from 20 to 40 or 45 years, 14 per cent.; and from 40 or 45 years and upwards 74 per cent. These numbers are remarkably similar in the several epidemics. For the two epidemics this year the deaths for the respective ages are 0 to 20 years, 26 per cent.; 20 to 45 years, 48 per cent.; and above 45 years, 26 per cent. It is an interesting problem to account for the difference introduced in the ages of death in the epidemics of the present year.

Prof. Hewlett refers to the disease waning and almost disappearing after the epidemic of 1893–94, but an examination of the Registrar-General's returns will show that the epidemics were exceptionally severe in 1895, 1899, and 1899–1900, and also in 1908, the deaths in London from influenza alone exceeding

1000 in each of these attacks. The year 1891 is referred to as the worst period, but at the date mentioned the Registrar-General says "one death was primarily attributed to influenza." In lieu of 1891 the year 1892 should have been given, when for the week ending January 23 the deaths in London were 506. The quiescence of the disease lasting three-and-twenty years is scarcely tenable, as shown by the above facts.

The total number of deaths from influenza for the past summer epidemic was 929 (not 1600), based on the reasoning followed in all epidemics since 1890. In the attack now in progress the total deaths (371) in London for the week ending October 19 were more than in any epidemic since 1895, when the deaths in the week ending March 19 were 473.

Since 1890 no influenza epidemic has occurred in London in September, only one (the present year) in August, two in October, two in July, three in June, and four in November. Of the total twenty-eight epidemics twenty-four have occurred in March and twenty-one in February.

Although the weather seems to have little bearing on the disease, the temperature generally has been abnormally high and the air humid at the outbreak of several of the epidemics, whilst when the air becomes cold and dry the incidence of the disease is commonly reduced. CHAS. HARDING.

65 Holmewood Gardens, London, S.W.

Supplies of Amœba proteus for Laboratories.

ONE of the ways in which the war has interfered with zoological teaching in this country is by cutting off supplies of various of the animal types which are examined by the student in the laboratory. Amongst these, as has already been indicated by letters to NATURE, is Amœba—the animal with the study of which many zoological courses commence.

It is easy enough to obtain Amœbæ of a kind, but what the teacher requires is a supply of the large Amœba which commonly goes under the name *A. proteus*. Of this, again, it is easy enough to obtain a few specimens, but the teacher—at least, if he has a class of nearly four hundred students, as is the case in this University—must be able to obtain a thousand or more specimens on a particular date.

With the object of grappling with our local difficulties in this matter, Dr. Monica Taylor, S.N.D., has been so good as to make a special study of the distribution of *A. proteus* in the neighbourhood of Glasgow, and of its culture in the laboratory. Pending the publication of her paper on the subject, I think it may be useful to other teachers of zoology if I summarise in a few words her chief results.

During the months June to December *A. proteus* seems to be of general occurrence in moorland lakes and ponds, while it disappears from December to May—no doubt becoming encysted, as described by Miss L. Carter (Proc. Roy. Phys. Soc. Edin., vol. xix., 1915). The main conditioning factors of its occurrence appear to be abundant food supply and a rich supply of oxygen. An apparently ideal spot is one where richly oxygenated water from the overflow of a pond passes over mud rich in organic *débris*.

The supplies of Amœba obtained in such a locality are placed in aquaria in which the water is richly aerated either by water-weed or by a special apparatus, and as a source of food supply grains of wheat are mixed with the mud, as suggested by Hyman. In this way Dr. Taylor has succeeded, as she says, in obtaining "millions" of Amœbæ in laboratory cultures. J. GRAHAM KERR.

University of Glasgow, October 22.

ALCOHOL IN INDUSTRY.

NOT the least remarkable result of the war on this country will be its effect on the development of chemical industry, and especially in the application of organic chemistry to the chemical arts. This, of course, has primarily resulted from the cutting off of the large supplies of manufactured organic products—mainly synthetic dyes and drugs, photographic chemicals, and numerous other substances comprehended under the term "fine chemicals"—which prior to 1914 mainly came to us from Germany. Thrown thus upon our own resources, we were compelled, in the interests of national health and welfare, to attempt the manufacture of certain of the more important of these products. Great difficulties were experienced at the outset, owing to our lack of experience and the absence of skilled assistance. The supply of chemists with any real training in the application of organic chemistry to industry was very far short of the sudden demand. We were overtaken by a Nemesis invoked by our own inactivity and lack of foresight. It is only within recent years that the teaching of organic chemistry has received any considerable amount of attention in our universities and technical colleges. For the most part it has been regarded as a purely academic subject, to be studied in the interests of pure science, and with no thought to its technical application as a branch of manufacturing chemistry. Except to the few who sought to fit themselves for a career in science, mainly as teachers, there was little or no inducement to pursue its study, as there were very few opportunities in this country to turn a knowledge of it to practical account.

The situation at the outbreak of war was further aggravated by the action of the Army authorities in drafting such trained men as were available into the combatant ranks. But, notwithstanding these disadvantageous circumstances, an astonishing amount of progress has been made. As regards medicaments our manufacturers have risen to the demands made upon them. In spite of many setbacks due to inexperience and ignorance, and the lack of adequate plant, we have it on the testimony of the highest authorities that the Services are now adequately supplied with every needful drug. In this respect our men, and the country generally, are infinitely better off than our enemies. It is notorious that Germany, in spite of all her boasted power of organisation, has failed lamentably in meeting the necessities of her Medical Service, and an untold amount of suffering, permanent injury, and a greatly increased mortality have thereby resulted.

As regards synthetic dyes, if the progress has not been relatively so striking or so adequate as in the case of drugs, it has at least been very considerable. We are very far from being alongside Germany yet, either in the amount or the range of our output, but we are in a fair way of being able to meet our more urgent demands. It is impossible in five years to make up the leeway of fifty, especially of fifty years of strenuous and almost feverish activity. With the blessed prospect of peace now in sight, it is hopeless to expect that we shall wholly catch up our rivals. Indeed, it will require skilful handling, both on the part of the Government and of our manufacturers, to safeguard the position we have already won.

But whatever the future may have in store, it is quite certain that applied organic chemistry in this country has received a great impetus, and that it is destined to become an increasingly important factor in our chemical industry. In certain subordinate branches, indeed, the ground gained has already been consolidated. German competition in the case of some organic products is no longer in question. Not only have we succeeded in manufacturing these substances; we are also turning them out of better quality than heretofore and rapidly securing a world-wide market for them.

In view of the prospect before us the problem of the supply of alcohol for industrial purposes acquires a fresh importance. It has been in the past a somewhat thorny question, made needlessly acute by misunderstanding and misrepresentation. It has been complicated by fiscal considerations, and by the attitude of a Treasury which was more concerned in safeguarding and securing revenue from this source than in appreciating the demands of industry. The Treasury, although ultimately responsible, may plead that it is not wholly to blame, since in this matter it is dependent upon its official advisers, who, being for the most part persons attached to revenue departments, could not be assumed to be altogether unbiased. Still, in spite of official inertia and conservatism, the revenue authorities have, of late years, become increasingly sympathetic with the needs of manufacturers, and concessions and relaxations which twenty years ago would not have been contemplated are now readily obtainable. A stumbling-block is the necessity for denaturing. Wood-naphtha costs more than ordinary spirit, hence methylated spirit is more expensive than duty-free common alcohol. In some cases the presence of methyl alcohol, or the substances associated with it in the crude commercial article, are positively detrimental. The Excise authorities have appreciated these objections by allowing manufacturers to denature the alcohol by the use of some substance which is ancillary to the manufacture of the article for which the alcohol is needed, and at the same time renders the spirit unpotable.

It can scarcely be doubted that industry will need much larger quantities of alcohol than have hitherto been available, and increased attention will need to be paid to possible sources of supply. It is not only in industrial chemistry and in many other arts that alcohol is required. It is beginning to receive consideration in this country as fuel, and particularly in internal-combustion engines. Up to the present time the use of alcohol as motor fuel with us has not been a commercial possibility; it could not be produced at a price that would compete with petrol at pre-war figures. Circumstances have, however, changed, and it is unlikely that any form of motor-spirit will sink, at all events for some time to come, to the prices of 1914. Nor is it probable that the raw materials which have hitherto served for the manufacture of alcohol in this country will for years reach their former low values. These substances for the most part have been cereals, or some form of starch-producing, and therefore potential sugar-producing, material. In addition, considerable quantities of spirit have been made from molasses and other saccharine substances capable of fermentation. Potatoes with us are too valuable as a food to be employed, as in Germany, for the manufacture of alcohol.

But there are other modes of obtaining alcohol than from substances which can be used for food, and it is this circumstance that has induced Mr. Long to appoint the Committee to which we made reference in NATURE for October 17. Large quantities of spirit are now obtained from the sulphite liquors in the manufacture of wood-pulp, and factories for the manufacture of alcohol by this process have been established in Sweden, North Germany, America, and elsewhere. To such an extent has the manufacture developed in Sweden that the Government is contemplating a monopoly of the wholesale trade in technical spirit—a measure which has aroused considerable opposition in industrial circles. We learn that a company with a minimum capital of 1,000,000 kronor has been founded in Stockholm to manufacture and sell motors and automobiles run on sulphite spirit.

The process of treating seaweed, to which Sir Edward Thorpe directed attention in a recent letter to the *Times*, is a method of saccharifying cellulose material very similar in principle to that employed in the wood-pulp industry. Factories to exploit seaweed in Sweden have been or are being erected at Varberg and in Skane, probably on lines similar to those worked in Glasgow. Considering the enormous quantities of valuable seaweeds to be met with on our coasts, especially among the Western Isles of Scotland and on the west coast of Ireland, it is to be regretted that no effective steps are taken to turn them to practical account. Although formerly of considerable commercial value, the only use that is now made of them is to a limited extent as manure on land adjacent to the shores on which they are gathered. Only an infinitesimal amount of that readily available is so used, and it seems a pity that material so intrinsically valuable should not be dealt with more efficiently.

EPIDEMIC CATARRHS AND INFLUENZA.

THE present epidemic of influenza, and the rise in the rate of mortality consequent upon it, are receiving much attention in the public Press, and many irresponsible statements are being made concerning the disease. Among these is the hint that the "so-called influenza" is plague in a thin disguise. These erroneous views may at once be discounted. There is no doubt, as Prof. Hewlett stated in his article in last week's NATURE, that in the present outbreak we are concerned with the same disease which was widely pandemic in 1889–92, and prior to that had been almost unknown for forty-three years. Since 1892 influenza has lifted up its head at intervals of a few years, and since war began it has been the cause of a fairly heavy mortality in this country, as well as among other belligerent nations, and farther afield in South Africa, in India, and in various parts of America. A clear general conspectus of our present knowledge, and, it may be added, our lack of knowledge, of the disease is given in a memorandum[1] recently issued by the Medical Officer of the Local Government Board.

The chief peculiarity of the epidemic prevalence of influenza during 1918 is that it has occurred at short intervals, scarcely three months having intervened between the epidemic which culminated in July and the even more severe epidemic which now prevails throughout the United Kingdom, and is almost world-wide. It has recently been stated that the epidemic occurrence of influenza in July should have furnished warning of the present autumnal epidemic. Those who put forward this statement have not made themselves acquainted with our national experience of influenza. In actual fact no previous known epidemic of influenza in this country has had a summer maximum, and no previous epidemic has recurred within three months of a previous epidemic. In the light of events this rapid recurrence is not difficult to explain; for the exigencies of warfare, the rapid transport of many tens and hundreds of thousands of troops across the seas in circumstances which necessitated dense aggregation of persons, have intensified infection, multiplied the opportunities for severe secondary infections, and have exposed the civil population to exceptionally virulent complex infection.

The memorandum referred to above states that the bacillus of influenza (Pfeiffer bacillus), which commonly is present in these cases—whether causally or as an aggravating cause of pneumonia—has associated with it pneumococci and hæmolytic streptococci, which produce septic pneumonia and empyema in a considerable proportion of the total cases. The question of vaccine treatment and of prophylaxis by vaccine is considered, and there is some hope of success in this direction, though reliance must be placed chiefly on the hygienic precautions which are detailed in the official document. Of these, probably chief importance should be attached to the avoidance, so far as practicable, of overcrowded conditions; and in this connection special stress is laid on the importance of avoiding large units of aggregation, which greatly intensify the risk of infection. The importance of this consideration is too often ignored in civilian life; under military conditions such large units of aggregation cannot always be avoided.

The main object of this article, however, is to emphasise the need for further research on this disease. Some of the lines on which such research is called for are indicated in Sir Arthur Newsholme's memorandum. "Influenza is to be regarded as a member of a group of catarrhal infectious diseases which in the aggregate are perhaps the chief enemies of human health," and it is significant that even in the years when the ravages of influenza are greatest bronchitis and pneumonia are each responsible for twice as many deaths as influenza. Thus the general problem is that of the prevention of catarrhs. How can immunity be secured and maintained? Will immunity against one catarrh-causing organism assist in securing immunity against others? If immunity cannot be secured against influenza, can one rob the disease of its terrors by a vaccine against purulent bronchitis or pneumonia?

These are among the problems urgently needing investigation. When the National Insurance Act was passed, one of its most valuable provisions was the 1*d*. per insured person which enabled the work of the Medical Research Committee to be initiated. During the war the energies of this Committee, and, it may be added, of most pathologists who could have been utilised for a national investigation on influenza, have been diverted to war-work. This work has been of great value; but it may be hoped that ere long staff and time will be available for a steady and continuous investigation of the numerous problems of immunity in relation to catarrhal infections. The public must be prepared to spend money on such investigations on a much larger scale than in the past if success is to be achieved; and for this purpose it will be necessary to train a generation of pathologists who can be certain of a fair livelihood while undertaking such work. Unless careers as pathologists are open to a much larger number of specially qualified workers than are at present available, the work of research will continue to be hampered as in the past. The harvest truly is great, but the labourers are few.

Meanwhile we must depend in the main on avoidance of crowds and on the practice of elementary personal hygiene in the prevention of influenza. The public can minimise this disease only by the active co-operation of every member. This involves a self-abnegation on the part of persons suffering from catarrh which is too often absent; they consider their work as more important than the welfare of their co-workers; and it is evident that so long as this continues influenza will at intervals continue to plague humanity.

DYESTUFFS AND THE TEXTILE INDUSTRY.

NOTHING could be more convincing of the neglect of this country to provide the means whereby the applications of scientific discovery should be made available in the conduct of important industries than the speech of Mr. Lennox B. Lee on the occasion of the annual meeting of

[1] Memorandum on Epidemic Catarrhs and Influenza. By Sir A. Newsholme, K.C.B. (H.M. Stationery Office.) Price 1*d*.

the Calico Printers' Association, of which he is chairman, on September 18. It appears that the association is by far the largest user of colour in this country. Before the advent of the war the 2000 colours it then used were to the extent of 70 per cent. produced solely in Germany, and of the remainder only 7 per cent. were of British origin. At the present time out of the restricted list of 230 essential base colours only 25 per cent. are produced by British makers, one-third of these being substitutes, and only used because better colours cannot be obtained, whilst the cost is not less than from 200 to 1000 per cent. above pre-war prices. Moreover, of the 230 colours above-named, only the commoner colours, including also one or two of the better kind, are obtained from British firms. The association is, in fact, dependent upon the Swiss colour manufacturers for the finer ranges and specialities, while quite half the colours of the said list cannot be obtained at all, amongst them some of the most valuable.

This is a very serious state of affairs, since of the cotton goods export of Great Britain, amounting in 1913 to 56,000,000*l*., more than half were exported in the coloured state. Unless in the future the colours essential to the industry can be produced in this country of a quality and range and at a price which compare favourably with the production of Germany and Switzerland, this great industry must inevitably suffer, and be doomed to ultimate failure; and not alone this important moiety of our cotton textile exports, for we shall likewise imperil the market for uncoloured textiles also. A boycott which is contemplated on the import of German dyes, with the view of encouraging the production of British dyes, will not meet the case so long as the quality or the class of dye (new dyes are continually being produced), or the price at which they can be sold to the user, will not compare with the product of the foreign manufacturer. The calico printers and dyers, having regard to the fact that they are in competition with nations all over the world in foreign markets, must of necessity get the colours they require in the best and cheapest market, and if they cannot procure these at home must do so where they can. We have the raw material of the coal-tar colours here in vast quantities, which we largely exported to Germany, and in the case of one large firm in the North of England, which is Swiss-owned, the intermediate products are sent to Switzerland, to be there treated and returned to this country in the form of dyes of fine quality.

There is but one effective remedy for this most serious menace to one of the greatest of our industries, and it consists in the provision of a numerous highly trained body of skilled workers which it is the business of our scientific colleges to supply. Therein lies the initial advantage of Germany and Switzerland. Just fifty-six years ago it was confidently stated in an official document that, having regard to the exhibits at the International Exhibition, London, in 1862, "England has now become the dye-producing nation of Europe," and we now see, because of our lack of enterprise and vision, how completely this has been falsified. Mr. Milton Clarke, the president of the Bradford Dyers' Association, declared in February, 1916, that the establishment of the synthetic dye industry was vital to our national safety, since dyes and high explosives were very closely related, and that complete, self-contained, and independent manufacture of aniline dyes within the United Kingdom was essential to the commercial and martial protection of the State. "Had it not been for the aid we have received from the Swiss makers," he went on to say, "I dare not contemplate what our position would have been during the last eighteen months."

The vital importance of this question is evidenced by the fact that, taking the whole range of the textile industries of the kingdom, the annual exports reach a total value of 200,000,000*l*., and the number of persons employed is something near two millions. It is, therefore, a matter of serious national concern, and justifies the Government in any prudently considered action which would legitimately and permanently ensure the well-being not only of the dye-producers, but also of the dye-consumers. Wisely conceived, their interests are mutual and inseparable, and must be studied as a whole.

THE RIGHT HON. SIR EDWARD FRY, G.C.B., F.R.S.

SIR EDWARD FRY, who died on October 18, within a few weeks of reaching the age of ninety-one, was born at Bristol, and educated at University College, London. He was called to the Bar in 1854, and, after a brilliant career, was made a Lord Justice of Appeal in 1883. He resigned in 1892, but his services were repeatedly utilised by the Government, particularly as chairman of various Commissions. He was also a member of the Hague Permanent Arbitration Court. A man of wide knowledge and interests, he was a good classical scholar and a student of history, philosophy, and the natural sciences. As a boy he and his younger brother David took a keen interest in the flora of the district near their home in Bristol, an area which included the famous botanical locality, the St. Vincent's Rocks. Mr. David Fry, who died in 1912, was a fellow-worker of Mr. James White, author of the Bristol "Flora."

Sir Edward Fry was especially interested in mosses, and a lecture which he gave in 1891 at the Royal Institution on British mosses was developed into an admirable little text-book in which the life-history, structure, and phylogeny of the mosses are described in a popular but thoroughly scientific manner. A second edition appeared in 1908. A companion volume on the "Liverworts, British and Foreign," appeared in 1911. In the latter work Sir Edward Fry was assisted by his daughter, Miss Agnes Fry, who had also been his collaborator in a somewhat similar booklet on the Mycetozoa, published in 1899. The last-named no doubt was the outcome of Sir Edward Fry's friendship with the late Mr. Arthur Lister and Miss G. Lister, the results of whose work on this remarkably primitive and isolated group of organisms had recently been published in the British Museum Catalogue of the Mycetozoa.

Sir Edward Fry's interest was not confined to the lower plants. One who met him in Switzerland recalls his knowledge of the Alpine flora; and in reference to a trip which he made with the Listers to Egypt in 1900 Miss Lister writes: "I well recall his deep interest in the xerophytic desert plants. The collection was worked out at home with the aid of Boissier's 'Flora Orientalis,' and took its place with those from Greece and other foreign and homelands he had visited." In the garden of his home at Failand, near Bristol, he had brought together many rare and unusual plants, and had also arranged part of it as a pinetum. His interest in his garden, his collections, and in natural life in many forms was retained to the end. He was elected a fellow of the Royal Society in 1883, and of the Linnean Society in 1887; he was also a fellow of London University, and the recipient of honorary degrees from Oxford, Cambridge, and other universities, including that of his native city, Bristol.

SIR W. H. THOMPSON, K.B.E.

SIR WILLIAM HENRY THOMPSON, who was a passenger on the R.M.S. *Leinster* when she was torpedoed in the Irish Channel on the morning of October 10, was a son of the late William Thompson, of Granard, Co. Longford. He was educated at the Dundalk Institution and at Queen's College, Belfast, and was a graduate in medicine of the Royal University of Ireland. After the outbreak of war, when the question of food supply became of paramount importance, he was able to give valuable help to the Royal Society's Committee on Food, of which he was a member. He became scientific adviser to the Ministry of Food shortly after its formation under Lord Devonport, and was made a Knight of the Order of the British Empire in January last in recognition of his services.

Thompson's first posts in medical education were demonstratorships at University College, Galway, and at the School of Anatomy, Trinity College, Dublin. In 1893 he was appointed Dunville professor of physiology, Queen's College, Belfast, as successor to the late Prof. Redfern. On the retirement of Prof. J. M. Purser in 1892 he was elected King's professor of the Institutes of Medicine, Trinity College, Dublin.

Thompson's scientific publications may be divided into several periods. The results of work, commenced at University College, London, in 1892, under the guidance of Sir E. Sharpey Schäfer, on degenerations resulting from lesions of the cortex of the temporal lobe appeared in the *Journal of Anatomy and Physiology*, vol. xxxv. Papers dealing with the nervous mechanism governing limb veins, and with the influence of atropine and morphine on the secretion of urine, which appeared in Du Bois Reymond's *Archiv* and in the *Archiv für Anatomie und Physiologie*, were the outcome of work in the Leipzig Physiological Institute. He published in a series of papers, down to the year 1900, the investigations which he carried out at the Sorbonne Physiological Laboratory, and at Queen's College, Belfast, on the effects on the circulation and on renal activity of peptone injections. A paper on the diuretic effects of sodium chloride, which brought forward evidence in support of Bowman's theory, belongs to this period.

After these papers, and as a result of work commenced in the physiological department at Marburg and continued at Heidelberg, Thompson's lines of research became more chemical. He attacked problems which were receiving close attention from Prof. Kossel—namely, those dealing with the physiological action of protamines and of their cleavage products. From this period onwards, during his tenure of the Dublin chair, his work developed along these lines. A long series of very important papers concerning creatinine and arginine metabolism appeared in the *Journal of Physiology* and in the *Biochemical Journal*.

For some years before the outbreak of war Thompson had been instrumental in gathering together a vast amount of statistical material dealing with the food supplies of Ireland and the dietary of the poorer classes.

A scientific colleague who was associated for a time with his work at the Ministry of Food writes:—"The very great value of Sir Henry Thompson's work as scientific adviser to the Ministry of Food can only be appreciated by those who had an opportunity of observing the patience and care with which he attacked every problem about which the authorities desired information."

Recently Sir Henry Thompson had been engaged in a series of investigations on the amount of work performed in different occupations, and the efficiency of the worker when so employed. He spent a short period in the Institute for Experimental Medicine in Petrograd, and afterwards published an English translation of the lectures on the work of the digestive glands delivered by Prof. Pavloff in 1897. The translation appeared in 1902, with the addition of a lecture by the translator on the passage of food through the alimentary canal.

The Lord Chancellor of Ireland, in a speech in support of a fund for the victims of the *Leinster* disaster, referred to Sir Henry's simplicity and earnestness of character, and said that in all human probability his journey to England would have been the last in his official capacity, as he had just been transferred to the Food Control Department in Dublin.

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NOTES.

THE formal transfer of Stonehenge by Mr. C. H. E. Chubb, of Salisbury, to the nation, represented by the First Commissioner of Works, on Saturday last, was a simple but effective ceremony. One of the horizontal stones in the centre made a good platform, with the great monolith replaced by Prof. Gowland as a background. Mr. Chubb made a modest and interesting speech as to the motives which had inspired him to make this generous and patriotic gift to the nation, believing that so ancient a monument should never have been in private hands. He presented the deed of gift to Sir Alfred Mond, who, in accepting it, said he was authorised by the Prime Minister to express his personal appreciation of Mr. Chubb's public spirit. He gave great satisfaction by stating that it was his intention to make a sunken fence in lieu of the wire fence now existing, which interferes to some extent with the view of the monument. Sir Alfred Mond was accompanied by Sir Lionel Earle and by Mr. Peers, the Chief Inspector of Ancient Monuments. Sir H. C. Sclater, the General Commanding in Chief the Southern Command, said that the military authorities would co-operate with the Office of Works in protecting the monument. Other addresses were delivered by Sir C. Hercules Read, Sir Arthur Evans, and Mr. Heward Bell (representing the Wiltshire Archæological Society). Mr. Chubb's gift comprises not only Stonehenge itself, but also thirty acres of land surrounding it, the possession of which will be useful to the Office of Works in the measures it proposes to take for preserving and protecting the monument.

ADMIRAL SIR ALBERT HASTINGS MARKHAM, K.C.B., whose death occurred on Monday last, did much for the furtherance of knowledge in the Arctic regions. Entering the Navy in 1856, when he was fifteen years of age, he saw considerable service in the East before the fascination of polar exploration appealed to him, mainly through a paper which the late Admiral Sir Sherard Osborn read before the Royal Geographical Society in 1865. He was afterwards entrusted by the Admiral with the command of the whaler *Arctic*, in which he carried out a cruise to Baffin's Bay and the Gulf of Boothia. In 1875 he was appointed second-in-command of the Government Arctic expedition under Sir George Nares. In spite of many difficulties, he successfully navigated his ship, the *Alert*, into winter quarters on the north-east coast of Grant Land in latitude 82° 27′ N., which was the highest point then attained by ship or man. In the spring of the following year he set out over the ice of the Polar Sea in charge of the northern party and reached latitude 83° 20′ N. This was only seventy-three miles from the ship in a straight line, but the party covered no fewer than 276 miles on the outward and 245 miles on the homeward journey. In appreciation of his discoveries Admiral Markham was presented with a gold watch by the Royal Geographical Society; in later years he was a prominent member of the society's council. In 1879 he carried out an expedition to Novaya Zemlya in company with Sir Henry Gore Booth, and in 1886 studied the conditions of navigation in Hudson's Strait on board his old ship, the *Alert*, in connection with the Canadian Government's proposals for the establishment of a summer service between Fort Churchill and England. In the course of his career Admiral Markham contributed largely to the literature of polar exploration, and he wrote the biography (published last year) of his cousin, the late Sir Clements Markham.

WE regret to learn of the premature death of Dr. Charles Rochester Eastman, of the American Museum of Natural History, in his fifty-first year. Dr. Eastman was born at New Orleans, and completed his education at the University of Munich, where he studied palæontology under Prof. K. A. von Zittel, and graduated as Ph.D. in 1894. His thesis was an important memoir on a fossil shark, *Oxyrhina mantelli*, from the chalk of Kansas, and most of his subsequent researches were on fossil fishes. From 1895 until 1909 he was assistant for vertebrate palæontology in the Museum of Comparative Zoology, Harvard University, where he arranged and described the great collection of fossil fishes. From 1910 to 1912 he held a temporary appointment in the Carnegie Museum, Pittsburgh, where he published illustrated descriptive catalogues of the Eocene fishes from Monte Bolca and the Jurassic fishes from the lithographic stone of Germany and France. He also lectured on vertebrate palæontology in the University of Pittsburgh. In 1915 he became one of the newly instituted research associates of the American Museum of Natural History, New York. In 1900–2 Dr. Eastman did good service to biological science by editing two volumes of a revised English translation of Prof. von Zittel's "Grundzüge der Palæontologie," and during recent years he wrote several interesting papers on natural history in medieval books. He also co-operated with Dr. Bashford Dean in preparing the valuable and exhaustive bibliography of fishes, of which two volumes have lately been published by the American Museum.

MR. ARTHUR CANNON, whose death occurred on October 13, has left behind a valuable record of work accomplished. Following upon a distinguished career at Greenwich College, to which he passed from Devonport Dockyard, Mr. Cannon became assistant to Sir John Biles at Glasgow University. While occupying that position he was, in 1912, appointed to the research scholarship in naval architecture awarded by the Royal Commissioners for the Exhibition of 1851. The programme of research outlined by him included the experimental investigation of the rolling of ships amongst waves, and to that subject and others akin to it the two years of the scholarship were devoted. Beginning with a purely mathematical treatment of the effect of "loose" water upon stability, Mr. Cannon pointed out for the first time the valuable conclusion that the initial stability is at a maximum when the "loose" water admitted to the interior of a ship is at the same level as the water outside, but that this condition is the worst for stability at large angles of inclination. He then proceeded to investigate experimentally the effect of "loose" water upon rolling. This part of the research was carried out on the rolling machine at Glasgow University (a variation of Russo's navipendulum), and led to the conclusion that, whereas in ordinary circumstances the "free" oscillation is the dominant factor in rolling, in the case in which there is a considerable amount of "loose" water in the ship the "forced" oscillation is the dominant factor. The results of this research are of especial value in connection with the fitting of "anti-rolling" tanks, in that they indicate the beneficial effects of small quantities of loose water and the harmful effects of large quantities. A further research into the subject of the rolling of ships had reference to the period of roll at large angles of inclination. The full record of Mr. Cannon's research is contained in the Transactions of the Institution of Naval Architects, and its value was marked by the award of the annual premium to him by the council of the institution on two occasions. Through his untimely death at only thirty-two years of age the profession of naval architecture loses a valued member.

In 1914 Mr. Cannon was appointed Assistant Naval Constructor at the Admiralty, and at the time of his death he was the Admiralty overseer on submarine-building at Messrs. Cammell Laird and Co.'s yard, Birkenhead.

WE regret to announce the death on October 9, at twenty-nine years of age, of Mr. Robert John Pocock, director of the Nizamiah Observatory, Hyderabad.

DR. G. E. MOORE will deliver his inaugural presidential address to the Aristotelian Society at 22 Albemarle Street on Monday, November 4, at 8 p.m., upon the subject of "Some Judgments of Perception."

THE John Scott legacy medal and premium has, on the recommendation of the Franklin Institute, been awarded to Mr. F. P. Fahy in consideration of the development of the Fahy permeameter.

WE much regret to announce the death on October 26, at eighty-seven years of age, of the Rev. A. M. Norman, F.R.S., honorary canon of Durham, and an eminent worker in many fields of natural history.

WE notice with regret the announcement of the death on October 23, in his ninety-first year, of Mr. R. Brudenell Carter, the distinguished ophthalmic surgeon and author of several valuable works upon ophthalmic subjects.

DR. A. SMITH WOODWARD, keeper of the Geological Department of the British Museum (Natural History), has been awarded the Cuvier prize by the French Academy of Sciences. Other British recipients of the prize have been Sir Richard Owen, Sir Roderick Murchison, and Sir John Murray.

DR. A. L. DAY, who has been director of the geophysical laboratory of the Carnegie Institution of Washington since its establishment in 1906, has resigned the position to engage in research work on glass and allied materials for the Corning Glass Works, Corning, New York.

THE hundredth session of the Institution of Civil Engineers will be opened on Tuesday, November 5, at 5.30 p.m., when Sir John A. F. Aspinall, president, will deliver an address, and will present awards made by the council for papers read and discussed or otherwise dealt with during the past session.

PROF. A. N. SKINNER, formerly professor of mathematics at the U.S. Naval Academy and assistant astronomer of the Naval Observatory, died on August 14, aged seventy-three years. Prof. Skinner discovered four variable stars, and was responsible for 20,000 observations to determine the positions of 8824 stars for the *Astron. Gesell.* catalogue.

THE death of Mr. Henry Westlake, at the age of seventy-two years, is recorded in the *Engineer* for October 25. Mr. Westlake was a prominent figure in South Yorkshire, and was for some years a director of Cammell Laird and Co., Ltd., and of the Workington Iron and Steel Co. For more than fifty years he was associated with the Staveley Coal and Iron Co.

WE regret to note that the *Engineer* for October 25 records the death of Mr. J. F. L. Crosland, who was connected with the Vulcan Boiler and General Insurance Co. for forty-nine years, during the last twenty-four of which he was chief engineer of the company. Mr. Crosland was a member of the Institutions of Civil, Mechanical, and Electrical Engineers, and took a prominent part in legislation dealing with boiler accidents. He was seventy-nine years of age at the time of his death.

THE death of Mr. Thomas Charles Hutchinson, the managing director of the Skinningrove Iron Co., is announced in the *Engineer* for October 25. Mr. Hutchinson was born in 1840, and played a great part in the development of the Cleveland district. He formulated a scheme for the erection of steel works in connection with the existing blast-furnace plant of his firm, adopted the new Talbot process, and installed the first electrically driven cogging mill in Great Britain. He took a keen interest in the Iron and Steel Institute and other kindred societies.

MR. THOMAS CODRINGTON, who died on October 21, aged eighty-nine, was a civil engineer deeply interested in geology. For nearly sixty years he had been a fellow of the Geological Society, and he contributed several papers on the geology of Hampshire, the Isle of Wight, South Wales, and other districts. He discovered the only known petrified rootlets, probably of palms, in the tubular hollows of the Berkshire sarsen stones, and he was the first to recognise the gizzard stones in a fossil reptile, a Plesiosaurian which he found in the greensand of Wiltshire.

Engineering for October 25 records the death of Mr. Josiah Richard Perrett, who for many years was an active agent in the development of warship design in this country, particularly at Elswick. Mr. Perrett did valuable work in the earlier days of experimental research into the resistance of ships at Dr. Froude's tank. He was born in 1848, and received his training at H.M. Dockyard, Devonport, the Royal School of Naval Architecture, the Chatham Dockyard, and the Admiralty. He joined the Elswick shipyard in 1887 as first assistant to Sir Philip Watts. He received decorations from Japan, Italy, and Turkey; a paper by him was read at the last Newcastle meeting of the Institution of Naval Architects.

M. PAUL KESTNER, the president of the Société de Chimie Industrielle, a society which has been recently formed to promote the organisation and development of industrial chemistry in France, will deliver an address on "The Alsace Potash Deposits and their Economic Significance in relation to Terms of Peace" to the London Section of the Society of Chemical Industry on Monday next, November 4; the meeting will be held at the rooms of the Society of Arts, John Street, Adelphi, at 7.30 p.m. M. Kestner is being entertained to luncheon on that day by the Society of Chemical Industry, and the company will include Lord Moulton, Lord Burnham, Sir Robert Hadfield, Sir Alfred Keogh, Sir Alfred Mond, Sir Arthur Churchman, Sir Charles Parsons, Sir Boverton Redwood, Profs. Louis, Pope, and Armstrong, Dr. Keane, and other distinguished chemists and engineers, the Sheriffs of the City of London, and several chemical manufacturers representing this important industry. The guests are invited by the Lord Mayor to tea at the Mansion House in the afternoon.

AT a meeting of the council of the Institute of Chemistry, held on October 25, it was reported by the General Purposes Committee that the position of the institute in connection with the proposals contained in the Whitley report had been under consideration. A letter had been addressed to the Minister of Labour pointing out that, although modern productive industry depended so much on the work of chemists, engineers, and the like, such technical experts do not appear to have any place in the constitution of the industrial councils; but, in view of the fact that it was proposed that the industrial councils should deal with such subjects as technical education and training, industrial research, utilisation of inventions and improvements, and industrial experiments, the Minister of Labour had been asked (*a*) whether it was intended that qualified professional technical experts should be represented on the industrial councils, and (*b*) whether it was desired that the professional bodies representing such men should be brought into consultation in any way in connection with the technical matters referred to. On the recommendation of the Public Appointments Committee, the council has approved a statement on the necessity for a definitely organised Government chemical service, which will shortly be brought to the notice of all Government Departments concerned.

THE second and third Chadwick lectures on "The Story of a New Disease" were delivered by Dr. Crookshank on October 17 and 24. In the second lecture epidemic encephalo-myelitis (the Heine-Medin disease or infantile paralysis) was considered. First described by Willis in 1661, the disease has recurred again and again, frequently assuming different types, the latest in this country occurring during the present year and resembling in many respects "botulism," a form of food-poisoning. Two forms of so-called food-poisoning, raphania and botulism, were discussed in the third lecture. Raphania was the name given in the eighteenth century by Linnæus and his pupils to an epidemic disorder characterised by mental affections, paralyses, and convulsions, that spread throughout Sweden, and was ascribed by Linnæus to admixture of radish-seeds with foodstuffs. It has been confused by later German writers with ergotism. Botulism is a disease of the nineteenth century, usually traced to the consumption of sausage and allied comestibles. The lecturer suggested that both botulism and raphania are caused by the virus of the Heine-Medin disease, and directed attention to modifications in the soil (*i.e.* the individual) in causing varying manifestations of the viruses of epidemic diseases.

AT the statutory meeting of the Royal Society of Edinburgh, held on October 28, the following office-bearers were elected:—*President:* Dr. J. Horne. *Vice-Presidents:* Prof. D'Arcy Thompson, Prof. J. Walker, Prof. G. A. Gibson, Dr. R. Kidston, Prof. D. Noël Paton, and Prof. A. Robinson. *General Secretary:* Dr. C. G. Knott. *Secretaries to Ordinary Meetings:* Prof. E. T. Whittaker and Dr. J. H. Ashworth. *Treasurer:* Mr. J. Currie. *Curator of Library and Museum:* Dr. A. Crichton Mitchell. *Councillors:* Sir G. A. Berry, Dr. J. S. Flett, Prof. Magnus Maclean, Prof. D. Waterston, Prof. F. O. Bower, Prof. P. T. Herring, Prof. T. J. Jehu, Dr. A. Lauder, the Hon. Lord Guthrie, Sir E. Sharpey Schäfer, Prof. J. Lorrain Smith, and Dr. W. A. Tait. Dr. W. A. Tait was also elected the society's representative on George Heriot's Trust.

A LETTER from Mr. Stefansson, written on July 20, from Fort Yukon, Alaska, is published in the *Geographical Journal* for October (vol. lii., No. 4), and gives some further details of the work of the Canadian Arctic Expedition during the last four years, additional to the discoveries of the southern party, which have already been announced. The north-west coastline of Prince Patrick Island and the north-east coastline of Victoria Island were completed. The coastlines of Emerald and Fitzwilliam Owen Islands and the shores of Hassel Sound between the two Ringnes Islands were mapped. Several new islands were added to the Arctic Archipelago, including one in the Gustav Adolf Sea between lat. 77° 0′ N. and lat. 77° 55′ N. in about long. 107° to 108° 10′ W., and another in Prince Gustav Sea. Christian Island and Findlay Land appear to be distinct, and Isachsen Land is probably separated from Ellef Ringnes Island. Relatively deep water was found outside Gustav Adolf and Prince Gustav Seas, making the existence of other islands to north-west improbable. Reindeer were found on all the islands visited, but musk-oxen only on Melville and Victoria Islands. On Banks Island they have been exterminated by the Eskimo attracted there by the wreck of Sir Robert McClure's *Investigator*, which they visited for iron year after year. Seals were plentiful on nearly all shores, but polar bears were very local. Mr. Stefansson had hoped to start in January this year on a sledge-journey northwards from Alaska. He had intended to travel about two hundred miles and then form an encampment on a floe and drift throughout the summer, taking soundings as he went. In this way he hoped to accomplish some of the work of the ill-fated *Karluk*. An attack of typhoid fever, however, forced his return to civilisation as soon as possible. We are glad to hear that he has now recovered and proposes to start a lecture-tour on behalf of the Red Cross.

CAPT. F. R. BARTON contributes to the Journal of the Royal Anthropological Institute (vol. xlviii., part i., 1918) an elaborate account of tattooing in south-eastern New Guinea, illustrated by excellent photographs and drawings, a vocabulary of the terms used in the art, and some folk-tales. One of the stories indicates the idea that tattooing was evolved from skin-painting and provides an interesting parallel to similar theories current among the Maoris of New Zealand.

IN the issue of *Man* for October Mr. H. Balfour describes a collection made by Mr. Clough in the Chatham Islands, now deposited in the Pitt Rivers Museum, Oxford. The most remarkable specimens are a fine bone dagger and a grotesque statuette carved in pumice-stone. Mr. Balfour is not aware of any close parallel to these articles. As he has recently pointed out, the evidence of a strong Melanesian element in the culture of Easter Island is very striking, and inasmuch as the presence of a similar non-Polynesian strain in the culture of the Chatham Islands—and, one may add, in New Zealand—is becoming more generally recognised, the suggestion offered as to the possible affinities of these articles may have considerable bearing on the ethnological problems of the South Pacific.

A VERY useful summary of the captures of the North Atlantic black Right whale, or Nordcaper (*Balaena biscayensis*), in Scottish waters, from 1905 to 1914, is given by Prof. D'Arcy Thompson in the *Scottish Naturalist* for September. The grand total for this period amounted to sixty-seven, but, it is to be noted, two-thirds of this total were taken during 1908 and 1909. The marked inequality in the numbers annually taken seems to be accounted for by the movements of the Gulf Stream, since when its waters are abundant the whales are scarce. Prof. Thompson suggests that when the Gulf Stream is warm and strong the whales keep further out to sea, but that when there is only little stream they are tempted to linger on our coast. He is of opinion that this whale is far from becoming extinct, but the evidence does not seem to bear out this optimistic view. He also makes some interesting comments on its size, which is commonly regarded as smaller than that of the Greenland whale. The evidence, so far as it goes, he suggests, seems to show that there is little difference, if any, between them in this respect. Figures are also given showing the numbers of rorquals—three species

—sperm, humpback, and bottle-nosed whales—taken at these stations during this period. The numbers are probably higher than most people would have supposed.

A new *Journal of General Physiology* is being published under the auspices of the Rockefeller Institute for Medical Research. The editors are Profs. Jacques Loeb and W. J. V. Osterhout. In the first instalment, which has just reached us, there are a number of interesting papers on photosynthesis, colloids, internal secretions, and regeneration in plants. Some doubt may be expressed, however, as to the need for another addition to the large number of journals devoted to experimental physiology and biochemistry.

Three important papers dealing with methods of testing the hardness of materials were presented for discussion at the Institution of Mechanical Engineers on October 18. The first paper, by Prof. C. A. Edwards and Mr. F. W. Willis, describes an impact method. The instrument employed consisted of a block of steel weighing 21 lb., which could be released by a mechanical device and allowed to drop 3 in. to the surface of the specimen under test. The energy of the blow was imparted to the surface of the specimen through a hardened steel ball 10 mm. in diameter firmly fixed to the weight. The impact energy was the same in all cases, namely, 63 in.-lb. The specimen was held very rigidly in a heavy steel base, and the whole arrangement was carefully bedded on a massive steel table. In another machine both weight and height of fall could be varied, so as to give energies of impact between 1·75 and 147 in.-lb. The results obtained may be expressed by the equation $d = CE^{0.25}$, where d is the diameter of the indent made by a 10-mm. ball, C is a coefficient which varies with the hardness of the metal, and E is the total energy of impact. The second paper, by Mr. R. G. C. Batson, of the National Physical Laboratory, dealt with both static and impact methods. Within the limits of Mr. Batson's impact experiments it is shown that the energy of the blow is proportional to the volume of indentation for cone and ball indenting tools, and the dynamic hardness number suggested is equal to energy of blow in kg./volume of indentation in cm.^{3} Further, the energy of the blow is proportional to the square of the spherical area of the indentation for ball indenting tool only, and the volume of indentation (and therefore the dynamic hardness number) is approximately independent of the form of the indenting tool (cone, 10-mm. ball, and 4·76-mm. ball). The third paper, by Prof. W. C. Unwin, deals with the Ludwik hardness test, in which geometrically similar indentations are made by use of a right-angled cone. Prof. Unwin suggests that a cone slightly truncated might be employed with advantage; such a cone is more durable than one with a sharp point, and the results differ slightly only. The discussion of these papers brought out a great deal of valuable information, and will be continued at the meeting on November 15.

Among forthcoming books of science we notice the following:—"Hot-bulb Oil Engines and Suitable Vessels," W. Pollock, and "The Production and Treatment of Vegetable Oils," T. W. Chalmers (*Constable and Co., Ltd.*); "Tri-lingual Artillery Dictionary," E. S. Hodgson, vol. ii., French-Italian-English, and vol. iii., Italian-French-English (*Charles Griffin and Co., Ltd.*); and a new and revised edition of the late D. K. Clark's "Mechanical Engineer's Pocket-book," H. H. P. Powles (*Crosby Lockwood and Son*).

OUR ASTRONOMICAL COLUMN.

The Planet Jupiter.—This brilliant object now rises at about 8 p.m., and is visible during the whole of the night which follows. Its position is between the stars δ and ζ in Gemini, and, the north declination being $22\frac{1}{2}°$, the planet remains above the horizon during $16\frac{1}{4}$ hours. During the coming winter it will be very favourably situated for telescopic observation. Mr. Denning states that the great red spot continues faintly visible south of the hollow or bay in the south equatorial belt, and the former objects have exhibited an increasing velocity since 1900, when the rotation period was 9h. 55m. 41·5s. In the present year between May and August the period had declined to 9h. 55m. 31·4s., as determined by Mr. F. Sargent, of Bristol, from observations by the Rev. T. E. R. Phillips and himself. On May 12 the longitude of the red spot was 45°, and on August 9 25°.

If the same rate of motion has been maintained during the interval since August 9, then the present place of the spot is in longitude 6°, and it follows the zero meridian (system II.) given in the *Nautical Almanac* (1918, p. 541) by about ten minutes.

Early in December next the position of the red spot may be expected to correspond nearly with the zero meridian of system II., and will therefore transit at the same time. It will be interesting to observe the times of mid-transit of the red spot, which may be expected nearly as follows:—

		h. m.				h. m.	
November	7	9 51	p.m.	December	1	9 28	p.m.
	9	11 28	,,		4	6 55	,,
	14	10 33	,,		6	8 33	,,
	19	9 40	,,				
	24	8 45	,,				

The hollow in the belt seems to have been certainly visible on Jupiter since Schwabe figured it on September 5, 1831, while the red spot appears to have been first seen and drawn by Dawes on November 27, 1857.

The "great south tropical disturbance," which is a very extensive dusky spot in the same latitude as the red spot, has been visible since February, 1901. It is now distended over about 185 degrees of longitude from 265° to 90°. Moving at a swifter rate than the red spot, it has had the effect of considerably accelerating the speed of the latter in late years.

The Rate of Stellar Evolution.—On the supposition that Cepheid variation is due to some kind of pulsation having the period of light variation, Prof. A. S. Eddington has pointed out that the variations of period indicated by theory may provide a means of estimating the rate of progress of stellar evolution (*The Observatory*, vol. xli., p. 379). The periods of similar globes of fluid pulsating under their own gravitation would be inversely proportional to the square roots of the densities, and the changes of density in a particular star might therefore be deduced from the change of period. Adopting Chandler's estimate that the period of δ Cephei (5·366 days) is decreasing 0·05 sec. annually, the star would double its density in rather more than three million years, and would take about ten million years to pass from type G to type F. This rate of change is much slower than that derived from the assumption that contraction is the source of the star's heat. The time-scale would, in fact, be enlarged a thousandfold, and would become more consistent with present views as to the age of terrestrial rocks, the development of the earth-moon system, and geological change. Observations of the change of period in Cepheid variables would therefore seem to be of possibly great importance, and it is fortunate that they can usually be determined with great accuracy.

THE INFLUENCE OF PROGRESSIVE COLD WORK ON PURE COPPER.

THE hardening effect of the various forms of cold work on metals and alloys has long been known and utilised in the arts, and in recent years various theories have been put forward to explain the phenomena observed. Few attempts, however, have been made to test whether any quantitative relationship exists between the amount of cold work done upon a metal and the magnitude of the change in its properties. A serious and well-planned attempt to obtain information of this kind has been made by Mr. Alkins, who presented a paper at the September meeting of the Institute of Metals on the change in the tensile strength of copper-wire as it is progressively hardened by cold-drawing in the ordinary way. Copper was chosen as the experimental material for the following reasons :—

(1) The wire used in the arts is of a high degree of purity, and seldom contains 1 part of impurity in 1000.

(2) It shows the hardening by plastic deformation very strikingly, inasmuch as its tensile strength may be doubled by cold-drawing without any indication that it is actually overdrawn.

(3) It has hitherto been accepted as a metal which does not possess any allotropic transformation between its freezing-point and 0° C. [Prof. Cohen, however, holds that there is evidence of an allotropic transformation at 71° C.]

In Mr. Alkins's experiments a billet of copper was cast and hot-rolled to a mean diameter of 0·553 in. in the ordinary way. The rolled billet was then annealed for four hours at about 600° C. in order to remove stresses completely, and was allowed to cool. After "pickling" in sulphuric acid to remove the scale it was cold-drawn by light drafts (twenty-five in all) down to 0·04 in. without any further annealing. From the billet after "pickling," and from the wire after each draft, a few feet were scrapped from the end, and three 2-ft. lengths cut for testing. The tensile strength of the wires was determined on a 5-ton Buckton machine. Five determinations were made on each sample of wire, and the readings were found to be concordant within 1 per cent. The mean of the five was taken as the actual breaking load. The results of the tests are shown in the accompanying graph, in which the co-ordinates are tensile strength in tons per sq. in. and sectional area in sq. in. It will be seen that the tensile strength is raised progressively from 15·49 tons in the original billet to 30·80 tons in the wire of the smallest sectional area. It will also be seen that the curve showing the variation of tenacity with sectional area consists of two rectilinear portions AB, CD, connected by a smooth curve BEC with a point of inflection at E. Mr. Alkins's analysis of the curve is as follows :—

The portion AB corresponds with the equation

$$T=31{\cdot}6-67\,A,$$

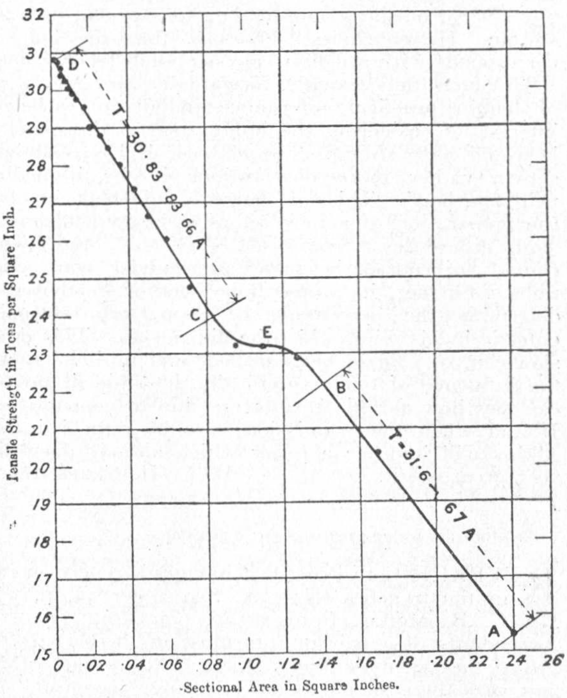
where T=tensile strength in tons per sq. in., and A=cross-sectional area in sq. in. The curved portion BEC agrees closely with the expression

$$T=23{\cdot}2-\sqrt[3]{A-0{\cdot}107},$$

and the upper rectilinear branch CD corresponds with the equation

$$T=30{\cdot}83-82{\cdot}66\,A.$$

According to these equations, then, from A to B the tensile strength increases at the rate of 67 tons per sq. in. for a reduction in area of 1 sq. in., while from C to D the rate of increase is 82·66 tons per sq. in. per sq. in. From B to E the rate diminishes to 0, and increases again from E to C. This curve shows no discontinuity, and at no stage is there a simultaneous diminution in sectional area and in the tensile strength. There is, however, one stage in the drawing at which a reduction of area of almost 10 per cent. (from 0·10927 to 0·095507 sq. in.) is unaccompanied by any change in the tensile strength. This corresponds with the point E, where the tenacity equals about 23·2 tons per sq. in. It appears, then, that over this particular range a reduction in area by cold work is not accompanied by any change in the tensile strength. Of this phenomenon the amorphous phase theory of plastic deformation does not appear to offer any explanation. Assuming, as Mr. Alkins does in the absence of quantitative data, that the amount of cold work actually performed on a metal during drawing is measured by the decrease in cross-sectional area, he is forced to the conclusion that two distinct changes occur in the hard drawing of copper, one of them along the branch AE and the other along the branch ED.



He states that he investigated several other physical properties of the metal as it was drawn down—for instance, density, elongation (both general and at fracture), and scleroscope hardness—and that all these were found to change in a similar way to the tensile strength. A full account of this and of further work is promised. Meantime, as a tentative explanation of the results recorded, he suggests that when copper is subjected to cold work by drawing through dies, the first change which occurs is allotropic in nature, and, after this is complete, a second change sets in which may be either allotropic or explicable on the lines of the amorphous theory.

Another set of experiments is quoted, in which wires were drawn down from the billet by heavy instead of light drafting, the reduction in area being accomplished in thirteen operations, as against twenty-five in the previous set. Here also the results yield a curve of the same type. It was found that over the range AE the values were identical with those obtained in the previous set of experiments, which appears to show that the transformation occurring after this range is constant is independent of the manner in which the cold work is applied. Beyond E, however, the new curve does not coincide with ED, but rises more steeply, the tensile strength corresponding with the 0·040 in. diameter wire, being nearly 33 tons per sq. in. It would appear, then, that the change taking place along ED is different in type from that occurring along AE. It is stated that wires of such a diameter that they fall within the range AE are stable at the ordinary temperatures. At any rate, they do not change in a year's time. On the other hand, wires corresponding with the points on the branch ED are unstable at atmospheric temperatures, their tensile strength being gradually diminished. Finally, Mr. Alkins records that, if fully annealed wire of any diameter is taken and drawn down, a stage is always reached, when its area has been reduced about 50 per cent., where, over a limited range, further drawing causes no corresponding alteration in the properties. He finds that the physical properties corresponding with this constant range are always the same—*e.g.* density=8·889, tensile strength=23·2 tons per sq. in., and so on. He concludes, therefore, that the point E corresponds with a definite physical state of the metal.

The facts thus brought forward by Mr. Alkins are of definite practical importance and distinct scientific interest. Considering the importance of the point E, it would have strengthened his case if he could have shown rather more observations in its immediate neighbourhood. This, of course, would have involved the preparation of a new set of rolls, by which very slight differences in area could be effected. Such work cannot, of course, be undertaken under war conditions. Further, he would have been well advised to determine the percentage of copper-cuprous oxide eutectic in his wire, which he did not do. This omission can, of course, be remedied, and until it is, and the influence of oxide specifically determined, no one can say how far his results are due to copper itself. If and when these omissions can be remedied, Mr. Alkins will improve a paper which already does him very great credit.

H. C. H. CARPENTER.

THE RAT PEST.

REFERRING to Prof. P. Chavigny's report on rats in the trenches (NATURE, September 19, p. 53), Mr. C. B. Moffat, Enniscorthy, points out that the descendants of a pair of rats must in three years far exceed the twenty millions stated. At the end of the first year there should be 50 offspring, 500 grand offspring, 1000 great-grand offspring, 1250 great-great-grand offspring—2800 in all. Half of this number, supposing females equal males, multiplied by 2800, gives 3,920,000 at the end of the second year. At the end of the third year the number should be far more than five thousand millions. It has to be borne in mind, however, that female rats probably reach their limit or menopause long before three years. The most secure data known to us are those of Helen Dean King (*Anat. Record*, vol. xi., 1916, pp. 269–87) on 76 females derived from a cross between the wild Norway rat and the domesticated white rat. The average number in a litter was 6·7 (Prof. Chavigny speaks of 10); the average total number of litters for a female was 7·7; there is a sharp decline in fertility after the female is a year old, and the menopause appears at eighteen months. The sex ratio for 3955 individuals was 106·1 males to 100 females. We do not know how Prof. Chavigny reached the figure twenty millions, but, as Mr. Moffat recognises, there are various biological considerations which make the computation not so simple as it seems at first.

Without doubt the most thorough and informative summary of the menace which faces us from the hordes of rats and mice in our midst has just been issued by the Trustees of the British Museum (Natural History), forming No. 8 of the Economic Series issued by that institution. The author, Mr. M. A. C. Hinton, one of the greatest living authorities on this subject, has marshalled his facts with extraordinary skill; so much so that he has contrived, within the space of some sixty pages, to pass in review, not only the life-history of these pests in a state of nature, their relation to public health, and their amazing destructiveness in the matter of our food supplies, but also the various preventive measures which afford us means of relief. On this head he has much to say in condemnation of the destruction of so-called "vermin," which, until now, has been so persistently and stupidly followed. Finally, he adds a most valuable chapter on the classification of the Muridæ, and a table showing the assumed rate of increase in the annual rat population, which, even while postulating a mortality which is purposely exaggerated, shows clearly enough that none but the most determined efforts can hope to lessen the seriousness of the situation, which has come about owing to the withdrawal of all labour hitherto devoted to the destruction of rats, either by the needs of the Army or by the allurement of the high wages paid for other kinds of work more or less directly arising out of the war. A number of well-chosen and beautifully executed illustrations, showing the dental and cranial characters by which our native species of Muridæ may be distinguished, add still further to the value of these pages. But the figures of the black and common rat and of the house-mouse, to say the least, leave much to be desired. This pamphlet should be carefully studied, not only by the agriculturist, the merchant, and those responsible for the preparation of food in restaurants, but also by the housekeeper; for it is only by the concerted efforts of us all that we can hope for success in this campaign, which is now to be commenced against a condition of affairs which is fraught with real peril.

THE RALEIGH TERCENTENARY.

THE tercentenary of Sir Walter Raleigh's death was celebrated on Sunday, October 27, by a special service at St. Margaret's Church, Westminster. The service was arranged by the Tercentenary Committee, of which the King is patron, Mr. Balfour one of the honorary presidents, and Prof. Gollancz hon. secretary. Two wreaths in memory of Sir Walter Raleigh were laid before the service at the foot of the Communion-table, where the body is said to have been buried. One was from the Tercentenary Committee; the other, of laurels, was from the Royal Geographical Society, and was inscribed: "To the memory of Sir Walter Raleigh on the tercentenary of his death." It was borne by Sir Thomas Holdich, K.C.M.G., and Mr. Arthur R. Hinks, secretary of the society. The address was delivered by the rector of St. Margaret's, Canon Carnegie. Memorial services were also held at the Temple Church and at Woolwich Parish Church. The work of Raleigh in exploration and colonisation was also commemorated on Tuesday by meetings at the Mansion House and elsewhere. At the Mansion House meeting Sir Charles Wakefield (hon. treasurer of the Tercentenary Committee) offered for the acceptance of the Lieutenant of the Tower a copy of Raleigh's "History of the World," which he hoped would find a place in the room where the history was written. He offered to the British Academy as the nucleus of a Raleigh Fund for History the sum of 500*l.* a year for at least the next five years, in the hope that it might not only advance historical learning among our fellow-citizens, but also help forward intellectual co-operation between American and British scholars. He would only stipulate that at least one public lecture be delivered annually, to be named after Raleigh.

At the Devon celebration of the tercentenary held at Exeter, Lord Fortescue, president of the organising committee, announced that he had received from Mr. Walter Peacock, Secretary to the Duchy of Cornwall, a letter to the effect that he was sure the proposal to celebrate the tercentenary would commend itself to the Prince of Wales and his Council, and suggesting that the proposed new University of the South-West should be styled the Raleigh University as a monument worthy of the man. Resolutions were carried that funds should be invited to this end, and a widely representative committee was appointed to co-operate with the existing committee for the furtherance of university education in the South-West.

Born of Devon parentage about the year 1552, Raleigh was the half-brother of Sir Humphrey Gilbert, another famous adventurer. In early life he served as a soldier in Ireland, but soon conceived plans for forming settlements in America, animated largely by hostility towards the Spaniards. An expedition sent by Raleigh to Newfoundland in 1583 resulted in the death of Sir Humphrey Gilbert. Raleigh then received from Queen Elizabeth the patent granted five years before to Gilbert to take possession "of any remote barbarous and heathen lands not possessed by any Christian prince or people." Quick to take advantage of his opportunity, he sent an expedition to America the same year. This expedition made a landfall in Florida and followed the coast northward to Pamlico Sound in North Carolina. A large tract of country which he did not reach Raleigh named Virginia in honour of Queen Elizabeth. In 1585 colonists were sent to Roanoke Island, but they soon had difficulties with the Indians, and the settlement proved a failure. Later attempts, in 1586 and 1587, met with no better success, and in 1589 Raleigh sold his rights in Virginia. Raleigh's next voyage of exploration was to South America in 1595, where, fired by stories of El Dorado, he hoped to find gold-mines. His "Discoverie of Guiana" gave an account of this expedition. Soldiering occupied Raleigh for some years, and, though high in Court favour, he was disliked in England for his arrogance and reputed greed. Soon after the accession of James I. he was accused of conspiracy and sent to the Tower. Many years later he was liberated in order to make a voyage to Guiana on the promise that the discovery of gold would obtain his freedom. The expedition achieved little, and Raleigh returned home and was beheaded in 1618. Gain and the hope of plunder were largely Raleigh's motives in his colonising enterprises, for he was in reality a pirate adventurer, but his work was of great importance in preparing the way for others and in helping to lay the foundations of Britain beyond the seas.

In connection with the tercentenary celebrations it is natural that some allusion should be made to the services Raleigh is commonly believed to have rendered to his country by introducing the potato. In the aggregate the literature of this plant would form a long series of volumes, and that dealing with its introduction into Europe and the British Isles is so copious that only the patient and leisured would care to study it thoroughly. This copiousness arises, no doubt, from the fact that, in spite of the reiterated statement that Raleigh brought the potato from Virginia, there is ample ground for controversy, and controversy there has been, leaving us very much shaken in our faith in the generally accepted account of its introduction by him. The appearance of the potato in the British Isles is supposed to date from 1586, and the tercentenary of its introduction was celebrated in 1886. But the first evidence we possess to show that the tuber was in cultivation in this country is that afforded by the catalogue of the plants in Gerard's garden in Holborn, published in 1596. Gerard, in his "Herball" of 1597, describes and figures it under the names of "Batatas Virginiana sive Virginianorum & Pappus, Potatoes of Virginia," and tells us that "it groweth naturally in America, where it was first discovered, as reporteth C. Clusius, since which time I have received rootes hereof from Virginia."

We learn from Clusius that the potato was cultivated in Italy in or about the year 1585, having probably been obtained from some Spanish source. It was taken to Belgium in 1586, and some tubers came into the hands of Philippe de Sivry, the prefect of Mons, who cultivated them, and sent, early in 1588, two tubers to Clusius at Vienna. It is thought that Gerard did not obtain the potato from Clusius, but, if the former may be trusted, it was obtained direct by him from Virginia. Gerard, however, is known to have handled the truth at least carelessly, and if he did not deliberately make a misstatement with regard to the origin of the plant, he was indifferent about it, and possibly wilfully suppressed information that would have elucidated the point. Introducers of plants of commercial value in later days have not always been quite candid as to their source. Gerard was probably proud of his possession of the potato, for his portrait, published in the "Herball," represents him as holding a flowering branch of the plant in his hand, and, for some reason obscure to us, may not have been disposed to divulge its origin. The late Sir James Murray, with his usual thoroughness, investigated the question of the introduction of the potato in connection with his article on the word in the New Oxford Dictionary. He says that Gerard "was in error in his statement that he obtained it from Virginia. In 1693 its introduction into Ireland was attributed to Sir Walter Raleigh after his return from Virginia (where he never was); but no contemporary statement associating Raleigh's name with the potato has been found."

It appears probable that the potato first reached this country as a result of one of Drake's expeditions to the New World, and it may have been brought on the vessel which, in 1586, conveyed to Plymouth the survivors of the ill-fated British colony in Virginia, and in the course of the voyage was probably taken with other booty from some Spanish ship. Drake as the introducer of the potato is so far accepted that a monument to him in commemoration of this was erected at Offenburg, in Germany, in 1854. It is extremely doubtful whether Raleigh had really any direct part in the introduction of the plant, but, according to Dr. Brushfield's painstaking researches, published in the Transactions of the Devonshire Association for the Advancement of Science (vol. xxx., pp. 158–97, 1898), it would appear that he was instrumental in extending its cultivation in this country and in popularising the tuber as a valuable food. He even says: "That Ralegh was the direct cause of the potato being brought to this land of ours can now scarcely be gainsaid; and to him must certainly be attributed the honour of promoting its cultivation in Ireland, from whence it was subsequently transmitted to England."

An interesting and able article on the subject, written by Dr. B. Daydon Jackson, appeared in the *Gardeners' Chronicle* in 1900 (vol. xxvii., pp. 161–62 and 178–80).

It is certainly as a populariser of the practice of smoking, and not as the introducer of the plant, that

Raleigh should be remembered with reference to tobacco. Its introduction was accomplished by Sir John Hawkins in 1565, and Raleigh early acquired the habit of smoking, which he succeeded in introducing to Court circles. Dr. Brushfield writes: "There can be no hesitation in affirming that Ralegh not only introduced it [tobacco] into general use in this country, but . . . was the first that brought it into fashion."

A BRITISH INSTITUTE OF INDUSTRIAL ART.

AT the Royal Society of Arts on October 28 the Right Hon. H. A. L. Fisher, President of the Board of Education, presided over a meeting called to consider a scheme for the promotion of a British Institute of Industrial Art. Mr. Fisher, in his introductory address, referred to the past history of industrial art in Great Britain, remarking that people in this country are apt to depreciate the national ability in artistic directions. What is needed is a centre to promote a closer relation between art and industry, and this the proposed scheme, which will involve the co-operation of the Board of Trade, the Board of Education, and the Royal Society of Arts, aims at providing. The chief feature of the scheme is a permanent exhibition to be held at the Victoria and Albert Museum, where representative works illustrating a high standard of British artistic craftsmanship will be shown. The exhibition should in time become self-supporting, and the nation would purchase annually a selected number of exhibits to form a permanent nucleus. The scheme also provides for a central fund to enable grants to be awarded for research and experimental work, institute scholarships, and initiate propaganda. Co-operation with the British School of Rome, with the view of enabling students to study Roman art, was proposed.

Lord Leverhulme, who opened the discussion, emphasised the importance of a shorter working day, combined with the more efficient use of machinery, in order to provide more leisure for study and artistic effort. Sir William McCormick remarked that the movement would be on parallel lines to the work of the Department of Scientific and Industrial Research, and mentioned several instances of processes—for example, the manufacture of fine porcelain—where scientific investigation and artistic effort could work in combination. Mr. Gordon Selfridge urged that a steady educational effort was needed before the public would sufficiently appreciate beautiful things to justify manufacturers in producing them. For the time being the scheme is to be administered by a representative executive committee, and it is hoped that ultimately sub-committees will be established to deal with the needs of individual industries requiring artistic talent.

CHEMICAL TECHNOLOGY AT THE IMPERIAL COLLEGE.

IN order to meet what seem to be the requirements of the post-war situation on a scale commensurate with Imperial needs, it is proposed to organise the future Department of Chemical Technology of the Imperial College of Science and Technology, South Kensington, so as to include the following four principal sections, namely:—

I.—*Fuel Technology and Chemistry of Gases, with Refractory Materials.*

(*a*) General fuel technology, and the constitution of peats, lignites, and coals; (*b*) the carbonisation of coal and wood distillation; (*c*) the chemistry of coal-tar, ammonia, and the manufacture of intermediate products from coal-tar; (*d*) the chemistry of gases and technical gas catalysis, with special reference to the new developments in the manufacture of ammonia, nitric acid, sulphuric anhydride, etc., resulting from the war; (*e*) refractory materials, clays, earths, and sands, used in furnace construction and the manufacture of ceramics, glass, and cements; and (*f*) technical analysis connected with the foregoing.

The arrangements contemplated under (*e*) would include some provision for investigating the materials used in the manufacture of *optical glass*, which it is hoped will be a useful adjunct to the new Department of Technical Optics; those under (*b*) meet the need, already felt in many quarters, of an adequate provision being made in this country for the scientific study of *wood distillation*, etc., in the interests of India and the Empire generally; and those under (*a*) will provide for an extension of the important investigations on lignites which have already been instituted in the Department during the war in the interests of the Dominions.

II.—*Chemical Engineering.*

Advanced study and investigations upon (*a*) the materials and principles involved in the design, construction, and use of plant for such general factory operations as the transportation of solids, liquids, and gases; filtration, desiccation, extraction, distillation, evaporation, crystallisation, etc.; condensing plant; the cooling, cleaning, and scrubbing of gases; the refining of solids, the concentration of acids; autoclaves and pressure plant, etc.; (*b*) the design and construction of foundations, flues, chimneys, etc.; and (*c*) factory economics and organisation. The underlying idea of this section of the Department's work is that students shall be trained in the working out of designs of commercial plant from their own notes and experimental work, including the drawing up of plans and specifications, and the organisation of factories in which the above-mentioned operations are carried out.

III.—*Electro-Chemistry.*

This section is to be developed so as to include broadly the principal applications of electricity in chemical industry, and especially to the many processes which are dependent upon the electrolytic or ionising actions of currents. These include, *inter alia*, the manufacture of caustic alkalis, chlorine, hypochlorites, etc.; "peroxidised" products such as persulphates, perchlorites, permanganates, etc.; also white lead, and such metals as sodium, magnesium, aluminium, calcium, etc. Also many organic substances are nowadays made by electrolytic "reduction" or "oxidation" processes.

The value to this country of such processes has been emphasised by the experience of the war, and it is more than ever important for the well-being of our chemical industries that no time should be lost in developing at this college a sub-department in chemical technology for the special study of them.

IV.—*Technology of Carbohydrates, Fats, Oils, and Rubber.*

The selection of the subjects to be included under this section has been largely influenced by two considerations, namely:—

First, the already large provision (*a*) in Manchester, Leeds, and Huddersfield for advanced study and research upon dyes and tinctorial chemistry, as applied to the great textile industries of the country; (*b*) in Leeds and in London in connection with the leather industries; and (c) in Birmingham in respect of the fermentation industries; and, secondly, the lack of any really adequate provision in this country for the needs of equally important branches of industry which depend upon the extraction and refining of certain well-defined groups of natural (and chiefly vegetable) raw materials.

The technology of the following groups of natural products has been selected because of their increasing economic importance, and of their close relationships with the work already developed in the botany department. It can scarcely be doubted that the study and investigation of their chemical properties, treatment, and uses in the Department of Chemical Technology will constitute an important link, not only with the work of the botany department, but also with the economic development of the vegetable resources of the Empire, on which grounds their adoption by the college may be urged as specially appropriate. The products in question are as follows:—(i) Celluloses, sugars, starches, gums, dextrins, and resins; (ii) animal and vegetable oils and fats, and the manufacture of glycerine, soap, and food products (*e.g.* margarine) therefrom; and (iii) rubber and similar materials.

Industrial Connection.

In the development of the foregoing scheme as a whole, emphasis is to be laid upon the importance of everything possible being done, both now and in the future, by way of establishing and extending connection between the various sections of the Department and the industries which they are severally designed to serve. The Department will also keep in close touch with the various organised efforts that are now being made to solve general industrial and economic problems by co-operative investigation and research.

The additional financial requirements for the important developments outlined above are estimated at 100,000*l.* for buildings and equipment, and not less than 10,000*l.* a year for maintenance and working expenses.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

LONDON.—The following doctorate has been conferred by the Senate:—*D.Sc.* (*Engineering*): Mr. Miles Walker, an external student, for a thesis entitled "Supply of Single-phase Power from Three-phase Systems."

TEACHERS have hitherto exercised but little influence on the public educational systems of this country. But if the public authorities that control this education are to exercise their growing power to the best advantage, they can scarcely do so without the increasing help of the teaching profession. The Teachers' Registration Council—"representative of the teaching profession"—was established in 1912. During its short life it has rendered valuable service to English education by preparing a register of teachers and by providing a teachers' parliament. But if the teaching profession is to take an effective part in directing a new national system of education, it can best do so by co-operating with the existing authorities on the lines indicated by the Whitley report. The initiative will probably have to come from the teachers. The Teachers' Registration Council can provide their side of the "Joint Industrial Council," but provincial councils of teachers are needed to provide their side of the "district councils." Accordingly a new step has been taken by the formation, at a meeting held in Manchester on October 26, of the first provincial council, representative of the teaching profession in Lancashire and Cheshire. The council consists of two representatives of each of the Universities—Manchester and Liverpool—and of the teachers' associations in these counties. It is anticipated that other provincial councils will quickly be set up elsewhere. Their establishment throughout the length and breadth of England will not only enable the teachers to exercise a profoundly beneficial influence upon the organisation of local education, but also be the means of securing a greater measure of life and liberty for the teaching profession.

SOCIETIES AND ACADEMIES.

LONDON.

Optical Society, October 10.—Prof. Cheshire, president, in the chair.—T. Y. **Baker**: Sources and magnitude of centring errors in a sextant. A centring error in a sextant is ordinarily due to the sextant being placed eccentrically on the dividing engine. In order to comply with the National Physical Laboratory's "A" class certificate, it is necessary that this eccentricity should not be such as to produce errors in the reading exceeding 40 seconds. This condition is satisfied provided the scale-centre lies within a certain ellipse the centre of which is the mechanical centre of the instrument,, and the axes of which lie one along and the other at right angles to the line of the middle reading. The semi-axes of this ellipse for a 7-in. sextant reading up to 120 are 5·2 mils and 0·7 mil respectively, but the former figure needs reduction to about 3 mils in order to allow of the vernier not reading "long" at the two ends of the scale. The customary practice of sextant-makers has been to readjust the position of the mechanical centre after the instrument has had the scale engraved. The workshop method of testing whether such readjustment is necessary is customarily the method of trying the length of the vernier against the scale at different points along the arc. The author showed that this method is not a sufficiently delicate test for the purpose of complying with the "A" certificate. An alternative method was described, in which the correctness or otherwise of the centre is determined by the tracing of a mark engraved upon the vernier against a circular arc cut from the same centre and at the same time as the marking of the scale. This method is being adopted by the Admiralty, and is already embodied in their specification for cadets' sextants.—T. **Chaundy**: Astigmatism: interchangeability of stop and object. For an object at O and a stop at S on the axis of an optical instrument, the astigmatism (*i.e.* astigmatic separation divided by the square of the height of the object) is to least order

$$\mu(1-FO.FS/f^2)/\mu'.SO,$$

together with a quantity symmetrical in O and S. The planes of stop and object may thus be interchanged without change in value of the astigmatism if $FO.FS=f^2$. In this case, with like end-media, F′, S′, O′ (the images of F, S, O in the instrument) are symmetrically placed with respect to F, O, S. In particular, an object at one focus and a stop at the other are interchangeable. The astigmatism in this case is unaltered by reversal of the instrument; its consequent convenience in calculation is pointed out. In particular, all the primary aberrations may be determined by differentiation of its expression in terms of the powers and separations of the system.

Royal Microscopical Society, October 16.—J. E. **Barnard**: A new illuminant for microscopical work. Note on the reports of the Medical Research Committee on the standardisation of pathological methods.

SYDNEY.

Royal Society of New South Wales, August 7.—Mr. W. S. Dun, president, in the chair.—R. T. **Baker**: The technology and anatomy of some "silky oak" timbers. This paper covers an investigation into the technology and anatomy of five species of timber-yielding trees belonging to the natural order Protaceæ, and all vernacularly known as members of the "silky oak" family. Two belong to the same genus, viz. *Grevillea robusta* and *G. hilliana*, the others being *Orites excelsa*, *Cardwelli sublimis*, and *Embothrium wickhami*. Their economic applications are enumerated, and the suitability of some of them for flying machines adds a new timber to those valuable arms of the Empire—the Navy and Army. Breaking strains, specific gravities, and weights of each are given.—R. H. **Cambage**: Vertical growth of trees. From tests made for several years on very young trees it appears that after the branches are thrown out the trunk does not increase in length to any appreciable extent below such branches, but the prolongation comes from the terminal shoot or growing point at the summit. Nails which were driven into very young acacias, cinnamomums, and eucalypts at 4 ft. and 5 ft. from the base were not carried upwards during several years or while the little tree-stems grew to double their length.

BOOKS RECEIVED.

The Physical Society of London. Report on the Relativity Theory of Gravitation. By Prof. A. S. Eddington. Pp. vii+91. (London: The Fleetway Press, Ltd.) 6*s*. net.

Jungle Peace. By W. Beebe. Pp. 297. (New York: H. Holt and Co.)

What is War? and Two Other Essays. By H. B. Cowen. Pp. 38. (London: The Cursitor Publishing Co.) 9*d*.

Psychological Principles. By Prof. J. Ward. Pp. xiv+478. (Cambridge: At the University Press.) 21*s*. net.

On the Nature of Things. By H. Woods. Pp. v+248. (Bristol: John Wright and Sons, Ltd.) 10*s*. 6*d*. net.

The Life and Letters of Joseph Black, M.D. By Sir W. Ramsay. With an introduction dealing with the life and work of Sir William Ramsay by Prof. F. G. Donnan. Pp. xix+148. (London: Constable and Co., Ltd.) 6*s*. 6*d*. net.

The Ontario High School Laboratory Manual in Chemistry. By Prof. G. A. Cornish, assisted by A. Smith. Pp. vii+135. (Toronto: The Macmillian Co. of Canada, Ltd.) 25 cents.

The Ontario High School Chemistry. By Prof. G. A. Cornish, assisted by A. Smith. Pp. vii+297. (Toronto: The Macmillan Co. of Canada, Ltd.) 50 cents.

Far Away and Long Ago. By W. H. Hudson. Pp. xii+332. (London: J. M. Dent and Sons, Ltd.) 15*s*. net.

Interpolation Tables or Multiplication Tables of Decimal Fractions. By Dr. H. B. Hedrick. Pp. ix+139. (Washington: The Carnegie Institution of Washington.)

Dictionary and Grammar of the Language of Sa'a and Ulawa, Solomon Islands, with Appendices. By W. G. Ivens. Pp. vii+249+11 plates. (Washington: The Carnegie Institution of Washington.)

Papers from the Department of Marine Biology of the Carnegie Institution of Washington. Vol. ix. Pp. 362+105 plates. (Washington: The Carnegie Institution of Washington.)

DIARY OF SOCIETIES.

MONDAY, NOVEMBER 4.

ARISTOTELIAN SOCIETY, at 8.—Dr. G. E. Moore: Presidential Address, Some Judgments of Perception.

SOCIETY OF ENGINEERS, at 5.30.—Sir Richard Cooper, Bart.: Obstacles to Post-war Trade.

TUESDAY, NOVEMBER 5.

MINERALOGICAL SOCIETY, at 5.30.—Anniversary Meeting.—Dr. G. F. Herbert Smith and Dr. G. T. Prior: A Plagionite-like Mineral from Dumfriesshire.—Lt. Arthur Russell: The Chromite Deposits in the Island of Unst, Shetlands.—Dr. G. T. Prior: The Nickeliferous Iron of the Meteorites of Bluff, Chandakapur, Chateau Renard, Cynthiana, Dhurmsala, Eli Elwah, Gnadenfrei, Kahowa, Lundsgård, New Concord, Shelburne, and Shytal.

RÖNTGEN SOCIETY, at 8.15.—Dr. G. B. Batten: Presidential Address.

INSTITUTION OF CIVIL ENGINEERS, at 5.30.—Sir John A. F. Aspinall: Inaugural Address, and Presentation of the Medals recently Awarded by the Council.

ZOOLOGICAL SOCIETY, at 5.30.—Prof. H. M. Lefroy: The Sydney Zoological Gardens.—Dr. R. T. Leiper: (1) Diagnosis of Helminth Infections from the Character of the Eggs in the Fæces; (2) Demonstration of the "New" Rabbit Disease.—J. F. Gemmill: Ciliary Action in the Internal Cavities of the Ctenophore, *Pleurobrachia pileus*, Fabr.

WEDNESDAY, NOVEMBER 6.

SOCIETY OF PUBLIC ANALYSTS, at 5.—H. Droop Richmond: Note on the Graduation of Gerber Butyrometers.—B. G. McLellan and A. W. Knapp: The Estimation of Cacao Shell.

GEOLOGICAL SOCIETY, at 5.30.—Major Sir Douglas Mawson introduces Discussion on the Antarctic Ice-sheet and its Borders.

ENTOMOLOGICAL SOCIETY, at 8.

THURSDAY, NOVEMBER 7.

ROYAL SOCIETY, at 4.30.—*Probable Papers:* Prof. G. E. Hale: The Nature of Sun-spots.—E. O. Hercus and T. H. Laby: The Thermal Conductivity of Air.—T. K. Chinmayanandam: Haidinger's Rings in Mica.

CHEMICAL SOCIETY, at 8.

INSTITUTION OF ELECTRICAL ENGINEERS, at 6.—Tenth Kelvin Lecture—L. B. Atkinson: The Dynamical Theory of Electric Engines.

FRIDAY, NOVEMBER 8.

ROYAL ASTRONOMICAL SOCIETY, at 5.

MALACOLOGICAL SOCIETY, at 7.—The Rev. Dr. A. H. Cooke: The Radula of Thais, Drupa, Concholepas, Cronia, Rapana, and the Allied Genera.—W. T. Webster: Notes on the Life-history of *Planorbis corneus* and other Freshwater Mollusca.

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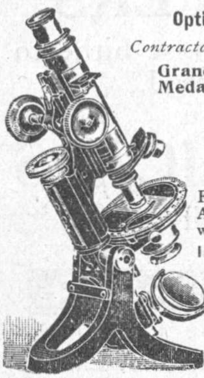

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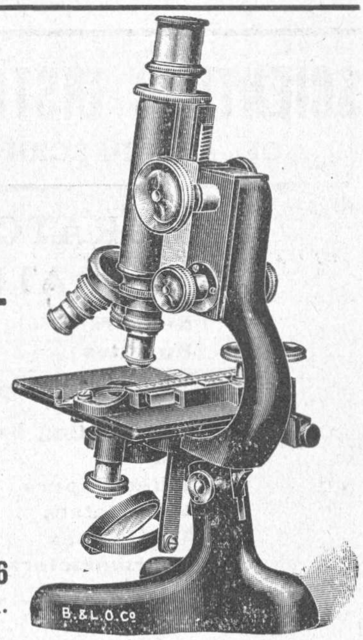

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5-in. TROUGHTON & SIMMS Theodolite, reading to 20″, 3-screw adjustment, web diaphragm, trough compass, locking plate, erecting eyepiece, and outer leather case...	30	0	0
6-in. NEWTON Theodolite, reading to 20″, 3-screw adjustment, pierced axis, locking plate, outer leather case ...	18	0	0
9-in. STANLEY Dumpy Level, 4-screw adjustment, web diaphragm	7	10	0
11-in. TROUGHTON & SIMMS Dumpy Level, web diaphragm, compass, 2 eyepieces	9	10	0
12-in. STANLEY Dumpy Level, 3-screw adjustment, stadia lines, Hoffmann head	16	0	0
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