THURSDAY, JUNE 26, 1919.

## FOREST POLICY AND LAW IN THE UNITED STATES.

(1) *The Development of Forest Law in America: A Historical Presentation of the Successive Enactments, by the Legislatures of the Forty-eight States of the American Union and by the Federal Congress, Directed to the Conservation and Administration of Forest Resources.* By J. P. Kinney. Pp. xviii+254+xxi. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1917.) Price 11*s.* 6*d.* net.

(2) *The Essentials of American Timber Law.* By J. P. Kinney. Pp. xix+279+x. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1917.) Price 13*s.* 6*d.* net.

(1) BEFORE the coming of European settlers the forests of the United States occupied an enormous area, half the whole country being covered with trees. This vast heritage has been greatly diminished. In the east there was little or no open land for the settlers, and clearings had to be made for farms and villages. Forest fires, felling for timber, and grazing have also shared largely in the destruction of a great part of the original forest. The history of the movement, so far as it is expressed in legal enactments, by which a check has been put on the wasteful exploitation of the great natural resources of timber is well given in the volume entitled "The Development of Forest Law in America."

Contrary to general belief, the Colonial legislatures in early days passed many laws against the destruction of forests by fires, and made enactments prohibiting waste of timber on common lands by unnecessary or indiscreet cutting. In 1818 a Massachusetts Act authorised agricultural societies to offer premiums to encourage the growth of oak and other trees necessary for shipbuilding; and, soon after, many States imposed severe penalties for the offences of cutting timber or setting fires on public lands. The first effective steps, however, in conservation were taken in 1885, when the New York legislature established a permanent forest administration and created forest reserves in the Adirondack and Catskill Mountains. The administration was specially charged with the duties of prevention and control of forest fires and with the encouragement of forestry on private lands.

In 1881 a Federal Act was passed which authorised the President to create "forest reservations in any State or Territory having public lands, wholly or in part covered with timber or undergrowth, whether of commercial value or not." It was high time, as sixty years had passed since the last preceding Act contemplating a general reservation of lands for the purpose of conservation of timber. "During this long period the pineries of the Northern States, which had seemed inexhaustible in 1831, had largely disappeared; the future exhaustion of the timber supply of the Southern States had become apparent to the far-sighted, and the transference of the title from the Federal Government to private individuals and corporations of vast areas of the incomparable forests of the Pacific Coast region had been effected." The Government began to take strong measures. President Harrison immediately set aside 17,000,000 acres of forest reserves out of the public lands which had not been distributed to settlers. Influenced by the ideas of Gifford Pinchot, who became chief of the Division of Forestry at Washington in 1898, virile Presidents like Cleveland and Roosevelt increased year by year the forest reserves until they amounted in 1905 to 100,000,000 acres. The name "national reserves" was changed to "national forests" in 1907. Besides the national forests, set aside out of public lands in the west, which now cover 170,000,000 acres, there are mountain forests in the east, in the Appalachian and White Mountains, which are being gradually purchased under the provisions of an Act passed in 1911 that authorised the expenditure of 11,000,000 dollars in their acquisition.

In addition many of the States have State forests, New York owning, for example, 1,800,000 acres, and Pennsylvania 400,000 acres. Nearly 300,000 acres of forests, owned by various cities and towns, have been acquired with the object of protecting the urban water supplies from contamination by impurities, which are always present when water catchment areas are subject to farming or grazing. In many of the States planting is encouraged by the distribution of young trees to private persons at low rates, and in other States bounties for planting are given—in Kansas, for example, 10 dollars per acre planted. In New York plantations of trees of from 1 to 100 acres are exempt from all taxation for a period of thirty-five years. The book under review is replete with information of this kind, showing the various ways in which forestry is encouraged in the United States by Government action.

(2) This is a compact treatise dealing with the statutes concerning property in trees, forests, and forest products in the United States, and with the interpretation of the laws by the courts. The first two chapters define and classify property and ownership in general. The next chapter treats of trees and timber as property. The legal doctrine of waste, timber trespass, and contracts referring to timber are each the subject of three chapters. Inspection and measurement of timber products are treated in twelve pages, and the laws referring to transport of timber by water in thirty pages. Mortgage on timber; the laws of boundary and highway trees; trees, nurseries, and sawmills as fixtures, are each the subject of a separate chapter. The final pages discuss the free use of timber taken from public lands by settlers and by mining, telegraph, and railway companies.

These two text-books on forest law by Mr. J. P. Kinney form an important contribution to the rapidly growing mass of American forestry lierature, and impress one with the painstaking way in which authorities and cases have been cited.

## *INORGANIC AND PHYSICAL CHEMISTRY.*

(1) *Recent Discoveries in Inorganic Chemistry.* By J. Hart-Smith. Pp. x+91. (Cambridge: At the University Press, 1919.) Price 4*s.* 6*d.* net.

(2) *Recent Advances in Physical and Inorganic Chemistry.* By Dr. Alfred W. Stewart. With an introduction by Sir William Ramsay. Third edition. Pp. xv+284. (London: Longmans, Green, and Co., 1919.) Price 12*s.* 6*d.* net.

(3) *Osmotic Pressure.* By Prof. Alexander Findlay. Second edition. (Monographs on Inorganic and Physical Chemistry.) Pp. xi+116. (London: Longmans, Green, and Co., 1919.) Price 6*s.* net.

(1) "RECENT Discoveries in Inorganic Chemistry" is a summary of facts culled from the literature of inorganic chemistry during the last fifteen years or so. "The book is in no sense intended to be a text-book, but is rather to be regarded as a supplement to existing text-books." Regarded from this point of view, the little volume fulfils its object. It will serve, at any rate, to indicate many of the more important subjects of recent inorganic research, although the account given of each is in general so brief that the original work and the collateral literature will have to be consulted. As the book stands, the title is rather too comprehensive.

(2) This book, which has now reached its third edition, consists of twenty chapters, eight of which are devoted to inorganic problems, four to radio-activity, and six to physical chemistry. It is written in a very clear and lucid style, and is eminently readable. Arbitrariness in the choice of the material discussed is almost inevitable in a book of this size. Thus whilst we find an excellent account of such subjects as radio-activity, X-rays and crystal structure, atomic numbers, and analysis by means of positive rays, we do not find any consideration of the modern advances made in chemical thermo-dynamics (such as the Nernst heat theorem), nor an account of the quantum theory, photo-chemistry, colloids, the work of Perrin and of Millikan on the determination of the Avogadro constant, the work of Langmuir on surface action, and the modern views of allotropy. Perhaps the least satisfactory chapter is that which deals with the structure of the atom. The subject is admittedly difficult to treat, but the author is scarcely justified in devoting a single paragraph to the Rutherford-Bohr atom, whilst giving a page to the purely geometrical atom model of G. N. Lewis, and five pages to his own atom, from which no quantitative results have as yet been obtained. Further, the gibe at the school of Ostwald in chap. xx., and the reference to the "thirty years of relative stagnation" from which physical chemistry is supposed to have suffered, are singularly inappropriate. As a matter of fact, the portions of the book which deal with inorganic chemistry and radio-activity are very much more satisfactory than the treatment of physical chemistry.

(3) Prof. Findlay's monograph on osmotic pressure is already so well known that it is only necessary to direct attention to the fact that a second and enlarged edition has now appeared. After dealing with the problems of the experimental measurements of osmotic pressure for both dilute and concentrated solutions, Prof. Findlay goes on to discuss in some detail the significance of the results obtained. This develops into a most illuminating account of the theory of solutions, involving a consideration of the allied properties, vapour pressure, lowering of freezing-point, and rise of boiling-point. Stress is rightly laid upon the necessity for distinguishing between the thermo-dynamic significance of osmotic pressure and the various attempts which have been made to picture the mechanism on a molecular basis. An equally clear distinction is drawn between osmotic pressure itself, the phenomenon of osmosis, and the mechanism of permeability of the membrane. The monograph is indispensable to every physical chemist.

W. C. McC. LEWIS.

## *THE PRIMITIVE NERVOUS SYSTEM.*

*The Elementary Nervous System.* By Prof. G. H. Parker. (Monographs on Experimental Biology.) Pp. 229. (Philadelphia and London: J. B. Lippincott Co., 1919.) Price 2.50 dollars net.

RECENT research on the functions of the nervous system of man and other mammals, such as Head's clinical observations and Sherrington's experimental work, has revealed the fact, which had not been adequately recognised before, that many of the most archaic dispositions of the primitive nervous system have survived in the highest vertebrates, where, as a rule, they are disguised and hidden from view by the more obtrusive features that give the vertebrate nervous system its distinctive character.

The need for a fuller and more accurate knowledge of the nature and origin of the earliest nervous mechanisms has thus become more insistent and essential to everyone who is attempting to understand the working of any of the more complex types of nervous system.

For some years, and especially during the last ten, Prof. Parker, of Harvard, has been investigating the simpler types of neuro-muscular apparatus, and has published (mostly in journals that are not easily accessible) a series of memoirs dealing not merely with the structure, but also with the functions, of this system, making use of the exact methods of modern quantitative measurement to estimate and express the results of his experiments.

Those who have followed his researches, no less than those who are not acquainted with the illuminating results of his work, will heartily welcome this small volume (one of a new American series, inspired, as the editors tell us, by the series of British monographs on physiology and biochemistry), in which he has collected his scattered papers and woven their contents into a clearly co-ordinated and simple story.

The book deals mainly with the neuro-muscular system of "the three simpler phyla of the multicellular animals, the sponges, the cœlenterates, and the ctenophores," but some of the most illuminating passages in the work deal with the survival of such primitive mechanisms in the heart, the alimentary canal, and other parts of the higher vertebrates. This much-tilled field of research was well worth re-cultivating; and Prof. Parker has been able to clear away much of the uncertainty and confusion in the results obtained by earlier workers, and to bring to light many new points that had escaped notice before.

Although it must be obvious that the functions of the most primitive nervous system, as an instrument to quicken and direct the response to changes in the animal's environment, presuppose the existence of a muscular system to perform such quick and precise actions, it remained for Prof. Parker to discover that the differentiation of muscle did actually precede the appearance of a nervous system.

Another important feature of the book is the convincing series of ingenious experiments to clear up the difficulties of the problem of nervous transmission in sea-anemones.

Prof. Parker seems to adopt the tradition of the text-books of physiology for students that the most primitive type of nervous system is of the two-celled receptor-effector type—simply a specialised sensory cell put into connection with a neighbouring muscle either directly or through the intermediation of a nerve-cell. But it is difficult to conceive of the biological usefulness of such an arrangement of isolated neuro-muscular units; and, so far as I am aware, there is no evidence of its existence, except in conjunction with a system that links up the whole organism. As Prof. Parker himself has shown (pp. 94 and 95), stimulation of one spot (in an animal provided with the most primitive type of nervous system) excites a response of the whole animal, and not merely of a single muscle-fibre.

G. ELLIOT SMITH.

## OUR BOOKSHELF.

*A Practical Handbook of British Birds.* Edited by H. F. Witherby. Part i. Pp. xvi+64. (London: Witherby and Co., 1919.) Price 4*s.* net.

ORNITHOLOGY, judged by its voluminous and ever-increasing literature, is to be regarded as one of the most attractive branches of natural science studied in the British Isles, and the works devoted to our native birds are amongst the most popular of all. The appearance of yet another book on British birds may be welcomed, since it brings our knowledge of the subject up to date. In recent years great changes have been made in the scientific nomenclature of ornithology, and, alas! are still in progress, while the recognition of numerous racial forms among the birds on the British list has rendered the study of the varied members of our avifauna difficult, especially for the field observer, and hence has given a great impetus to collecting. In addition to these major changes, important advances have been made in our knowledge of the many and complicated movements of migratory birds witnessed on our shores; and also the periods of moulting and other changes in plumage. All these come within the scope of the work under consideration.

The information under each species is divided into sections, and dealt with throughout in uniform order. These sections include keys to the various groups from orders to species, plumages, nesting, food, distribution, etc. While this method of treatment has its advantages in brevity, it detracts much from the literary aspect of the work, and renders it unattractive reading. Though the plan has been carefully carried out, the sections lack uniformity in treatment, inasmuch as those devoted to plumages are redundant as compared with the rest. The shorter the accounts of plumages the better, provided they are adequate, for unnecessary details are neither conducive to lucidity nor helpful. As regards the illustrations, the coloured plates (of which there are to be twelve) are good, and the text figures (which are numerous), though satisfactory on the whole, are in many cases poor, and in others unnecessary. It is a sign of the times that a handbook on British birds, professedly compact and concise, should run to 1200 pages. The work is to be issued at intervals in eighteen parts, and when complete will form two volumes.

*Soils and Fertilisers.* By Prof. T. L. Lyon. Pp. xxii+255. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1918.) Price 6*s.* 6*d.* net.

THIS little book is written chiefly for elementary students in secondary agricultural schools, for short-course students in colleges, and for teachers attending summer courses. A good deal of the material is drawn from the author's well-known larger work on soils, which was written for senior students. In spite of differences of conditions here and in the United States, the English teacher will find the book of interest as being a compact summary of the points which an American teacher brings before his students.

The first three chapters deal with soil formation, a subject which in this country is left to the geologist, the soil student taking the soil as he finds it and not concerning himself with its origin. Then follows a section on soil water, which in many parts of the States is of great practical importance, and in any case presents many features of scientific and educational interest.

The author distinguishes three forms of soil water: hygroscopic water, a thin film absorbed from the air and condensed on the particles of the dry soil; capillary water, also a film, but thicker than the preceding, taken up by soil in contact with liquid water and held by surface forces; and gravitational or free water, which can drain away, and, indeed, should be allowed to do so wherever it assumes unduly large proportions. No mention seems to be made of the mole plough, which, in this country, has proved of great value in drainage work. Afterwards comes a chapter on the bacteria of the soil, followed by one on soil air and soil temperature.

The remainder of the book deals with fertilisers. It is evident that American farmers suffered much less from shortage of fertilisers than did our own farmers as the result of the war. For, whilst an English book written, like the book before us, in 1918 would have been compelled to devote much space to substitutes and to revise considerably the descriptions of processes and comparative standards, the author did not find such alterations necessary, and his chapters differ little from what might have been written before the war.

## 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 Credibility of Long-continued Experiments.

AT the Rothamsted Experimental Station certain experiments are continued for a long series of years in order to amass sufficient data to allow of proper statistical treatment. Some of the experiments have been carried on since 1843, others since 1852, 1856, 1860, etc. A characteristic feature of the work is the length of time for which particular observers are responsible for their records, some being in charge of the same work for twenty, thirty, or forty years. The fundamental weakness in such long-continued experiments is one inherent in human nature itself: errors once introduced are apt to persist, and to cause much harm unless they are soon detected.

In many of the experiments it is not possible to institute any very satisfactory check on the results. In some cases, however, this can be done. The measurements taken at the rain and drain gauges afford an instance, and the agreement is so close as to deserve record.

In 1870 three drainage gauges and one rain gauge were set up at Rothamsted, each 1/1000 acre in area. The rain gauge is simply a very large funnel embedded in the soil; the drain gauges are also large funnels, but filled with soil to depths of 20, 40, and 60 in. respectively. In constructing them, however, the soil was not disturbed, but was left in its natural position, whilst the framework of the gauge, by an ingenious arrangement, was built round it. From 1870 to the present day readings have been taken of the amounts of water percolating through the drain gauges: this amount being some 40 to 60 per cent. of the water collecting in the rain-gauge. Samples of the water from each gauge are then sent to the laboratory, where the chlorine and nitric and ammoniacal nitrogen are determined.

This work went on without intermission from 1888 until 1916, when it was suspended owing to the sudden death of Dr. N. H. J. Miller, who had been in charge the whole of the time.

The results have now been calculated out and added up.

It is well established that soil neither absorbs nor gives up chlorine to water containing sodium chloride in solution, therefore the amounts of chlorine found in the drain gauges ought to be equal to that in the rain gauge if the numerous separate records were accurate. Over a short period there is always liable to be a difference, because some of the chlorine may not yet have had time to percolate, but over a long period this is eliminated. The actual results obtained at Rothamsted are:—

*Chlorine in lb. per acre.*

| Average per annum for 4 years | From drain gauges | | | From rain gauge |
|---|---|---|---|---|
| | 20 in. | 40 in. | 60 in. | |
| 1882–92 ... | 12·24 | 13·27 | 12·45 | 12·25 |
| 1892–96 ... | 14·15 | 15·19 | 14·24 | 14·35 |
| 1896–1900 ... | 16·26 | 17·61 | 16·07 | 17·90 |
| 1900–04 ... | 17·67 | 18·65 | 17·79 | 17·23 |
| 1904–08 ... | 16·23 | 16·18 | 16·00 | 16·75 |
| 1908–12 ... | 19·57 | 18·86 | 20·67 | 18·48 |
| 1912–16 ... | 19·02 | 18·93 | 19·58 | 19·54 |
| Total amounts for 28 years | | | | |
| 1888–1916 ... | 460·56 | 474·76 | 467·20 | 466·00 |

The number of measurements involved is very large; there are some 18,000 readings at the gauges and a large number of titrations in the laboratory. The gauge-reading has to be multiplied by its titration value, and the resulting figures are then added up. Considering the multiplicity of the data, the agreement in the results is remarkable; the widest divergence over twenty-eight years is only 2 per cent.

This close agreement is the result of careful daily work, and not of accident. There is no correspondence in the laboratory between the rain and the drainage samples; this is prevented by the carry-over of water and of chlorine in the drain-gauges from day to day, and even month to month. Nor is there any possibility of straining readings to compel agreement; the figures were not regularly added up during the course of the work, but only at rare intervals.

The result shows how accurately continuous observations can be made provided care is taken. The readings at the gauges have throughout been taken by Mr. E. Grey, who without fail and in all weathers has stuck to the work. The titrations were made by the late Dr. Miller, who would have felt great pride in the final result had he lived to see it. Fortunately, Mr. Grey is still in charge of the gauges.

E. J. RUSSELL.

Rothamsted Experimental Station, Harpenden.

### The Lustre of Some Feathers of Humming Birds.

THE brilliantly metallic feathers of the crests and gorgets of most humming birds, which are also erectile, must have a great significance, and present an interesting problem. Why should the most intense brilliancy be on those particular spots?

An explanation suggested itself while observing a doctor examining the throat of his patient, in bright sunshine, by the help of a laryngoscope fixed upon his forehead, his patient being placed with his back to the light.

Holding a humming bird, in *bright* sunshine, in front of the corollæ of flowers that were turned away from the light, the illumination of the inside of the corolla was most striking, and its use in revealing any small insects it might contain became quite apparent.

The refulgent patches of feathers are absent in some groups of humming birds, such as the "Hermits," but these have the habit of frequenting the gloom of the forests, and of catching the small insects that form their food from on, or beneath, the foliage, and these habits explain their absence.

Perhaps this suggestion may lead others to investigate the facts from a more strictly scientific viewpoint. H. J. CHARBONNIER.

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### The Stinging Instinct in Bees and Wasps.

IT is almost impossible to irritate a worker wasp or bumble-bee to the pitch that it will fly to attack, except when it is defending its home. The queen wasp or bumble-bee will not even defend her home. If she is disturbed when the nest is in a very early stage, she deserts it. When it is in an advanced stage she will return to it afterwards. Worker honey-bees are also disinclined to attack except when defending their home But in beating off a threatening bee as one walks through the apiary, one is very likely to get stung. The readiness to attack and the force of the attack are in proportion to the population of the colony. As soon as the nest or hive is removed, the returning bees or wasps that hover around the old place, vainly searching for it, cannot be induced to attack.

But recently I took a hive of bees out of its winter case and carried this case, which had a few of the bees crawling around the flight-holes, to a distant part of the apiary. Two hours later some of these bees still remained on the case, and I started to brush them off. They flew up angrily at me and gave me several stings. Hive-odour is evidently an important factor in the stimulation of the stinging instinct.

F. W. L. SLADEN.

Ottawa, Canada.

### The American Astronomical Society.

SOME of your readers may have seen the erroneous statement in the issue of *Science* for May 9, 1919, p. 446, stating that at the next meeting of the American Astronomical Society there would be representatives from the observatories of Greenwich, Oxford, Cambridge, Vienna, and Potsdam. This statement was copied from a student publication, which confused the coming meeting with the attendance at previous meetings of the society. There will, of course, be no German or Austrian astronomers at any meeting of the society in the near future.

JOEL STEBBINS (Secretary).

Urbana, Illinois, June 11.

## GRAIN PESTS AND THEIR INVESTIGATION.[1]

A CONSIDERABLE number of different insects and mites occur in flour and stored grain, some of which bring about serious damage, while others are of comparatively little economic importance. Up to the year 1917 very little had been done in this country with the view of determining the best methods for dealing with grain pests. No trustworthy estimates were available as to the actual damage sustained by cereal crops while in storage, although there is abundant evidence that material injury is incurred to both wheat and maize, either before or after its arrival in Britain. In June, 1916, the Council of the Royal Society, as the result of a correspondence with the Board of Agriculture, appointed the Grain Pests Committee for the purpose of investigating the relative importance of grain insects, suggesting measures for combating them, and inquiring into the extent of the losses sustained. The Committee included Mr. J. C. F. Fryer (Board of Agriculture), Mr. O. E. Robinson (representing the milling trade), with Prof. Herdman as chairman. Representatives of the Liverpool grain trade and of the Incorporated National Association of British and Irish Millers were also added. Direct relations with the trades concerned were established, and problems observed in the mills and warehouses were investigated both on the spot and in the laboratory. It was decided to divide the work between several institutions in London and the Liverpool University, while further work was delegated to the zoological laboratory at Oxford.

The results obtained by the Committee's investigations are being issued by the Royal Society in two series: (1) Memoranda mainly of a provisional nature; (2) reports of the detailed investigations. Three reports and the same number of memoranda have appeared up to date. The first report, by Prof. Dendy, deals with the effect of air-tight storage upon grain insects. The earlier belief that grain weevils are almost independent of ventilation, and can live indefinitely in tightly closed vessels, is not borne out by Prof. Dendy's experiments, in which hermetically sealed vessels were used. By enclosing *Calandra granaria* and *C. oryzae* in hermetically sealed vessels containing wheat, the carbon dioxide evolved was observed to have a lethal effect upon the imprisoned insects. It was found that within the limits of a wide range of conditions as to temperature, moisture, and degree of infestation hermetical sealing is a very effective method for dealing with the weevil problem. The time taken to bring about the lethal effects appears to depend chiefly upon the relative volume of air present. In practice it is, therefore, of first importance to ascertain that hermetical sealing of the silos or other receptacles is effectively carried out.

The greater part of the second report is by Prof. Newstead and Miss Duvall on the Acarids of stored grain and flour. The most important species concerned is *Aleurobius farinae*, which is not infrequently accompanied by the predaceous mite *Cheyletus eruditus*. An excellent account of the structure and bionomics of the latter species is given: the authors express doubt whether it is ever sufficiently abundant in Nature to be effective

[1] Royal Society, Grain Pests (War) Committee. Report No i., May, 1918. (1) Introductory Note. By the Chairman of the Committee. (2) Report on the Effect of Air-tight Storage upon Grain Insects. Part i. By Prof. A. Dendy. Report No. ii., 1918. (1) Bionomic, Morphological, and Economic Report on the Acarids of Stored Grain and Flour. By Prof. R. Newstead and H. Muriel Duvall. (2) Appendix i. By Prof. J. M. Beattie. (3) Appendix ii. By A. E. Humphries, Member of the Royal Commission on Wheat Supplies. Report No. iii., November, 1918. (1) Report on the Effect of Air-tight Storage upon Grain Insects. Part ii. By Prof. A. Dendy and H. D. Elkington. (2) Experiments with Two Secondary Grain Pests, showing their Inability to Attack Sound Wheat. By Prof. A. Dendy. (3) Observations on the Attraction of Certain Grain Beetles, especially Weevils, by Water. By Prof. A. Dendy. Memoranda Nos. i.-iii. Issued January 24, 1918.

in reducing Tyroglyphid pests. It is found that mites will not injure wheat and flour in which the moisture content is 11 per cent. or less, whatever the temperature may be. When the moisture exceeds 13 per cent. they increase and flourish exceedingly; given favourable moisture conditions, the mites increase very rapidly between 60° and 75° F., while between 40° and 50° F. increase is retarded. The remedy advised for mite-infested wheat is to screen it thoroughly in order to remove as many of the mites as possible, and to subject it to treatment whereby the moisture is reduced, such as a blast of hot air followed by cooling. Prevention from attack may be secured by storing flour with a low moisture content—below 11 per cent. The lowest lethal temperature for the mites was found to be 120° F., which required at least six hours' application to be effective. In the form of appendices to the report are observations by Prof. Beattie on the degeneration of flour caused by bacteria, and by Mr. A. E. Humphries on an examination of flour samples into which acari had been introduced.

In the third report Prof. Dendy, in conjunction with Mr. H. D. Elkington, records the effect of air-tight storage upon other grain insects. It is claimed that air-tight storage is probably the most effective method of preserving all grain and cereal products from any insect or mite attack. It is particularly satisfactory to note that this method was found to be successful in destroying the larvæ of the notorious Mediterranean flour moth (*Ephestia kühniella*), along with the various other species dealt with. At the end of the report Prof. Dendy gives an account of experiments which go a long way towards proving that the beetles *Tribolium castaneum* and *Silvanus surinamensis* are unable to attack sound wheat. It appears, therefore, that these pests are of a secondary nature, only attacking and completing the destruction of already damaged grain. In a third article Prof. Dendy records observations which confirm the general opinion that *Calandra oryzae* and *C. granaria* are powerfully attracted by moisture. When water is present in sufficient quantity, *C. oryzae* is the more strongly attracted species.

In the forthcoming reports we shall look forward to a presentation of the results of testing these important laboratory experiments on a large scale in mills, warehouses, and elsewhere. During these times of food scarcity and high prices it is urgent that opportunities for this work should be afforded as speedily as possible. Every saving in grain destruction, with the consequent economy in the use of shipping, contributes towards the early settling down of the country to more normal conditions. To avoid waste in every form should be a keynote of national reconstruction. The importance of storage in air-tight receptacles is widely recognised in India, although the factors involved have not been understood. The initial difficulties of constructing air-tight silos and receptacles need to be surmounted. Once this is achieved, as Prof. Dendy remarks, the method is likely to prove valuable where large quantities of grain have to be stored for lengthy periods, especially in hot climates or even during long sea voyages. Air-tight storage is likely to prove effective not only as a preventive measure, but also as a remedy against badly weevilled grain. Both the Committee and the investigators directly concerned are to be congratulated upon the experimental results so far achieved. Fundamental observations of this nature can scarcely fail to prove beneficial to the State.

A. D. IMMS.

## THE JEWELRY TRADE IN WAR-TIME.[1]

"MINERAL INDUSTRY" is an annual publication which treats of the state of the trade of the various minerals entering into commercial use in the United States during the previous year. The volume for the year 1917 did not appear until the close of last year. As for so many years past, the chapter in it on precious stones comes from the pen of the well-known authority on all that is concerned with gem-craft, Dr. G. F. Kunz, of New York. With his customary happy touch he interweaves the statistics of imports with much that is of interest to the economist and the mineralogist.

We have remarked before on a similar occasion that the jewelry trade acts as a very sensitive barometer indicative of the general state of trade in a country. The unpreparedness of the Allied nations for war, and especially of our own country, had led to the placing of immense orders for munitions in the United States, and the consequent keen demand for labour brought sudden affluence to certain classes in the community. The result was that the imports of precious stones in 1916 reached unprecedented heights. By the following year the industrial position had become stabilised, and the imports stood at a figure—just under 41 million dollars—which was about that of the more prosperous years immediately preceding the war. It must, however, not be forgotten that prices had risen very considerably. Thus Dr. Kunz tells us that in Great Britain the cost of cut diamonds had advanced between 30 and 40 per cent., the increase being about equally divided between the rise in wages and the advance in the charge for the rough stones.

Many have remarked as a curious and unsatisfactory state of affairs that in the days before the war, whereas practically all the rough stones in the world passed through London, very few indeed of them were cut in England. A century ago things were different; then London vied with Amsterdam, but for some reason or other—possibly the want of a fostering hand—the industry pined and withered, and a few years ago had all but passed away. Under the stimulating care of Mr. Bernhard Oppenheim, efforts are now being made to restore the industry, and a very promising scheme, which has had the practical support of the powerful De Beers Company, is working at

1 "The Production of Precious Stones for the Year 1917." By Dr. G. F. Kunz. "Mineral Industry," 1918, vol. xxvi., pp. 576-601.

Brighton for enabling men partially disabled in the war to be trained in the craft of cutting gem-stones, and especially diamonds.

Of what in the trade are known as fancy stones, the most popular during the year under review appear to have been sapphire and emerald. Ruby still remains under a cloud, probably owing to the competition of the synthetical product. The Burmese jade, which is worked by Chinese and Japanese artificers, has been in considerable demand. Gem-stones, on account of their hardness, find a use in industry. The diamond drill is a familiar instance, but it may not be so well known that some electric motors have jewelled bearings; one factory in the United States used for that purpose no less than a ton of sapphire material.

Among the new occurrences of gem-stones referred to by Dr. Kunz may be mentioned opal, with an emerald-green to apple-green play of colour, from Hôsaka, Japan; black opal from Stuarts Range Field, South Australia; and chrysolite from Lac La Hache, British Columbia, which has been found in ten-carat stones. Dr. Kunz makes no reference to the beautiful blue zircons from India, which form one of the most interesting novelties in London jewelry of recent years; but, perhaps owing to the interruption of the ordinary trade channels, these stones had not, at least in any quantity, reached New York.

## NOTES.

ADDITIONAL interest has been given to the forthcoming commemoration of the centenary of the death of James Watt by the movement just inaugurated in Glasgow to found locally a James Watt chair of engineering at the University. Birmingham engineers decided some time ago that a similarly named chair should be installed in the University of their city, besides holding a centenary commemoration and erecting an international memorial to the three great pioneers, Watt, Boulton, and Murdock. The commemoration in Birmingham will be held on September 16–18. London, Glasgow, and Greenock, and, indeed, all parts of the country, are heartily co-operating, and, with few exceptions, the universities and scientific societies, together with many manufacturers and individual eminent men, are associating themselves with the scheme. In the Science Museum at South Kensington steps are being taken to arrange a comprehensive exhibition of Watt relics. In Birmingham the Watt relics existing there, which have so carefully been preserved by the forethought of Mr. George Tangye, and were a few years back presented to the city, will be completely re-arranged and displayed with many additions. Two pumping-engines made by Boulton and Watt will be seen; one, the first sold by the makers in 1776, will be actually shown under steam, and raising water. A memorial service will be held in the Parish Church at Handsworth, where the three contemporaries are buried. A garden-party will be held in the park at Heathfield Hall, where the garret workshop still remains as Watt left it. Lectures will be delivered by eminent men and a centenary dinner held. Some doubt seems to have been raised with regard to the claims of Birmingham to an international memorial. It should be remembered, however, that Watt's association with Boulton led to the success of his engine. Boulton's factory was famous for workmanship throughout Europe. It is true that Watt conceived his first ideas whilst working at the University in Glasgow, but he gained no practical success until he went to Birmingham. He spent the best part of his life there, including the evening of his days after he retired from business. The foundations he laid by scientific thought and careful study have resulted in the great and universal application of steam, and the appeal comes appropriately from Birmingham for an international memorial to him.

THE Wilbur Wright memorial lecture was given on June 18 at the Royal Society of Arts by Mr. Leonard Bairstow. The subject was "The Progress of Aviation in the War Period," and the lecture commenced with a *résumé* of the progress made during the last five years, and a discussion of the possibilities of the present-day aeroplane for commercial purposes. By far the most interesting part of the lecture was that dealing with stability. An account was given of the use of the accelerometer to record the acceleration of a machine during any manœuvre, and of the information which has been obtained from its readings. Only in rare cases is the acceleration such as to reduce the pilot's apparent weight to zero, and in the majority of "stunts" he is pressed into his seat by a force greater than his normal weight. Mr. Bairstow exhibited a gyroscopic model which clearly showed the nature of stable and unstable oscillations, and then showed some lantern-slides made from accelerometer records, in which these types of oscillation had been observed on actual aeroplanes. He strongly emphasised the necessity for a thorough investigation of all the problems connected with the stability of aeroplanes, and expressed a hope that, now the war is ended, systematic research will be put in hand to provide fundamental data which will enable the scientific designer to treat stability with the same degree of certainty as he is now able to compute the performance of a machine. Mr. Bairstow's opinions on this point are of great interest, as he was the first to apply the results of wind-tunnel experiments on models to the complete calculation of the stability of a machine.

AT the summer meeting of the Anatomical Society, held at the Royal College of Surgeons, London, on June 21, Major E. Distin Maddick exhibited a series of moving films which he had prepared to illustrate the application of the kinema to the teaching of anatomy. During the war Major Maddick designed and prepared many films for the use of cadets of the Royal Air Force, showing the building up and dismantling of aeroplanes and of aeroplane engines. In these films the spectator saw the various machines taken to pieces and the parts again assembled, exhibited and built up at a rate suitable to permit a demonstrator to name the various parts and explain their uses. It was this method which Major Maddick, who is a member of the College of Surgeons, has applied to the teaching of anatomy. His films show a human skeleton which turns its various aspects to the audience and then begins slowly to disintegrate until only the spinal column is left. The parts then begin to assemble, and part by part the skeleton is again built up. For large audiences desirous of becoming acquainted with the elements of human anatomy Major Maddick's films will serve a most excellent purpose, and are certain of a welcome by our soldiers in France and on the Rhine. The members of the Anatomical Society, while admiring the excellence of the technique shown by Major Maddick's films, expressed the hope that he would extend its application,

particularly to the movements of limbs and joints in health as well as in disease. Such films would prove invaluable for investigators, teachers, and students.

AN International Hydrographic Conference was opened in London on June 24. The subjects to be discussed are:—(1) Charts; (2) sailing directions; (3) list of lights; (4) notice to mariners; (5) time-signals, distance-tables, and other miscellaneous hydrographic publications; (6) tide-tables; (7) instruments used for surveying on shore and at sea; (8) time-measuring instruments; (9) interchange of publications; and (10) establishment of an International Bureau. Representatives were present from Argentina, Belgium, Brazil, Chile, China, Denmark, Egypt, France, Great Britain, Greece, India, Italy, Japan, Netherlands, Norway, Peru, Portugal, Siam, Spain, Sweden, and the United States. Rear-Admiral Sir John Parry was elected president of the conference; M. Renaud, vice-president; and Mr. W. D. Barber, secretary.

PROF. F. SODDY has been elected a foreign member of the Swedish Academy of Sciences in succession to the late Sir William Crookes.

THE council of the British Scientific Instrument Research Association has appointed Mr. H. Moore to be assistant director of research.

MR. L. G. RADCLIFFE, of the Municipal College of Technology, Manchester, has been awarded the gold medal of the Worshipful Company of Dyers, London, for his researches on the sulphonation of fixed oils.

THE following acceptances of lectureships in connection with the Royal College of Physicians of London are announced:—Dr. J. L. Birley, the Goulstonian; Sir W. Leishman, the Horace Dobell; Sir J. Rose Bradford, the Lumleian; and, for 1921, Dr. J. L. Golla, the Croonian.

THE Ministry of Health for England and Wales has now been formally established by Order in Council, and the King has approved the appointment of Dr. Addison as the first Minister of Health. The functions and staff of the Local Government Board will be taken over by the Ministry.

THE annual general meeting of the Research Defence Society will be held at the rooms of the Medical Society of London, 11 Chandos Street, Cavendish Square, on Thursday, June 26, at 4.30, Lord Knutsford presiding. A short address will be given by Sir Anthony Bowlby on "Experimental Medicine and the Sick and Wounded in the War."

THERE will be an additional meeting of the Royal Astronomical Society this session, probably on July 11, to receive certain American astronomers who are on their way to Brussels to take part in the conference of the International Research Council, which will be opened there on July 18. The party is expected to include Profs. Adams, Boss, Campbell, Eichelberger, Mitchell, Schlesinger, and Stebbins.

THE last conference of the present series on "Health Work for Whitley Councils" will be held under the auspices of the Industrial Reconstruction Council on Tuesday, July 1, at 6 p.m., in the Hall of the Institute of Journalists, 2 and 4 Tudor Street, E.C.4. The chair will be taken by Sir Alexander Roger, and the opening address given by Dr. E. Halford Ross, after which will follow questions and discussion. No tickets are necessary.

THE death is announced, in his seventy-fifth year, of Dr. William Gilson Farlow, professor of cryptogamic botany at Harvard University since 1879. Dr. Farlow was president of the American Academy of Arts and Sciences in 1905. He was the author of books on "The Black Knot," "Diseases of Olive and Orange Trees," "The Gymnosporangia," "Marine Algæ of New England," "The Potato Rot," and an Index of Fungi.

A SUMMER meeting of the Royal Meteorological Society will be held at Kew Observatory, Richmond, on Wednesday, July 2. A demonstration of a portable wireless apparatus for use in the location of distant lightning flashes will be given by Mr. R. A. Watson-Watt, and the president (Sir Napier Shaw) will exhibit two diagrams showing the motion of air in travelling depressions. Pilot-balloon ascents will be made from the observatory grounds, and there will be an exhibition of autographic records of the observatory, photographs of clouds and other meteorological phenomena, and recent meteorological instruments.

THE President of the Board of Agriculture and Fisheries has appointed a Departmental Committee to arrange for the testing, adaptation, and improvement of machines likely to prove of value to agriculture, to examine inventions and new devices, and to advise as to the further steps which should be taken to promote the development of agricultural machinery. The Committee consists of the following members:—Sir Douglas Newton (chairman), Mr. G. C. Baddon, Mr. Thompson Close, Major J. G. Merrison, Capt. B. J. Owen, Mr. H. G. Richardson, Prof. R. S. Seton, and Mr. J. G. Stewart. The secretary of the Committee is Mr. V. E. Wilkins, Board of Agriculture, 72 Victoria Street, London, S.W.1, to whom all communications should be addressed.

As already announced in NATURE (February 6, 1919, p. 448), a revision of "Pritzel's Index" is in course of preparation by the Royal Horticultural Society, with the assistance of botanists attached to the Royal Botanic Gardens, Kew, the Natural History Museum, the Linnean Society, and the co-operation of the U.S. Government Plant Bureau. The estimated cost of the production of the work is 3500*l.*, which may possibly be increased to 4000*l.* in consequence of the present enhanced cost of labour and materials. Up to the present contributions amounting to 968*l.* have been promised, but, being of the opinion that many more people would like to have a share in the issue of this important work, an appeal for subscriptions has just been circulated by the Royal Horticultural Society, Vincent Square, S.W.1.

THERE has been formed in America a Union of Scientific Federal Employees similar to the National Union of Scientific Workers in this country. The aims of both unions, to advance science as an essential element in the national life by improving the status of the scientific worker, are stated in terms which are nearly identical. The American union differs from the British; first, because it includes only Federal employees, and, secondly, because it is affiliated to a "Labour" organisation. The first difference already seems likely to disappear; the second indicates a difference in political conditions rather than in policy, for one of the chief arguments urged in America for affiliation was based on the cordial relations of the Labour unions to the Federal Departments. Another argument, which has also been urged over here, is that intimate relations with scientific workers will widen the outlook of the Labour unions. There is no indication at present how the American union proposes to solve the difficult problems connected with qualifications; perhaps they do not arise while membership is restricted to Federal employees. The secretary of the union is P. G. Agnew, Bureau of Standards.

REGULATIONS have been drafted by the Society of Engineers for association with other engineering societies. The scheme admits members of such associated societies to various privileges offered by the Society of Engineers, such as attendance at meetings, visits, functions, etc., the use of the library and reading-room, and also of the appointments and employment register. The society contributes to the associated society not more than one-fifth of the annual subscription paid to the society by each member thereof who is also a member of the associated society at the date of his election. Provision is also made for the representation of associated bodies at meetings of the council of the Society of Engineers, but it is stipulated that the latter does not assume responsibility for any acts done or liabilities incurred by any associated society. It is stated that the Gloucestershire Engineering Society was the first to be associated with the scheme.

THE inaugural meeting of the American Society of Mammalogists was held in the New National Museum, Washington, D.C., on April 3 and 4. Officers were elected as follows:—*President:* C. Hart Merriam, Smithsonian Institution. *Vice-Presidents:* E. W. Nelson, U.S. Biological Survey, and Wilfred H. Osgood, Field Museum of Natural History. *Recording Secretary:* H. H. Lane, University of Oklahoma. *Corresponding Secretary:* Hartley H. T. Jackson, U.S. Biological Survey. *Treasurer:* Walter P. Taylor, U.S. Biological Survey. With the intention of aiding research and of centralising ideas and energy, committees were appointed on the life-histories of mammals, the study of game mammals, anatomy and phylogeny, and bibliography. The policy of the society will be to devote itself to the study of mammals in a broad way, including life-histories, habits, relations to plants and animals, evolution, palæontology, anatomy, and other phases. The publication of the *Journal of Mammalogy*, in which popular as well as technical matter will be presented, will begin this year. Membership in the society is not confined to Americans, but any person interested in mammals is invited to join. Application for membership may be sent to Mr. Hartley H. T. Jackson, U.S. Department of Agriculture, Washington, D.C.

THE drought which has been so severely felt over the southern portion of England came to an end on June 20, when there was an inch of rain over the metropolitan area due to the passage of a secondary disturbance. In many parts of the country, especially in the north and west, there was a break in the drought on June 12 due to the passage of a well-developed cyclonic disturbance across the country. Over London generally the weather was absolutely rainless for 25 days from May 10 to June 3 inclusive, and for Kew Observatory the Daily Weather Report gives no measurable rain for 32 days from May 3 to June 3. For a period of 48 days from May 3 to June 19 the total rainfall at Kew was only 0·08 in.; a partial drought, more than 28 days the aggregate rainfall of which does not exceed 0·01 in. per diem, continued for 51 days, from April 30 to June 19, the total rain measurement being 0·43 in. At Greenwich the drought lasted only 15 days, from May 10–24; whilst at Portland the drought continued for 32 days from May 18 to June 18. At Dungeness, for a period of 46 days from May 4 to June 19, the rainfall was only 0·14 in., whilst a partial drought continued for 50 days from May 4 to June 22, and was continuing at the time of our going to press. The rainfall for the seven weeks, May 1 to June 18, varied much in different parts of the country. At Stornoway the measurement was 5·50 in., at Glasgow 4·75 in., and at Birr Castle, Ireland, 5·65 in. At the English stations the Meteorological Office returns show that the rainfall was very much less. The amounts were:—Liverpool, 1·82 in.; Nottingham, 1·63 in.; Yarmouth, 1·32 in.; Jersey, 0·85 in.; Portland, 0·64 in.; and Dungeness, 0·34 in.; whilst for the London area the Rainfall Organisation at Camden Square had 0·48 in., Greenwich Observatory 0·45 in., and Kew Observatory 0·19 in. The absolute drought was severe and prolonged, but the partial drought was of comparatively short duration compared with others in the spring of former years.

THE Government of the Punjab has recently announced that three great irrigation schemes, each costing 1000 lakhs of rupees, are now under consideration. They are expected to yield a financial return of from 6 to 8 per cent. on the capital expenditure. These projects are: A canal starting from the Indus at Kalabagh to irrigate 5,000,000 acres, or 8000 square miles, of wilderness lying between the Indus, Jhelum, and Chinab rivers; the Bhakra reservoir dam, 350 ft. high, to be built across the Sutlej at the debouchure from the Himalayas in order to store up 110,000 cubic ft. of water for purposes of irrigation during the winter; and the Sutlej valley project of canals from the Sutlej near Ferozepore for irrigation chiefly of the territories of Bikaner and Bahawalpur.

THE Moriori, who inhabited the Chatham Islands, and are now practically extinct, have excited an interest comparable in kind, though not in degree, with that aroused by the extinct Tasmanians. They have until quite recently been regarded as a branch of the Maori people driven to the Chathams many generations ago by tribal war. But this view has been challenged on linguistic and other grounds, among which are differences between the Maori and Moriori vessels. The latter are carefully described by Mr. H. D. Skinner in the May issue of *Man*. Mr. Skinner's conclusion is that "the Moriori Waka-rimu may very well have combined elements derived from raft and canoe, a development necessitated by the absence at Chatham Islands of any timber from which a dug-out canoe could be made. . . . The use of rowing, as opposed to paddling, for the propulsion of canoes has been recorded amongst the Maoris on the west coast of the South Island, while an oar of the Moriori type was found many years ago in a cave at the head-waters of the Taieri in Otago, and is now in the Otago University Museum."

THE *Veterinary Review* for May (vol. iii., No. 2) contains a valuable bibliography on contagious abortion of cattle. It starts from the year 1895, and contains 225 references. The remainder of the issue is occupied with abstracts, bibliography on current literature of veterinary subjects, and book reviews.

CAPT. MAJOR GREENWOOD discusses problems of industrial organisation in a paper published in the March issue of the Journal of the Royal Statistical Society (vol. lxxxii., part ii.). The advantage in respect of retention of workers of the factory with a welfare system appears to be considerable. As regards the influence of the type of work, the younger women doing heavy work do not seem to fall away faster than those of a similar age doing light work, but with women above twenty-two years of age there is a decided difference. Contrasting day-workers and continuous night-workers, the percentage inferiority in output of the night-workers amounted to $17 \pm 4{\cdot}1$ in winter and $12 \pm 3$ in summer. As regards hours of

labour and output, a reduction of 8½ hours per week (from 68·2 hours to 59·7 hours) increased the gross output by 8 per cent.

FROM an analysis of more than half a million admissions to sick report of troops in camps in the United States, of whom 531,445 were white and 15,186 coloured, Lt.-Col. A. G. Love and Major C. B. Davenport form a comparison of white and coloured troops in respect to incidence of disease. As regards total relative frequency of disease in the two races, the coloured troops were about 19 per cent. more liable to go on sick report than the white troops. The coloured troops were relatively less resistant to diseases of the lungs and pleura as well as to certain general diseases, like tuberculosis and smallpox; they are also much more frequently infected with venereal diseases. But the uninfected negro is highly resistant to diseases of the skin, mouth, and throat; he seems to have more stable nerves, has better eyes, and metabolises better (Proc. National Acad. Sciences, vol. v., p. 58, 1919).

DR. H. H. LAUGHLIN has made a cytological and statistical study (Carnegie Inst. Washington, Publication No 265, pp. 48+18 tables) of the relative and absolute durations of the several arbitrarily delimited progress-stages in cell-division. His material was found in the root-tip cells of the common onion. With great carefulness Dr. Laughlin has determined the duration of ten successive stages at temperatures of 10° C., 20° C., and 30° C. The total period at these three temperatures was 292·52, 240·97, and 91·56 minutes respectively. The resting stage counts for 194·92, 159·57, and 33·26 minutes; the early prophase for 52·2550, 59·2592, and 51·4147. Thereafter the changes take place very rapidly. The velocity increase at a given temperature compared with the velocity of the same stage at 10° C. lower (what is known as the $Q_{10}$ value) approximates to the expectations deducible from van't Hoff's law. That is to say, the mitosis behaves in its velocity increments to temperature-increments like the simpler chemical reactions. But this does not mean that mitosis is "a simple chemical reaction." Far from it; we have to deal with a *répertoire* of activities, a vast complex of physical and chemical activities, in which the many aberrations from the velocity-gradient of a simple chemical process are mutually cancelled. The author's study marks a distinct step of advance in the analysis of mitosis.

THE "tillite" with scratched boulders in the Varanger district of Finmarken is referred by Olaf Holtedahl, of Kristiania (*Amer. Journ. Sci.*, vol. xlvii., p. 85, 1919) to a pre-Caledonian epoch, probably Ordovician. A comparison is made with the coarse conglomerates of Girvan in Ayrshire. The paper reviews the Palæozoic rocks of Finmarken, and assigns an inorganic and concretionary origin to the structures known as stromatolites, including Cryptozoön and Gymnosolen. The author cannot agree with Walcott that the limestones containing these objects were accumulated in fresh water, but he thinks that algal activities may have aided in the deposition of the calcium carbonate.

THE zoning of the "Karroo System" of South Africa, which is in reality the representative of more than one system, receives a new investigation from Mr. A. L. du Toit in the Proceedings of the Geological Society of South Africa for 1918 (p. xvii). The author carries the glacial Dwyka series down into the Upper Carboniferous, and the Ecca beds thus become Lower Permian. The Cave Sandstone at the top of the Karroo formation is regarded as an æolian deposit of probably Rhætic age, comparable with the Pleistocene löss of the northern hemisphere. The former wide extension of the overlying Drakensberg lavas, including the basalts along the Zambesi, is indicated, and these are also brought, so far as present evidence goes, within the Rhætic series.

THE Press of Aragon (Spain) has recently published a description of trials made by a Spanish engineer of straw-compound as a substitute for coal. This fuel is said to have great advantages over coal for locomotives and agricultural tractors, as it develops sufficient heat in thirty minutes to give the necessary head of steam. The U.S. Commerce Report No. 86 (1919), reporting this discovery, states that the ashes left by the fuel in question make an excellent fertiliser. Another Spaniard has patented a process for the use of banana fibre for textiles, yarns, cords, and alpargata soles as a substitute for hemp and jute. Trials have proved satisfactory, and plant is to be laid down to work the process.

THE recently issued annual report of the Decimal Association shows that the efforts of the association in favour of the compulsory introduction of decimal coinage and the metric system of weights and measures continue to make satisfactory progress. The Bill brought forward by Lord Southwark last year has aroused the interest of many public bodies, and numerous resolutions have been passed in favour of decimal coinage. The measure will remain in abeyance until the Royal Commission appointed to deal with the subject issues its report, which is expected in the early autumn. A number of local educational bodies have signified their approval of the proposal to introduce the metric system of weights and measures. British Chambers of Commerce abroad are actively supporting the proposed reform, as they regard the adoption of the metric system by this country as an essential preliminary to success in supplanting German ascendency in foreign markets. Although the use of the system has been for many years permissive in the United Kingdom, business firms adopting it suffer much inconvenience owing to the railway companies refusing to accept consignment notes made out in terms of metric weights; this difficulty will continue to hamper progress until the system is made obligatory. The *Decimal Educator*, a quarterly journal started by the association during the year, has met with a marked measure of success.

WITH reference to Irish reconstruction problems, the question of producing industrial alcohol was discussed by Dr. J. Reilly, of the Royal Naval Cordite Factory, in a lecture delivered before the Royal Dublin Society a short time ago. One of the chief points suggested for consideration was whether, by the use of alcohol as a motor-fuel, the dependence of this country upon foreign supplies of petrol could not be obviated or lessened. We import about 150,000,000 gallons of petrol yearly. To replace this by alcohol obtained from potatoes about 7,000,000 tons of the latter would be required. Allowing for rotation crops, this quantity of potatoes would require some 6,000,000 acres of land for its production. At present Ireland grows about 4,000,000 tons of potatoes per annum. She could grow more, no doubt, though how much more is not at present very clear. Assuming that the requisite amount of land could be spared after food needs were supplied, the practical test of the matter would be the price of the alcohol produced in relation to that of petrol. As to this the lecturer gives no dogmatic pronouncement; he only suggests that there is a case for consideration. In a country such as Ireland, with a large agricultural population, it is essential for prosperity that the land should be made to provide more wealth,

both in the shape of food and in that of raw material for industry. It has been argued that crops with a higher starch-content can be grown more cheaply in tropical countries, and the resulting alcohol could, and would, be imported here. Against this Dr. Reilly remarks truly that it is unwise for a country to rely solely on foreign supplies.

AMONG forthcoming books of science we notice the following:—Vol. iii. of the English translation, by H. Spencer-Browne, of Doyen's "Surgical Therapeutics and Operative Technique" (*Baillière, Tindall, and Cox*); "The Story of the English Public Health," Sir Malcolm Morris, and "Infant and Young Child Welfare," Dr. H. Scurfield (each in the new series of English Public Health) (*Cassell and Co., Ltd.*); "The Natural History of the Child," Dr. C. Dunn (*Sampson Low and Co., Ltd.*); and a new and revised edition of "Mental Diseases," Dr. H. R. Cole (*University of London Press, Ltd.*). "The Chemical Trade Year-Book" is in preparation by *Messrs. Bandon and Morris,* of Red Lion Passage, W.C.1.

MR. F. EDWARDS, 83 High Street, Marylebone, has just issued a catalogue (No. 391) of nearly 1000 items relating to the Dominions, Colonies, and Dependencies of the British Empire. It contains many scarce works, is carefully classified, and will doubtless interest many readers of NATURE. Mr. Edwards has also circulated a short list (No. 390) of new books at remainder prices. Many of the volumes deal with scientific subjects. The catalogues will be sent free upon application.

THE Scientific Attaché to the American Embassy informs us that the position of the solar prominence referred to in the cablegram from Dr. L. A. Bauer published last week (p. 311) was wrongly recorded. A further message states that the position should have been given as *south*-south-west instead of *west*-south-west.

## *OUR ASTRONOMICAL COLUMN.*

THE PLANETS.—The three bright planets which have been so conspicuous during the last few months are now leaving the evening sky. Jupiter will be in conjunction with the sun on July 21, Saturn on August 25, whilst Venus, which will be at greatest elongation 45° E. on July 5, is approaching greatest brilliancy (August 8), and will be at inferior conjunction on September 13. Mars is coming into view as a morning star rising in the N.E.

On the evening of July 2, at 9h. G.M.T., a very close and interesting approach of Venus and Saturn may be observed in the W.N.W. sky. The two objects will be separated by an apparent distance of 10′ of arc. Venus will set at about 10.30 G.M.T., and will be a brilliant object, offering a strong contrast to the feeble appearance of Saturn in the strong twilight. It will be interesting to examine the two planets in the same field of view with a good telescope, and to note the great difference in colour and brilliancy to the unaided eye. This conjunction will form one of the most attractive planetary configurations of 1919. It is true that the conjunction of Venus and Saturn is not a rare event, although one of the same character as that to which we are now referring is very seldom observed, since it will take place at a very convenient time for observation and the objects will be unusually near each other. On a few evenings preceding and following July 2 the changes in the relative places of Venus and Saturn will be considerable, and it will be entertaining to trace them from night to night.

ADMIRALTY TIDE-TABLES.—A sentence in the Astronomer Royal's report, noticed in last week's NATURE, may have given rise to misconception. The day used in the Admiralty tide-tables for the current year and previously begins at midnight, and is divided into two periods of twelve hours, a.m. and p.m. respectively. The change to be introduced into the issue of the tables for 1920 is that the hours will be numbered from 0 to 23.

## *THE NATIONAL PHYSICAL LABORATORY.*

THE annual visitation and inspection of the National Physical Laboratory by the General Board took place on Tuesday, June 24. The numerous visitors invited by the Board made a tour of the laboratory, and were given an opportunity of seeing in operation various subjects of interest which are at present being investigated at the laboratory.

The engineering department exhibited an apparatus for the determination of the absolute viscosities of liquids at high pressures. The liquid under test is arranged to flow through a capillary under a constant-pressure difference, and its velocity calculated from the indications of the instrument. The Lanchester worm-gear testing machine for obtaining the efficiency of a worm-gear was shown. The machine is so arranged that a pressure corresponding to a transmission through the box of as much as 100 h.p. can be obtained between the gear-teeth, it being necessary to supply from an external source only the losses in the gear and apparatus. In the apparatus used for the measurement of journal friction, a tilt due to a force of about 1/300th of a pound weight acting at the end of a 3-ft. lever could be measured. Variations of the coefficient of friction of the bearings due to different oils could be observed with this apparatus. Other exhibits in this department were the following:—An apparatus for testing the wear of stranded cables, an extensometer for use at high temperatures, a high-velocity impact testing machine, and a wear-testing machine.

The aeronautical department demonstrated how data for solving problems such as the following are obtained in the wind channels:—(1) The mutual interference of air-screw and body, and the flow in the neighbourhood of the air-screw; (2) the spinning of aeroplanes; (3) the balancing of rudders; and (4) the determination of the rotary derivations on SS. Zero airship. Various models of complete machines and a model of a mooring device for rigid airships were exhibited.

Demonstrations were given in the metallurgy department of the rolling of high tensile aluminium alloys. The recuperative gas furnace and the electric "ring" furnace for high-temperature work were seen in operation. A chronograph for the direct plotting of time-temperature observations in the form of "inverse-rate" curves, as required for the heating and cooling curves of metals and alloys, was demonstrated. The curve plotted by the instrument may be regarded as the differential coefficient of the simple time-temperature curve representing the observations.

Tests on seaplane-floats were carried out in the William Froude national tank. Two different types of experiment were conducted: (*a*) on resistance, running angle, and longitudinal stability of a float when planing on the water; and (*b*) on the impact of a seaplane when alighting on water, measurements of the deceleration and the blow received by the float being made.

In the large gauge-room, which was added to the metrology department during the war for the purpose of testing gauges used for munitions, were seen different types of gauges and the methods of testing them. During the busiest period of the war some

10,000 gauges were dealt with in this building alone. A minimeter of special design was shown which enabled rapid and accurate measurements to be made on slip-gauges. The instrument serves to indicate the difference between the gauges under test and the corresponding standard gauges kept at the laboratory. A difference as small as one millionth of an inch is readily shown on the scale of the instrument. The following instruments for measuring and inspecting screw-gauges were exhibited:—(1) Screw diameter-measuring machines of the "floating micrometer type," (2) screw-pitch measuring machines for checking accuracy of pitch of screw-gauges, and (3) vertical projection apparatus giving a magnification of 50. Errors of 0·0001″ in the thread form can be detected with this instrument.

The exhibits of the optics division included the following:—A large Michelson interferometer, as modified by Twyman, for testing prisms and lenses; another interferometer used for determining the planeness of flat surfaces and the parallelism of glass plates, on which measurements could be made to within a tenth of an interference fringe; the following methods for the accurate determination of the curvatures of lens surfaces—(*a*) a magnification method for very steep curves such as are encountered in microscope objectives, (*b*) the Guild precision spherometer for medium curves, and (*c*) an arrangement of Newton rings for shallow curves, either convex or concave; a simple projection apparatus for testing mirrors for defects in polishing, silvering, or in quality of the glass; and apparatus for testing blocks of prisms for strain.

The heat division showed an apparatus for testing the heat-insulating properties of materials employed in the construction of cold stores, an apparatus for detecting contaminated regions in thermo-elements, and an instrument (designed by Mr. E. A. Griffiths) for indicating the contents of the petrol tank of aircraft or automobiles. The latter works on the principle that the heat loss from a wire is greater when the wire is immersed in a liquid than when exposed to air or vapour. The instrument is compensated for the effect of varying atmospheric temperatures.

The exhibits of the electricity department included apparatus for the accurate measurement of capacity at low frequencies; an electrical method of measuring frequency; apparatus for measuring the amplifying power of valves at audible frequency; the reception of continuous waves by the heterodyne method; and a three-electrode valve set for producing oscillations of telephonic frequency.

The working of the Paterson-Walsh electrical height indicator was demonstrated. This instrument consists of two observation tubes capable of rotation about parallel axes placed at a known distance apart. The two parts are electrically connected, and the connections are so arranged that the height of the object is given directly on a dial attached to the apparatus. Other items of interest shown were the methods of testing radium dials, the testing of insulators for high-voltage transmission under artificial rain, arc lamps for searchlights, and the heating of buried cables.

## PHYSIOLOGY OF SEX AND REPRODUCTION IN POULTRY

IN numerous animals it seems that the determination of sex depends upon the chromosome content of the egg-cell and sperm-cell. But there is considerable evidence that in some cases the normal sex-ratio may be experimentally modified and in some degree controlled. This led Prof. Raymond Pearl (Proc. Amer. Phil. Soc., vol. lvi., 1917, pp. 416–36) to make a statistical investigation of the sex-ratio in the domestic fowl, and he considers data representing 22,000 chicks. In families of ten and more Prof. Pearl found the ratio of males per 1000 females to be 944, or 48·57 per cent.; and it is very interesting to notice the nearly perfect agreement of this result with Darwin's, which was 48·64 per cent. There is normal variability from stock to stock and from year to year, and aberrant sex-ratios occur. But before these aberrant sex-ratios can be regarded as indicative of either environmental or hereditary effects, it is necessary to show that they occur with such frequency as to exceed considerably the frequency expected on the basis of chance alone. This has not been done. In regard to the flocks Prof. Pearl dealt with, there was evidence that the pre-natal mortality is not differential in respect to sex. It follows that the sex-ratio observed at birth is substantially the same as the initial zygotic sex-ratio—that is to say, the ratio determined by the constitution of the fertilised ovum. In another paper (*Science*, vol. xlvi., 1917, p. 220) Prof. Pearl states that hens with high fecundity as a fixed characteristic tend to produce a larger proportion of female offspring—a very important conclusion.

For measuring the net reproductive ability of mated pairs of the domestic fowl (Barred Plymouth Rocks) Prof. Pearl proposes (*Genetics*, 1917, pp. 417–32) a reproductive or fertility index. This index expresses the actual number of chicks produced by the mating and capable of living three weeks after hatching as a percentage of the maximum total number of chicks which it would be physiologically possible for the mating to produce. It has a mean value of about 12 per cent. Net fertility, as measured by the reproductive index, is a rather highly variable character, agreeing in this respect with other purely physiological characters. As to the influence of age, it is shown that reproductive ability, as measured by the index, diminishes with advancing age of the birds mated, having its maximum when each of the birds mated is from ten to fourteen months old. The rate of decline with advancing age is more rapid in the males than in the females.

In mammals there is a steady increase in the rate of fertility to a maximum, after which, with a further increase in age, there is a decline to total sterility. But in the fowls Prof. Pearl experimented with there is a steady and progressive decline in fertility after the first breeding season (Proc. Nat. Acad. Sci., vol. iii., 1917, pp. 354–56). There is a significant drop in reproductive ability as we pass from a combined age of two years for the mated birds to three years. In passing from three years to four there is no significant change. In passing from a combined age of four years to five there is a large drop in the net reproductive ability of the mating.

Miss Alice M. Boring and Prof. Pearl discuss (*Anat. Record*, vol. xiii., 1917, pp. 253–68, 6 figures) the extraordinarily discrepant statements that are made in regard to the presence or absence of interstitial cells in the testes of male birds. They find these elements in the testes of just hatched chicks. But they may be, and usually are, quite absent from the testes of birds more than six months old and of full sexual maturity as regards both primary and secondary characters. This makes it difficult to believe that the interstitial cells of the testes have (in the case of the fowl) any causal influence upon the secondary sex-characters. The observers found true interstitial cells invariably present in the ovary, and they notice that these elements are structurally identical in the two sexes.

In a joint paper (*Amer. Journ. Anat.*, vol. xxiii., 1918, pp. 1–35, 9 plates, 6 figures) Prof. Pearl and

Miss Boring report the results of their study of the corpus luteum in the hen. Its origin is from the theca interna of the ovary, and it is clearly homologous with the corpus luteum of the cow. The course of its development is an abbreviation or fore-shortening of that in the cow, corresponding, indeed, with the late involution stages. Its resemblance to the corpus luteum of the oviparous duckmole is striking. The corpora lutea in hen and cow contain a similar yellow fatty substance. In both there is a yellow amorphous pigment in the cells containing the fatty substance. In the hen a mass forms in an atretic or undischarged follicle, which is practically identical with the corpus luteum that forms in a discharged follicle.

The same investigators have made a study of eight cases of hermaphroditism in poultry (*Journ. Exper. Zool.*, vol. xxv., 1918, pp. 1–30, 9 plates, 9 figures). The birds in question were females with embryonic or degenerating ovaries. Three were changing to a male condition in respect to reproductive organs, external characters, and even sex behaviour. But no structural counterpart was found for the abnormal behaviour of one hen treading another hen. Development of comb, spur, and wattles does not stand in any direct quantitative relation to the sex-condition of the gonad, but the shape and carriage of the body have a general relation thereto. The amount of lutear cells or pigment is in precise correlation with the degree of external somatic femaleness exhibited by the individual, but it does not appear that the interstitial cells of the gonads have any causal relation to the secondary sex-characters in the abnormal birds here dealt with.

We have not come to an end of the interesting budget of papers from Maine. Thus there is an investigation by Prof. Pearl (*Amer. Naturalist*, vol. li., 1917, pp. 545–99 and pp. 636–39) redefining the concept of inbreeding, and showing how the degree of kinship between any two individuals may be most precisely expressed. There is another by Prof. Pearl and Mr. S. W. Patterson showing that milk production changes with age in a definite manner (following a logarithmic curve), and in Jersey cows reaches its maximum at approximately the age of eight years and seven months. J. A. T.

## SCIENCE AND INDUSTRIAL DEVELOPMENT.

THE British Scientific Products Exhibition, which has been organised by the British Science Guild, and will be opened by the Marquess of Crewe at the Central Hall, Westminster, on Thursday, July 3, will afford an opportunity for vindicating the supremacy of Great Britain in the field of discovery and invention. It will show the strength and variety of home manufactures and indicate the indispensability of science in industry, in peace as in war.

One of the practical results of the exhibition should be to create new markets for new products and establish new industries for dealing with raw materials. The extent to which Germany had derived benefit from the exploitation of these resources and insidiously used her control to our disadvantage was not realised until after the outbreak of war. With this knowledge before us, and the conviction that most strenuous efforts will be made by Germany to appropriate trade and commerce which in Imperial interests we should secure for ourselves, it is of the utmost importance to accentuate the lesson which events have taught us. The exhibition will provide this means of enlightenment and its influence at the present epoch cannot be over-estimated.

We must leave for a later occasion the account of the main features of the exhibition, and direct attention here to the one aspect which deserves special emphasis. Modern industry requires the use of a greater number of skilled research workers and of men with technical knowledge for responsible positions. The census of production (1907) showed that the net annual output per head is generally greatest in those industries which employ the highest proportion of persons receiving salaries as distinct from wages, and it diminishes as one passes to industries where the percentage of wage-earning employees increases. Thus, taking the nine leading industries, but not including coal-mining, the highest annual output per head is 185*l.* in the chemical industries, where 12 per cent. of the persons employed receive salaries and 88 per cent. wages; next in order of annual output per head and proportion of salaried employees come iron and steel factories (118*l.*) and engineering factories, including electrical engineering (108*l.*); and at the bottom of the list are the jute, linen, and hemp factories with a net output of 61*l.* only, the percentage of wage-earners being 98, of salaried persons 2. These figures indicate that the employment of skilled technologists means increased productivity, and they point to the importance of improved training of artisans in technical schools. If research methods are to be more generally applied to industries greater skill and accuracy will be required from the general body of workers, so that it is not merely the duty of the universities and colleges to supply highly trained research workers, but the technical schools have also the important duty of educating the artisan for the new type of work required under the new conditions.

The way to increase the number of highly skilled technologists is to make their position and prospects better than they have been. Many employers still express their preference for the so-called practically trained man over the man with scientific training, whereas in other countries the college-trained technologist finds ready acceptance in all branches of industry. Whether it is accepted or not, the fact remains that much of the commerce and manufacture of the modern world demands the leadership of highly trained, widely informed men, and that these men must be forthcoming if we are to be able to take a leading place among the nations of the world. It should be the purpose of an efficient educational system to provide adequate opportunities for the training of men of this type from whatever station of life they may be selected. Of all methods of reconstruction none is more likely to add to national wealth and strength than the application of science to industry; and the more men there are capable of being entrusted with it, the greater will be the progress.

## THE HISTORY OF THE LONDON PLANE.

IN an article on "The Artificial Production of Vigorous Trees," an abstract of which was published in NATURE, January 7, 1915, p. 521, Prof. Augustine Henry directed attention to certain well-known trees, like the Lucombe oak, Huntingdon elm, cricket-bat willow, and black Italian poplar, which owe their vigour and botanical characters to the fact that they are of hybrid origin. Such hybrids arose as chance seedlings due to cross-pollination of two trees of different species growing together. The introduction into Europe during the seventeenth century of North American trees which grew alongside similar, but distinct, European species in parks and gardens was the occasion of considerable hybridisation. Trees like the black Italian poplar and the London plane, which have never been seen anywhere in the wild

state, are intermediate in botanical characters between an American and a European species in each case, and are undoubtedly first-crosses.

The origin and history of the London plane, *Platanus acerifolia*, form the subject of a paper by Prof. Henry which appeared in the Proceedings of the Royal Irish Academy for April last. This tree has all the peculiarities which are met with in a first cross. It is intermediate in fruit and in leaves between the supposed parents, the Oriental plane, which is indigenous in Greece and Asia Minor, and the Occidental plane, which grows in a wild state in the forests of the eastern half of the United States. Its vigour is exceptionally great, as is usual in hybrids of the first generation; and its seeds when sown produce a mixed and varied crop of seedlings, in which are variously combined the characters of the two parents. Several supposed forms of the London plane, which are not uncommonly cultivated, appear

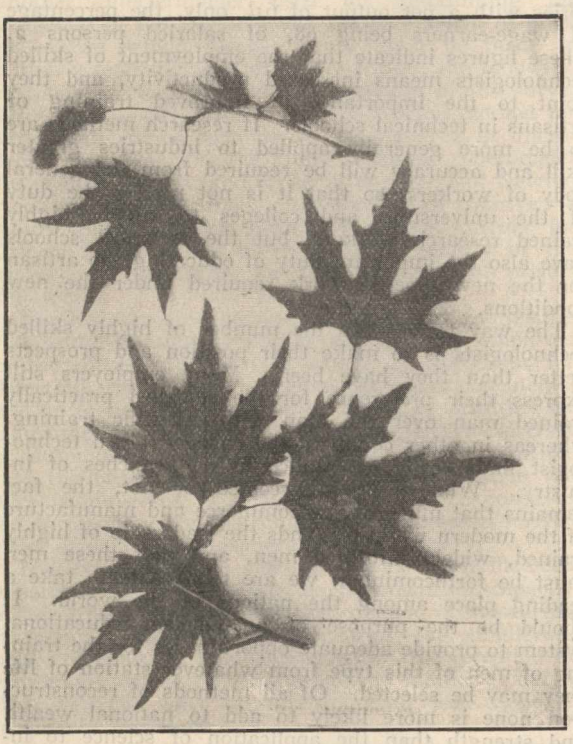

FIG. 1.—*Platanus orientalis*. From Thermopylæ seed.

to be chance seedlings of this tree, being hybrids of the second generation.

The London plane is extensively used for planting in the streets of towns of Europe and North America, as it has been found to surpass all other trees in its powers of resistance to drought, smoke, and other unfavourable conditions of soil and atmosphere. In the cities of New England, Ohio, Pennsylvania, etc., the London plane is much more successful as a street tree than the Western plane, notwithstanding the fact that the latter is the finest and largest native broad-leaved tree in the forests of these States. The selection as a street tree of the London plane in preference to the native species in the regions where the latter flourishes depends on the vigour inherent in the former tree on account of its hybrid origin.

The London plane, being undoubtedly a hybrid, must have originated as a chance seedling in some botanic garden where an Occidental plane and an Oriental plane happened to be growing close together. Such a seedling, by the vigour of its growth and the novelty of its foliage, would attract attention and be propagated by an observant gardener. The ease with which the London plane can be raised from cuttings would much facilitate its propagation. Prof. Henry shows that it possibly originated in the Oxford Botanic Garden about 1670, though this surmise cannot be definitely proved.

The Occidental plane was introduced from America into England by Tradescant in 1636, about a century later than the earliest record of the Oriental plane in this country. By 1670 there would have been trees of the American species old enough to bear pollen. The connection with Oxford is as follows:—Jacob Bobart, jun., who succeeded his father as curator of the botanic garden at Oxford in 1680, left in MS. "An Enumeration of Trees and Shrubs," in which


FIG. 2.—*Platanus occidentalis*.

for the first time there is mention in any record of the London plane. This MS. is, unfortunately, without date, but a similar MS. has 1666 on the fly-leaf. In the "Enumeration" the planes in cultivation are distinguished as follows:—

No. 475. *Platanus orientalis, pilulis amplioribus.*
No. 476. *P. inter orientalem et occidentalem media.*
No. 477. *P. occidentalis aut virginiensis.*

Corresponding with the diagnosis, No. 476, of the London plane, as intermediate between the Oriental and the Occidental species, there is a dried specimen, undoubtedly *P. acerifolia*, in the Sherard Herbarium at Oxford labelled "*Platanus media.*"

The first published description of the London plane was by Plukenet in 1700 in his "Mantissa" (p. 153), which reads as follows:—"Platanus orientalis et occidentalis mediam faciem obtinens, Americanus, globulis grandioribus, foliis splendentibus atris." The type-specimen of this description is in the British Museum, Herb. Sloane, No. 101, folio 112. In addi-

tion, there are two sheets of specimens, collected by Petiver about the same period, one of which, Herb. Sloane, No. 149, folio 237—two fine leaves of *P. acerifolia*—is labelled "*Platanus media*, n.d., Bobart, Ox." It is possible that the original tree from which this specimen was taken by Bobart was then living in the Oxford Botanic Garden. As Plukenet describes this plane as bearing large fruit-balls in 1700, it may have been then thirty years old, which would give the date of origin of *P. acerifolia* as 1670.

This history synchronises well with the date of the magnificent London plane, probably the oldest in Europe, which is living in the Palace Garden at Ely, and now measures 110 ft. high, the trunk being 23 ft. in girth at 5 ft. above the ground. It was planted by Gunning when he was bishop there between 1674 and 1684. Bishop Gunning spent some time at Oxford before his appointment to the Ely diocese.

The splendid London plane at the Ranelagh Club, Barnes, is precisely of the same size as the Ely tree, and is probably of the same age, both these trees

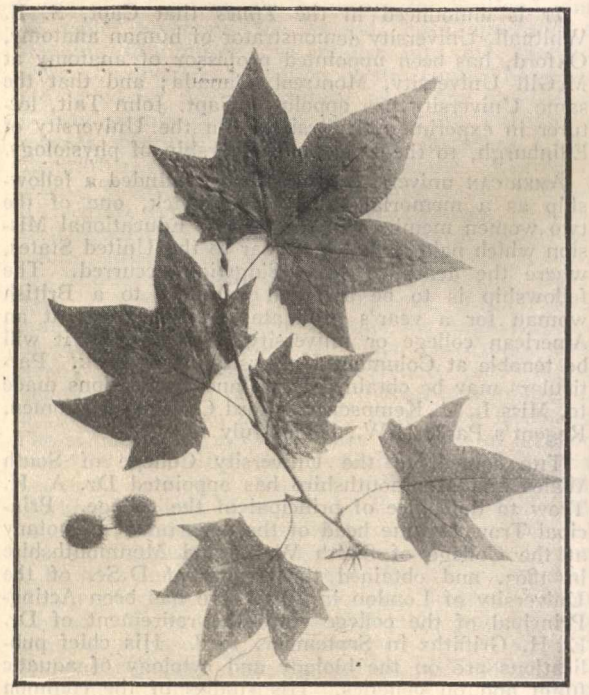

FIG. 3.—*Platanus acerifolia*. Kew.

being apparently cuttings of the original tree, which is postulated in this account to have been in the Oxford Botanic Garden. There is no record of the age of the Ranelagh Club tree. There are two other immense London planes, probably coeval with the Ely tree, namely, one at Peamore, near Exeter, and the other at Woolbeding, Sussex; but no particulars of their history can be obtained.

On the Continent there are no examples of the London plane approaching in size or age the fine trees at Ely and Barnes; and no mention is made of it by any Continental writer before 1703, when it was briefly described by Tournefort. Since the latter date the cultivation of the London plane has spread over the Continent, and it is now common in towns in France and Germany. In the United States, as stated above, it is widely cultivated as a street tree, but almost invariably under the erroneous name of *P. orientalis*. The true *P. orientalis* is very rare in America, and is never used for planting in streets.

Various seedlings of the London plane have been selected from time to time, and one of them, *P. pyramidalis*, which originated on the Continent about 1850, is now as commonly planted in the streets of our towns as the true London plane. Another seedling, *P. hispanica*, a beautiful tree resembling the Occidental plane in foliage, was known in England before 1731, and must have come from seed of one of the earliest London planes. The history of *P. hispanica* is as follows:—Miller, in his "Dictionary" (seventh edition published in 1759), mentions in all four planes. The Occidental and Oriental planes, he says, "are undoubtedly distinct species, but there are two others in English gardens, which I suppose to be varieties that have accidentally risen from seed; one is titled the maple-leaved plane (*P. acerifolia*), and the other is called the Spanish plane-tree." He considered *P. acerifolia* to be a seminal variety of *P. orientalis*, as seeds of a large Oriental

FIG. 4.—London plane at Ely.

plane in Chelsea Garden produced plants of this sort several times. His description of the Spanish plane is unmistakable: "It has larger leaves than the other sorts, more divided than those of the Occidental plane, sharply indented in the edges, light green, foot-stalks short and covered with a light down. It grows faster than the other sorts, but I have not seen any very large tree of this kind." He further states that he planted four planes, one of each sort, in 1731.

It would appear from this evidence that *P. hispanica* originated some time before 1731, and was probably a seedling of one of the early London planes, which by this time had been bearing seed for many years. This beautiful tree has always been rare in cultivation. There are, however, two fine trees at Kew, which have tall, straight stems, with ascending branches above and pendulous branches below, bearing magni-

ficent foliage. *P. hispanica* has been considered by many authors to be a variety of *P. occidentalis*, but the achenes clearly show it to be of hybrid origin.

The history of the other peculiar planes, here regarded as hybrid seedlings of the second generation on account of their botanical characters, is obscure. They may ultimately prove to be identical with young seedlings of *P. acerifolia* which are now growing at Kew and Glasnevin, when these in after years acquire adult foliage and bear fruit. This would be a positive proof of their hybrid origin.

The botanical characters of the two parent species, of the London plane, and of the supposed descendants of the latter, six of which are in cultivation, have been carefully investigated by Prof. Henry, assisted by Miss M. G. Flood. The numerous differences observable in the achenes, fruit-balls, and leaves of these trees prove to be exactly of the same kind and range as occur in hybrids artificially produced, and afford presumptive evidence that from *P. acerifolia*, an accidental cross between two wild species, the other planes, such as *P. pyramidalis*, *P. hispanica*, etc., only known in the cultivated state, are descended.

When the seed of a first-cross is sown the seedlings produced constitute a mixed and varied crop, in which are variously combined the characters of the two parents. The best proof, then, of the hybrid nature of *P. acerifolia* is the fact that it does not come true from seed, which appears to have been known to Lorberg in 1875 and to Gadeceau in 1894. Two sowings made in recent years establish this very clearly. There are now eight seedlings planted in the Queen's Cottage grounds at Kew which were raised from seed of *P. acerifolia* that was sown in April, 1911. These range in height from 4 ft. to 10 ft., and are very diverse in foliage, some closely resembling *P. orientalis*, and others resembling *P. occidentalis*, a few being intermediate. One of them appears to be identical with *P. hispanica*. There are also two seedlings at Glasnevin, which are the only survivors of a set raised at Cambridge in 1910 from seed of a large London plane growing near the main gate at Kew. The rest of the set died from drought, having been transplanted into a field in that dry year. These two seedlings are extremely unlike in foliage; one has leaves indistinctly lobed, resembling those of *P. occidentalis*; the other has deeply lobed leaves, and differs little from *P. orientalis*.

The artificial production of a cross between *P. orientalis* and *P. occidentalis* has not been possible in this country, where there exists no adult living tree of the latter species from which pollen could be obtained. An attempt to reproduce *P. acerifolia* by cross-pollination of the Occidental and Oriental planes might be made in the United States, using the native tree as the female parent.

## *UNIVERSITY AND EDUCATIONAL INTELLIGENCE.*

CAMBRIDGE.—Mr. R. H. Rastall, of Christ's College, has been appointed University lecturer in economic geology, Mr. Herbert Stone University lecturer in forestry, and Mr. F. Debenham, of Gonville and Caius College, University lecturer in surveying and cartography.

Mr. T. C. Nicholas, of Trinity College, has been appointed assistant to the Woodwardian professor of geology, and Mr. J. M. Wordie, of St. John's College, demonstrator of petrology.

Mr. A. W. Hill, of King's College, and Mr. E. H. Rayner, of Trinity College, have been approved for the degree of Sc.D.

EDINBURGH.—The University Court, on the recommendation of the Senatus, has resolved to re-establish the lectureship in military history and strategy. It has also been resolved to institute a diploma in public health.

Dr. H. S. Allen, reader in physics, King's College, London, and secretary of the Physical Society of London, has been appointed lecturer in natural philosophy.

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MR. S. C. MONK has been appointed lecturer in electrical engineering at the Devonport Technical School.

THE resignation of Dr. R. L. Weighton of the chair of engineering at Armstrong College, Newcastle-upon-Tyne, is announced.

THE first award of the William Gibson research scholarship for medical women (minimum 250*l*. per annum) has been made to Miss M. Esther Harding. The scholarship is held for two years.

IT is announced in the *Times* that Capt. S. E. Whitnall, University demonstrator of human anatomy, Oxford, has been appointed professor of anatomy at McGill University, Montreal, Canada; and that the same University has appointed Capt. John Tait, lecturer in experimental physiology in the University of Edinburgh, to the Drake professorship of physiology.

AMERICAN university women have founded a fellowship as a memorial to Miss Sidgwick, one of the two women members of the British Educational Mission which paid a visit last year to the United States, where the death of Miss Sidgwick occurred. The fellowship is to be awarded annually to a British woman for a year's graduate research work at an American college or university. For 1919–20 it will be tenable at Columbia University, New York. Particulars may be obtained from, and applications made to, Miss L. C. Kempson, Bedford College for Women, Regent's Park, N.W., before July 1.

THE council of the University College of South Wales and Monmouthshire has appointed Dr. A. H. Trow to the office of principal of the college. Principal Trow became head of the department of botany at the College of South Wales and Monmouthshire in 1893, and obtained the degree of D.Sc. of the University of London in 1899. He has been Acting-Principal of the college since the retirement of Dr. E. H. Griffiths in September, 1918. His chief publications are on the biology and cytology of aquatic fungi and on genetics. His studies of the common groundsel constitute a valuable addition to our knowledge of the inheritance of quantitatively variable characters. The work that will devolve upon Principal Trow for the next few years under the scheme of reconstruction to be effected as the result of the Report of the Royal Commission on University Education in Wales will be of a critical character, and of vital importance for the growth and evolution of the institution.

*School Science Review*, the new publication promoted by the Association of Science Masters (formerly the Association of Public School Science Masters), will be greatly appreciated by all interested in the progress of science. To teachers themselves it will supply that long-felt want: a medium for the regular interchange of opinions from the schools point of view, and for the record of new ideas in courses and experimental work; to wider educational circles it will show clearly what is being done in the leading schools for the advancement of science. The first number runs to thirty-two pages of most readable material. Mr. C. L. Bryant, of Harrow, writes a valuable account of the

work and influence of the association since its inception in 1900. Mr. Durrant, of Marlborough, supplies a contribution dealing with ions in solution, and gives many valuable suggestions for the treatment of the subject in schools. Sir William Tilden deals with the aims, objects, and methods of science teaching, and lays stress upon the value of research work in science classes. Mr. Hough (Oundle), in an illuminating article on research, appeals for an extension of such work among school pupils, and gives definite examples of how school researches have helped to solve industrial problems. Mr. Hart-Smith (Battersea) contributes an account of recent advances in chemistry, and space is found for notes on apparatus and experiments, reviews, and current topics. The Review, which is to be published four times a year, is replete with interesting matter, and the editor (Mr. Adlam, City of London School) may be warmly congratulated on the excellence of the publication.

THE Lords Commissioners of his Majesty's Treasury, in consultation with the President of the Board of Education, the Secretary for Scotland, and the Chief Secretary for Ireland, have appointed a Standing Committee "to inquire into the financial needs of university education in the United Kingdom and to advise the Government as to the application of any grants that may be made by Parliament towards meeting them." The first members of the Committee, which will be known as the "University Grants Committee," are as follows:—Sir William M'Cormick (chairman), Prof. W. Bateson, F.R.S., Sir Dugald Clerk, K.B.E., F.R.S., Sir J. J. Dobbie, F.R.S., Miss S. M. Fry, Sir F. G. Kenyon, K.C.B., Sir Stanley Leathes, K.C.B., Sir William Osler, Bart., F.R.S., and Sir J. J. Thomson, O.M., F.R.S. It may be recalled that in NATURE for August 15 last an article was published in which particulars were given of the position of university and higher technical education in the United Kingdom in 1913–14 in comparison with the United States and Germany. The article was afterwards made the basis of a report issued by the British Science Guild upon "Industrial Research and the Supply of Trained Scientific Workers." Since then the Civil Service Estimates for 1919–20 have been issued (see NATURE, April 10), and they show that the total amount of the grants to be paid out of the Exchequer for the maintenance of university institutions is 1,000,000*l.* instead of about 500,000*l.* There is also a supplementary non-recurrent grant of 531,000*l.* in aid of maintenance of universities and colleges. The Committee just appointed is apparently to inquire into financial needs only. What is wanted is a Commission to make a broad survey of the whole subject of university and higher technical education from the point of view of national needs and how far the existing provision satisfies them.

IN the form of a thirty-two-page pamphlet, Mr. Frank Stevens, the resident curator, has sent us "Some Account of the Educational Work at the Salisbury Museum, 1916–19." This work consists essentially of classes for school children, beginning with the elementary schools of the city, extending to those of the adjacent villages and to some of the secondary schools, and, finally, to some bodies of adult students. The school classes, begun in 1913 as private and informal talks by Mr. Stevens, developed by 1916 into an historical course sanctioned by the educational authorities as part of the school lessons. The first course dealt with prehistoric and early historic times, in relics of which the neighbourhood and the museum of Salisbury are so rich. The pamphlet gives synopses of this and later courses, and indicates the objects used in illustration of each lecture. "The museum specimens," as Mr. Stevens happily puts it, "took the place of the experiments at a chemical lecture in impressing the facts of the lecture." But they did more than that; they emphasised the relation of the home locality to national life, and showed how the general course of history was reflected in Salisbury. Thus a living interest was given to a lesson that is too often a dry memorising of names and dates, intelligence was trained, and citizenship cultivated. The value to the children is obvious. But the museum has also been a gainer. The number of adult visitors has increased every year, and this growth of the public interest in the collections has led to an increase in donations and subscriptions. Further, under the terms of the Wilkes bequest, a sum of 300*l.* per annum has been allotted for the continuance of the school classes. Mr. Stevens has laboured, and now writes, with a justifiable enthusiasm. His example is most worthy to be followed, and those who would follow it should beg a copy of his pamphlet.

## SOCIETIES AND ACADEMIES.

### LONDON.

**Royal Society**, June 5.—Sir J. J. Thomson, president, in the chair.—Dr. P. **Phillips**: The relation between the refractivity and density of carbon dioxide.—P. N. **Ghosh**: The colours of the striæ in mica, and the radiation from laminar diffracting boundaries. (*a*) The striæ are shown by an examination of the Haidinger's rings in mica (and otherwise) to be the boundaries between parts having slightly different thicknesses. (*b*) The colour of any stria as seen in the Foucault test is complementary to the colour of the central fringe in the laminary diffraction-pattern produced by it. (*c*) The colours are altered by holding the mica obliquely, or by immersing it in a cell containing liquid. (*d*) The luminosity of a stria in the Foucault test is approximately a maximum when the phases of the wave-front, after passing through the plate on the two sides of the stria, are opposite, and practically zero when the phases are identical. (*e*) Attempts to reproduce the phenomenon by etching glass plates with dilute hydrofluoric acid were not very successful, owing, apparently, to a want of sufficient sharpness in the boundary thus produced. This is indicated by the fact that such a plate shows distinct *asymmetry* with reference to the direction of the incident light, both in the Foucault test and in laminar diffraction. (*f*) The striæ in mica appear doubled (with a black line in the centre) when the light coming to a focus is screened in a symmetrical manner, instead of by a knife-edge, as in the Foucault test.—Dr. E. F. **Armstrong** and Dr. T. P. **Hilditch**: A study of the catalytic actions at solid surfaces. The rate of hydrogenation of a number of unsaturated fatty oils in presence of finely disseminated nickel has been studied and the results expressed in the form of curves. These are characterised by an initial linear segment followed by an abrupt change of direction to a segment of gentler slope, which is also linear at first, but subsequently may exhibit considerable curvature. The point of inflexion is at a corresponding part of each curve. The two well-defined linear components of the curves correspond with the hydrogenation of glycerides more unsaturated than olein and to the hydrogenation of olein. The curves never approach the logarithmic type required for a unimolecular action. The general aspect of the curves obtained for catalytic hydrogenation is markedly similar to those obtained in the case of enzymes, and they undoubtedly represent related phenomena.

**Royal Meteorological Society**, June 18.—Sir Napier Shaw, president, in the chair.—Sir Charles **Close**: Note on the rainfall at Southampton and London during a period of fifty-seven years (1862–1918). The variations in rainfall in England are so great that any seasonal period can be detected only by the study of many years' statistics. Even when the statistics are available for a long period, the form in which they are usually published does not readily lend itself to a clear appreciation of the existence of a simple seasonal period. Thus the monthly means are usually uncorrected for variation in the lengths of the months, and the custom of treating the months separately produces an effect of discontinuity. If, however, after correcting for monthly inequalities, the *accumulation* of rainfall, reckoning from any fixed date, is tabulated and plotted, the rainfall assumes a more regular aspect. If, further, from these monthly figures of accumulation we deduct the average precipitation, the remaining figures approximate to a simple sine-curve with an annual period. The irregularities left over occur chiefly in September and October. The fifty-seven years' rainfall at Southampton, from 1862–1918, have been examined in this way, and the London rainfall for the same period. For Southampton, counting from April 1 (but any date will do), the accumulation, in inches at $n$ months, as represented by the expression

$$2{\cdot}63 \times n - 0{\cdot}95 - 1{\cdot}35 \sin (n \times 30° - 45°).$$

For London by the expression

$$2{\cdot}13n - 0{\cdot}7 \sin (n \times 30°).$$

The maximum irregularities left over amount to 0·30 in. and 0·20 in. respectively on October 1. It would appear, then, that at the places in question the rainfall can be considered to result from uniform precipitation throughout the year, modified by a simple annual harmonic term, further modified by small irregularities in September and October.—Lieut. J. **Logie**: Note on tornadoes. The paper aimed at showing that no convection currents are capable of producing tornadoes of the intensity claimed for some of these storms. Working from the equation $dp/dh = -g\mathrm{D}$ (which is shown to be sufficiently accurate for the purpose in hand, even in a tornado-centre), and assuming that at some height the pressure above the tornado is equal to that at the same level outside, the author computes the difference of temperature between the air in the centre of the tornado and that outside. For a tornado having a pressure reduction of 50 millibars at the surface the mean temperature difference is found to be 23° Å. if the tornado extends only to 5 km. (16,000 ft.), 10° Å. if it extends to 10 km., and 5° Å. if it extends to 15 km. From the known values of the lapse-rate of saturated air, it follows that under conditions of maximum instability a saturated ascending current not less than 8 km. high might produce a tornado of this intensity. Since such instability rarely occurs, and, in addition, ascending currents of saturated air are usually everywhere penetrated by descending masses of cooler air, even a tornado of this intensity is unlikely to be so produced in natural conditions. The case of a 250-millibar reduction is also considered as being at times actually achieved. In this case the temperature difference, even if the tornado reaches 15 km., is shown to exceed 35° Å., a difference not capable of being produced by the release of latent heat due to condensation of cloud, and still less likely to be caused by simple heating of the ground surface. It is suggested that the required rise of temperature may be due to the lightning which is usually described as a characteristic of the funnel-cloud.—Capt. D. **Brunt**: A periodogram analysis of the Greenwich temperature records. The monthly mean temperatures at Greenwich for the years 1841–90 were taken and represented by a Fourier series up to 100 terms, so as to permit of the detection of any periods of length greater than one year. Periods of 9·5 years, 5 years, 4 years, 23 months, and 20 months were shown to exist, all having amplitudes of the order of 0·5° F. Some of these correspond with periods found in other meteorological records, *e.g.* the 20-month period has been found by Prof. Turner in the rainfall records of Greenwich and Padua. The interval covered by the observations was insufficient to permit a detailed discussion of periods of length greater than about ten years. Many of the periods found were not continuous during the whole interval covered by the observations, *e.g.* the 20-month period died away about 1894, being replaced by a period of about 23 months. The general result of the investigation was to show that periods in astronomical sense do not exist in these temperature records. It was shown that the effect of correcting the observations for the effect of the periods found was to produce an almost inappreciable diminution of the standard deviation of the observations, tending to show that the variations of the monthly mean temperatures from year to year are to be regarded either as purely chance variations or as due to periods of length less than a year.—Lieut. G. **Green**: The propagation of sound in the atmosphere. Sound-waves emitted by a source situated on the earth's surface generally undergo refraction as they advance owing to the changing conditions of wind velocity and of temperature as the waves pass from layer to layer of the atmosphere. In the paper a mathematical discussion is given of the paths of sound-rays issuing in all directions from a source, under certain conditions of wind velocity and temperature closely resembling the conditions generally to be observed in the atmosphere. The mathematical results obtained would make it possible to calculate the mean speed of sound in any chosen direction from a source to a recording instrument at a given distance from it, provided observations of the horizontal velocity of the wind and of the mean temperature of the air have been taken at the earth's surface and at various heights above the surface. The mean horizontal velocity of a sound element in tracing out a ray is equal to the sum of the velocity of sound and the horizontal component of wind velocity in the plane of the ray, taken at a height above the earth's surface equal to one-third the total height reached by the ray. Numerical results are given for special cases to illustrate the effect of a given wind gradient on the propagation of sound in all directions from a source; and the effect of the same wind gradient combined with a favourable, and also an unfavourable, temperature gradient. The case of a wind increasing in velocity and veering as we ascend from the earth's surface is illustrated in the closing section of the paper.

**Institution of Mining and Metallurgy**, June 19.—Mr. H. K. Picard, president, in the chair.—W. H. **Goodchild**: The genesis of igneous-ore deposits. The primary object of this paper is to provoke discussion. Its scope is limited to the synoptic presentation of a few of the more important principles and processes concerned in the formation of ore deposits from rock magmas, together with an outline of sundry more or less novel methods for elucidating the nature of those processes. Starting out with the fundamental principle that "the meaning of a vast number of the structures with which the geologist is confronted—either in the field on the grand scale, or in the laboratory with his small specimens—cannot, as a rule, be correctly

gauged without some considerable knowledge of the various physico-chemical equilibria within the masses at various stages of the general cooling process," the author proceeds to enunciate four leading principles as laid down by Le Chatelier, van't Hoff, Ostwald, and Henry as a basis for calculating the general characters and directions of the chemical changes occurring during the cooling. He then deals with the volume relationships of minerals and the problem of volcanic power, the evolution of igneous rocks by magmatic differentiation, and the formation and behaviour of submagmas, from which he goes on to classify igneous-ore deposits under three types, namely, those due to precipitation concentration, solution concentration, and a third group which appears to arise from the degasification of enriched subsidiary magmatic differentiates, this latter class not improbably including the metallic copper of the Lake Superior region and the gold deposits of the Rand. The author's endeavour is, however, rather to illustrate a method of attack on some of the problems than to discuss in detail any particular deposits, and he urges a more extended practice of what he terms magmatic geology as a means to that end.

EDINBURGH.

**Royal Society**, June 2.—Dr. John Horne, president, in the chair.—Dr. L. **Dobbin**: The presence of formic acid in the stinging hairs of the nettle. The generally accepted view that formic acid is present in the stinging hairs of nettles is not convincingly established by previous investigations in which nettles, as a whole, and not exclusively the cell-contents of the stinging hairs, were submitted to examination. The author has secured the collection of these cell-contents alone, and the conversion of the free acid or acids which they contain into corresponding salts, by pressing the leaves of growing nettles between strips of the purest filter-paper previously impregnated with barium hydroxide or sodium carbonate and dried in air. The optical characters of the lead and barium salts prepared from the material so collected were examined by aid of the polarising microscope, and the various preparations were found to include crystals possessing the same characters as known specimens of lead formate and barium formate.—Dr. R. A. **Houstoun**: X-ray optics. Part i. A method that the author developed ten years ago for calculating the number of electrons per molecule concerned in the production of an absorption band is applied to absorption bands in the X-ray region. The mean result for five "K" bands comes out 1·002. This is at once a verification by a new method of the wave-lengths in the X-ray region, and a guarantee that the theory of dispersion holds in this region. Other X-ray problems are then treated.—Dr. A. C. **Mitchell**: Pulsations of the vertical component of terrestrial magnetic force. An account was given of observations recently made at Eskdalemuir Observatory of pulsations in the vertical component of the earth's magnetic force. Although the ordinary recording magnetograph may apparently register an undisturbed state of the earth's magnetism, minute investigation by means of large loops of cable laid over the ground shows that there is continual agitation going on. This state of disturbance is less noticeable during the night than during the day; it takes peculiarly characteristic forms during displays of the aurora; while the method of observation is sufficiently delicate to observe oscillation periods as low as one-seventh of a second. These very rapid oscillations are, it is believed, identical with the fundamental period of the earth's oscillation as an electrified sphere. Other sudden changes, such as those which frequently usher in a magnetic storm, can also be studied in detail by this method.—Col. R. A. **Marr** (Norfolk, Virginia, U.S.A.): Samples of encysted wood. This wood, obtained from the Balsa tree, is extremely light, its density being about half that of cork. Unfortunately, it rotted easily in its natural state, but by a special process discovered by the author a waterproofing mixture could be carried to the centre of any piece of timber, coating the cells and ducts with an extremely thin permanent film. In this form the wood had been of great service in floating mines during the war.

PARIS.

**Academy of Sciences**, June 2.—M. Léon Guignard in the chair.—E. **Picard**, B. **Baillaud**, and M. **Ferrié**: A project of the Bureau des Longitudes relating to the determination of a network of longitudes and latitudes all over the world. Three points are suggested: Paris, Shanghai, and near San Francisco. The differences of longitude are to be determined by comparisons between pendulums using wireless signals. The precision attainable should be of the order of 0·01 sec. of time. Greenwich and a point in New Zealand are suggested as additional points on the chain.—H. **Deslandres**: Observations relating to the total eclipse of the sun on May 29, made at the Meudon Observatory. The eclipse was not visible at Meudon, and it did not prove possible to organise an expedition on account of war conditions. Observations of an unusually large prominence were made. Experiments on wireless communication with the Island of Ascension were also made; the signals from this station are not usually perceived during the daytime, but at the moment the umbra and penumbra of the moon produced a weakening of the normal illumination on that portion of the earth between Ascension and France the signals were clearly made out.—G. **Bigourdan**: The unification of astronomical and civil time. It has been agreed between the United States, Great Britain, and France that, commencing January 1, 1925, the astronomical day shall commence, like the civil day, at midnight.—M. **Tilho**: A scientific expedition of the Institute of France in Central Africa. Geographical sketch of the Tibesti, Borkou, and Ennedi.—M. Emile Bourquelot was elected a member of the section of chemistry in succession to the late M. Jungfleisch.—G. **Julia**: Integral functions and growth.—E. **Kogbetliantz**: The summation of divergent series.—J. **Rey**: The flow of petrol vapour.—P. **Fox**: Measurements of stellar parallax at the Dearborn Observatory. Data for thirty-five stars are given, obtained by the photographic method. The accuracy is about 0·01 sec.—E. **Belot**: New data on the primitive solar nucleus, its encounter with the original nebula, and the formation of spiral nebulæ.—M. **Marti**: A method of sounding at sea from a moving vessel, based on the propagation of sound in water. A small charge of explosive is detonated. A microphone receives and records the original sound, and then its echo, reflected off the sea-floor. The accuracy of reading permits of detecting differences in depth to about 1 metre, but the uncertainty of the mean temperature of the water introduces an error of about 0·3 per cent.—L. **Dunoyer**: The error in dead-reckoning involved by incomplete knowledge of the wind velocities.—H. **Abraham** and E. **Bloch**: The measurement in absolute value of the periods of high-frequency oscillations.—M. **Boll**: The evolution of very dilute solutions of tetrachloroplatinic acid in total darkness and at varying temperatures.—G. **Chavanne** and L. J. **Simon**: The critical solution temperatures in aniline of the principal hydrocarbons contained in petrol. Seventeen hydrocarbons were examined, and these were found to fall in three main groups: the aromatic hydrocarbons miscible at the ordinary temperature;

paraffins, ranging from pentane to octane, with a critical solution temperature of about 72° C.; and saturated cyclic hydrocarbons with a critical solution temperature of about 36° C.—M. **de Mallmann**: The system chlorine-hypochlorous acid-sodium hypochlorite.—M. **Dalloni**: The dome of Noisy-les-Bains and the Habra (Algeria).—M. **Mascré**: The *rôle* of the nutritive layer of pollen.—H. **Piéron**: The part played by physiological energy losses in the relation which unites the time of sensorial latency to the intensity of stimulation.—J. E. **Abelous** and J. **Aloy**: The inversion of saccharose by mechanical ionisation of water. A 5 per. cent. solution of sugar in water, after five passages through a spray pulveriser, contained the same amount of invert-sugar as a similar solution to which four drops of pure hydrochloric acid has been added and left in repose for the same time (40 minutes).—A. **Vandel**: The determinism of the two modes of reproduction of *Polycelis cornuta*.—MM. **Hartmann** and **Peyron**: Neo-formations of chorio-ectodermic origin in tumours of the testicle.

June 10.—M. Léon Guignard in the chair.—G. **Bigourdan**: Co-ordinates and instruments of the observatory for navigation. Historical account of the position and instruments in the observatory in the Hôtel de Cluny, dating from about 1750–75.—A. **Rateau**: Theory of the flight of aeroplanes at various altitudes.—E. **Borel**: The theory of ensembles and the decimal numbers.—P. **Boutroux**: A mode of definition of a class of multiform functions in the whole of the domain of existence of these functions.—H. **Cramer**: The distribution of the prime numbers.—F. **Michaud**: The vapour-pressure of liquids in thin layers. Starting with data by Devaux on the variation of the surface tension of a thin film of one liquid on another, such as oil on water, it is shown that the vapour-pressure of the oil on the water under these conditions is reduced to about 1/5000th of the normal saturation-pressure. Similar considerations apply to the case of a thin film of a liquid on a solid, such as water on glass.—Ph. **Glangeaud**: The casual or superposition volcanic group of the Mont Doré massifs.—C. E. **Brazier**: The influence of the vertical distribution of temperatures on velocities of the wind measured in the neighbourhood of the soil.—G. **Bertrand**: The preservation of fruit without the addition of sugar, alcohol, or antiseptics, and without sterilisation by heat. Fruit washed in cold water can be kept in a good state of preservation in cold water, provided that the bottles are completely filled and that air is wholly excluded.—R. **Fosse**: The mechanism of the artificial formation of urea by oxidation and the synthesis of natural principles in plants.

## *BOOKS RECEIVED.*

The Analytical Geometry of the Straight Line and the Circle. By J. Milne. Pp. xii+243. (London: G. Bell and Sons, Ltd.) 5*s*.

Projective Vector Algebra: An Algebra of Vectors Independent of the Axioms of Congruence and of Parallels. By Dr. L. Silberstein. Pp. vii+78. (London: G. Bell and Sons, Ltd.) 7*s*. 6*d*. net.

Physical Laboratory Experiments for Engineering Students. By Profs. S. Sheldon and E. Hausmann. Part i.: Mechanics, Sound, Heat, and Light. Pp. v+134. (London: Constable and Co., Ltd.) 6*s*. net.

Photography: Its Principles and Applications. By A. Watkins. Second edition. Pp. xvi+333. (London: Constable and Co., Ltd.) 10*s*. 6*d*. net.

Farm Concrete. By K. J. T. Ekblaw. Pp. xi+295. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd.) 8*s*. 6*d*. net.

The Modern Milk Problem in Sanitation, Economics, and Agriculture. By J. S. MacNutt. Pp. xi+258+plates xvi. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd.) 10*s*. 6*d*. net.

Peach-Growing. By H. P. Gould. Pp. xxi+426+plates xxxii. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd.) 10*s*. 6*d*. net.

Navigation By Prof. H. Jacoby. Second edition. Pp. xi+350. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd.) 11*s*. 6*d*. net.

The Causes and Course of Organic Evolution. By Prof. J. M. Macfarlane. Pp. ix+875. (New York: The Macmillan Co; London: Macmillan and Co., Ltd.) 17*s*. net.

## DIARY OF SOCIETIES.

*THURSDAY*, JUNE 26.

ROYAL SOCIETY, at 4.30.—Dr. A. E. H. Tutton: Monoclinic Double Selenates of the Cobalt Group.—Hertha Ayrton: A New Method of Driving off Poisonous Gases.—Dr. F. W. Aston: Experiments with Perforated Electrodes on the Nature of the Discharge in Gases at Low Pressure.—Mary Seegar and Prof. Karl Pearson: De Saint-Venant Solution for the Flexure of Cantilevers of Cross-section in the Form of Complete and Curtate Circular Sectors; and on the Influence of the Manner of Fixing the Built-in End of the Cantilever on its Deflection.—Dr. H. Jeffreys: The Relation between Wind and the Distribution of Pressure.—Prof. C. H. O'Donoghue: The Blood Vascular System of the Tuatara, *Sphenodon punctatus*.—*And other Papers*.

*FRIDAY*, JUNE 27.

PHYSICAL SOCIETY, at 5.—Prof. C. L. Fortescue: The Current-Voltage Characteristics of High-Voltage Thermionic Rectifiers.—Prof. Ernest Wilson: The Measurement of Small Susceptibilities by a Portable Instrument.

*MONDAY*, JUNE 30.

INSTITUTION OF ELECTRICAL ENGINEERS, at 6.—Capt. L. B. Turner: The Oscillatory Valve Relay: A Thermionic Trigger Device.

## CONTENTS.



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