

the British Westinghouse Company, Ltd. (who visited the United States in the year 1915 for the purpose of inquiring into the organisation of industrial research), that there are probably more than fifty industrial concerns which have established research laboratories on an extensive scale, and that many of these laboratories expend from 20,000*l.* to 60,000*l.* a year on research work.

*The Eastman Kodak Company.*—The laboratories of this company at Rochester, N.Y., are maintained at an annual cost of about 20,000*l.*, and are generally considered to be among the finest in the country.

*The Mulford Company.*—This company, founded in 1894 at Philadelphia, affords an excellent illustration of what can be accomplished by the adoption of scientific research and the application of science to industry. The company now has a capital of 400,000*l.*, it employs 1400 persons on wages, and its scientific staff comprises about sixty graduate chemists, pharmacists, bacteriologists, and physicians. The company manufactures drugs, and specialises in the production of serums, anti-toxins, and vaccines.

*The American Rolling Mill Company.*—This company, which has a number of factories, is a large producer of sheet iron and steel. The laboratories comprise works laboratories in which routine testing and the elimination of manufacturing troubles are dealt with, and a separate research laboratory, established in 1910 at a cost of 10,000*l.*

*The Detroit Edison Company.*—This company maintains a small research laboratory, partly for the purpose of investigating troubles incident to the smooth working of the technical side of the enterprise, and partly for investigating the utilisation of electrical energy for special purposes.

*The National Electric Lamp Association.*—This association comprises about twenty electric lamp factories in different parts of the States. The research laboratories, at which there are about 200 employees, comprise fifteen separate laboratories, in addition to a model lamp factory, in which the results of laboratory investigations are tested and developed on a manufacturing scale. Another laboratory is maintained for testing and standardising the products of the factories. There is also a separate department which specialises in the development of automatic tools for lamp making. The scientific and technical members of the staff are drawn almost entirely from the universities.

*The Pennsylvania Railway Company.*—This company has an extensive research laboratory with a staff of more than 300. The investigations are connected mainly with materials utilised in railway work, and elaborate chemical, physical, and electrical equipment is provided. There is also a laboratory on a workshop scale used for the development of results obtained in the research laboratories.

*The National Cash Register Company.*—The research laboratory of this company at the works at Dayton, Ohio, is equipped for chemical, physical, and microscopic investigations. The staff of the laboratory numbers fifteen, about two-thirds of whom are university or technological college graduates. But little work of a purely scientific nature is undertaken, the investigations being directed mainly to the elimination of manufacturing troubles and improvements in the materials used.

*The General Electric Company.*—This company organised a department of chemical and physical research in 1901, with an initial capital expenditure of about 300*l.*, and an annual expenditure of 600*l.* The investigations undertaken were connected directly with the field of electric engineering. At the present time the capital expenditure on the laboratory exceeds 100,000*l.*, while the annual expenditure is about 50,000*l.* The staff comprises about 200 men.

## UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

LONDON.—An offer from the Rhodes Trustees to subscribe 50*l.* a year for three years for the provision of secretarial assistance for the Standing Committee of the Imperial Studies Committee has been accepted by the Senate with thanks.

The thanks of the Senate have been accorded to the Society of Antiquaries for the renewal for a further period of five years of the Franks studentship founded by them in memory of Sir A. Wollaston Franks, K.C.B., for the promotion of the study of the archaeology of the British Isles in its comparative aspects.

The following doctorates have been conferred:—*D.Sc. in Psychology*: Mr. E. N. McQueen, an internal student, of University College, for a thesis entitled "The Distribution of Attention"; *D.Sc. in Botany*: Miss Lilian J. Clarke, an external student, for a thesis dealing with various experiments in botany gardens, and other papers; Mr. R. C. Knight, an external student, for a thesis entitled "The Interrelations of Stomatal Aperture, Leaf Water-content, and Transpiration Rate," and other papers; and Mr. S. G. Paine, an external student, for a thesis entitled "The Permeability of the Neash Cell," and other papers.

As was explained in these columns at the time, the Board of Education in July, 1914, proposed in Circular 849 to institute two annual examinations, a lower and a higher, for grant-earning secondary schools, to be conducted by university examining bodies in close co-operation with the Board of Education. In January, 1916, the Board announced that the proposals must be considered to be in abeyance, as the necessary financial aid was not forthcoming. The Board of Education now announces in Circular 996 the formation of a Secondary Schools' Examinations Council, the main function of which, we learn from the *Times*, will be the co-ordination of the numerous examinations to which secondary schools at present submit their pupils. The new council is to consist of eighteen persons, appointed by the universities and other bodies, including four by the Teachers' Registration Council.

THE Appointments Board of the University of London has issued a pamphlet describing its aims and work. Founded eight years ago, it has had its own secretary for the last six years, and has dealt with 2500 students and graduates, for many of whom it has found posts. While a large proportion of the posts filled have been in the teaching profession, the board is endeavouring to induce a greater number of graduates to enter business houses, and, on the other hand, is pointing out to employers the advantages of having well-educated men and women on their staffs. The present pamphlet gives no hint to intending clients as to the directions in which business openings are most likely to be found, but in a recent report of the board to the Senate of the University it was stated that a great demand exists at the present time for men and women with a scientific training in engineering, physics, or chemistry, and that this demand would probably continue after the war. The supply of such men and women is altogether too inadequate, and it seems to be the duty of our universities to increase the supply as soon as possible. If the experience of the Appointments Boards of the other universities is in any way like that of the London board, the fact is of great interest to the parents of future university students, and should not remain buried in the minutes of university bodies, but should be made known to the public without delay.

WE have received from Mr. Gilbert H. Richardson, of The Gables, Elswick Road, Newcastle-on-Tyne, a "Declaration concerning the Need for Standardising Auxiliary International Language," which he invites the readers of NATURE to sign. The declaration states that there is need for an international language, that there should be only one such language, and that at the close of the war a permanent International Commission should be appointed and financially supported by the Governments of the Powers for the purpose of settling all questions relating to the grammar, vocabulary, orthography, and pronunciation of the auxiliary international language. At the present time there are two such languages, "Esperanto," founded by the late Dr. Zamenhoff, and "Ido," which was proposed in 1901 as a simplification of Esperanto. It is now proposed that there should be a commission to examine both these languages, with power to impose its decisions upon those who wish to employ an international language. Should the commission decide in favour of either Esperanto or Ido, the report would promote the use of the language recommended. In the event, however, of yet a third language being drawn up by the commission, it is doubtful whether Esperantists and Idists would be prepared to adopt this new tongue. The verdict of the commission would depend largely upon its composition. We suppose that the French, Italian, and Spanish members would vote for Ido, while members of the Slav nationalities would support Esperanto. The terminations "aj," "oj," and "uj," constantly occurring in Esperanto, are disconcerting to English readers, who will certainly prefer the general appearance of Ido, which, when printed, looks remarkably like Italian. The circumflex accents over certain consonants, which make Esperanto difficult to print, are discarded in Ido. On the whole, we think that of the two languages Ido would be the more easily acquired by an Englishman.

### SOCIETIES AND ACADEMIES.

#### LONDON.

**Geological Society,** May 16.—Dr. Alfred Harker, president, in the chair.—T. Sheppard: British geological maps as a record of the advance of geology. Geological changes were often indicated on old topographical maps; consequently, old plans and charts were of use in connection with geological inquiries. Some maps, dating from Elizabethan times, show that in the Humber area great changes have taken place; large tracts of land have been denuded, and many towns and villages have disappeared; and large stretches of reclaimed land marked places where water once stood. Writers of 1595 were familiar with lithological differences in various parts of the country. Strachey (1719) and Packe (1743) produced some remarkable geological sections and plans. The first systematic series of maps, illustrating the geological features of the counties, was issued in the reports of the old Board of Agriculture, and dated from 1793 to 1822. One of the earliest attempts to prepare geological maps was by Prof. Jameson, who read a paper in 1805 "On Colouring Geognostical Maps" (Wernerian Nat. Hist. Soc., vol. i., published 1811). The first strictly geological map was apparently that made by W. Smith in 1799, showing the geological structure of the Bath district. The first geological map of England and Wales was a small one, also by Smith, and it was presented to the society when the first Wollaston medal was awarded to Smith in 1831. The society's collection includes geological maps of Scotland and Ireland, some of great value and his-

torical interest. As examples of privately published maps, those by Sanders of the Bristol Coalfield, Jordan's London district, and Elias Hall's Lancashire area were described.

#### MANCHESTER.

**Literary and Philosophical Society,** May 8.—Mr. W. Thomson, president, in the chair.—R. F. Gwyther: The specification of stress. Part v. The formal solution of the statical stress equations, and a theory of displacement as consequent on stress. The first portion of this paper is intended to show how the stress equations, given in part iv. and part iv. continued, are capable of simple general solution. Particular integrals are supposed to be dealt with separately, and no attempt has been made to treat of any specific problem. The aim has been to establish a basis for a theory of dealing with stress and displacement by continual steps of approximation, developed in the second part of the paper. In the second part the theory and method proposed are described.—Dr. E. Newbery: Recent work on overvoltage. The overvoltages, cathodic and anodic, of a number of electrodes have been measured in acid, in alkali, and in certain solutions of metallic salts under varying conditions of time and current density. Elements in the same group of the periodic system show the same cathodic (hydrogen) overvoltage. Overvoltage is due to the high solution potentials of compounds of the electrode material with the discharged ion, or with a product of the discharged ion. These compounds (hydrides, higher oxides, etc.) form solid solutions in the electrode substance, and are usually stable only under the influence of high pressures or high temperatures. Metal overvoltages (during deposition or dissolution of the metal) are due to the presence of the same compounds which produce gas overvoltages, and are in most cases very low compared with gas overvoltages. Iron, nickel, and cobalt are exceptions to this rule. Changes of overvoltage are produced (a) by changes of constitution of the above compounds, and (b) by changes of concentration of the solid solutions formed. Passivity is due to the insolubility and good electrical conductivity of the above compounds, which form a protective coating over the attackable metal surface.

#### PARIS.

**Academy of Sciences,** May 14.—M. A. d'Arsonval in the chair.—J. Boussinesq: Solutions of the problem of thrust, resembling that of Rankine and Maurice Lévy for sand, and sustaining walls of rectilinear profile.—H. Le Chatelier and F. Bogitch: The refractory properties of clay. From a study of the melting points, it would be concluded that refractory clay bricks ought to serve for the construction of industrial furnaces in steel works. This is not found to be the case in practice, silica bricks being exclusively employed. It is shown that the gradual softening of the clay bricks and loss of resistance to pressure are the causes of this difference, and experiments on the alteration of shape by pressure at increasing temperatures are given. The results are in general agreement with the work of Mellor and Moore.—H. Douvillé: The geology of the country to the west of the Pyrenees chain.—L. Mangin: Arctic forms erroneously described under the name of *Chaetoceros criophilus*. The Arctic form belongs to a quite different species, and is allied with *C. peruvianus*, with which it has often been confused.—E. Ariès: The absolute value of entropy and energy.—E. Kogbetliantz: The summation of ultraspherical series.—M. Pétrovitch: Arithmetical theorems on Cauchy's integral.—J. Guillaume: Observations of comets made with the *coudé* equatorial at the Observatory of Lyons. Observations of Wolf's comet (1916b)