

annum. It is estimated that many of the large powers in Canada can be developed at a total cost, including all generating machinery and transmission lines, ranging from 12*l.* to 20*l.* per c.h.p., in which case the cost per h.p. per annum should not exceed 2*l.* to 3*l.*

Resources of Canada.—Canada is exceptionally fortunate in the extent and distribution of its water-powers. Extending over a belt of several thousand miles in length, from Alaska to Labrador, and over a width of several hundred miles, there is an almost continuous network of lakes and rivers.

The following table shows how general is the distribution of water-power throughout the Dominion:—

Province	H-horse-power		Per cent.
	Available	Developed	
Nova Scotia	100,000	21,412	21·4
New Brunswick	300,000	13,390	4·5
Prince Edward Island	3,000	500	16·7
Quebec	6,000,000	520,000	8·7
Ontario	5,800,000	789,466	13·6
Manitoba	3,500,000	76,250	3·1
Saskatchewan		100	
Alberta	3,000,000	32,860	9·0
British Columbia		269,620	
N.W. Territories, Yukon	100,000	12,000	12·0
	18,803,000	1,735,598	9·2

Resources of Australia.—Though comparable in area with the United States, there has yet been no notable hydro-electric development in Australia. Except on the east coast, the topography is too flat or the rainfall too low to provide the necessary conditions. Some of the large irrigation schemes are capable of being utilised for power production, but the aggregate of such possible power is small.

The only possibilities of considerable powers are to be found in the rivers draining the Great Dividing Chain of the east coast.

The aggregate power suggested as being capable of economic development in the Great Dividing Chain is as follows:—

Australian Alps	300,000 to 500,000	h.p.
Blue Mountains	25,000 to 50,000	„
New England Range	200,000 to 500,000	„
Cairns district	100,000 to 250,000	„
Total	625,000	1,300,000

Conclusions.

The main conclusions to be drawn from the evidence available to the committee are:—

(1) That the potential water-power of the Empire amounts in the aggregate to at least 50 to 70 million horse-power.

(2) That much of this is capable of immediate economic development.

(3) That, except in Canada and New Zealand, and to a less extent in New South Wales and Tasmania, no systematic attempt has as yet been made by any Government Department to ascertain the true possibilities of the hydraulic resources of its territories, or to collect the relevant data.

(4) That the development of the Empire's natural resources is inseparably connected with that of its water-powers.

(5) That the development of such enormous possibilities should not be left to chance, but should be carried out under the guidance of some competent authority.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

THE Institution of Naval Architects' Scholarship for 1918 has been awarded by the Council to Mr. H. W. Nicholls, of Chatham Dockyard. The scholarship is of the value of 100*l.* per annum, and is tenable for three years.

A COPY of the calendar for the session 1918-19 of the McGill University, Montreal, has been received. Its 377 pages give very full details of the varied courses of instruction provided, not only for graduation in the more ordinary university faculties, but also for non-graduate students desiring to study other branches of learning. It is possible here to refer only to a few of the expedients adopted to assist needy students of ability. Particulars are given of loan funds which have been established for the purpose of aiding students who, upon the completion of their second or later year's work, require assistance to enable them to finish their course of study. Satisfactory arrangements are made to secure the eventual repayment of the loans. The provision of scholarships, exhibitions, and prizes is on a generous scale, and the needs of every class of student seem to have been thought of, and means taken to give due recognition to excellence in whatever line of work has been followed.

THE prospectus of the University courses in the Municipal College of Technology, Manchester, for the forthcoming session describes fully the facilities which the college offers for systematic training in the principles of science and art as applied to mechanical, electrical, municipal, and sanitary engineering, as well as to architecture, the building trades, the chemical and textile industries, and to photography and the printing crafts. Not only does the college provide the necessary courses for students who desire to graduate in the faculty of technology, but it caters liberally for more advanced study and research. A new degree of Doctor of Philosophy has been instituted with the object of encouraging research among suitable graduates from approved universities. It is interesting to note in this connection that the governing body of the college is prepared to award a limited number of research scholarships in technology, each of a value not exceeding 100*l.* The prospectus gives full particulars also with regard to the entrance scholarships available at the college.

A NEW departure is announced by the Royal School of Mines, which is now a constituent part of the Imperial College of Science and Technology, in the institution of a new associateship of the school in mining geology. The curriculum has been designed under the guidance of a number of the leaders of the mining world in England, who constitute the advisory committee of the school, and also in consultation with many successful mining geologists and mining engineers. The students receive, in the subjects essential to them, the same training as the regular mining students of the school, comprising, for example, surveying, principles of mining, exploitation of mines, and mine sampling and valuation, but in addition they spend practically an entire year on the branches of geology and mineralogy specially applicable to mining, concerning which much knowledge has been acquired and published in recent years. In addition to a grounding in the necessary parts of mineralogy and petrology, special attention is devoted to structural, stratigraphical, engineering, and mining geology. The course is an eminently practical one, and comprises work in the laboratory and in the field, the latter including not only instruction and practice in geological surveying, but also a series of visits

under guidance in order to study areas chosen as illustrating different types of mineral deposits. The course has also been so arranged that it can be taken in a post-graduate year by those who have already completed the associateship in the subjects of mining.

THE main heads of the School Teachers' Superannuation Bill, which Mr. Fisher hopes to introduce in the House of Commons in the autumn, have been published as a Parliamentary paper (Cd. 9141). The Bill will bring within one comprehensive system of State pensions, on a non-contributory basis, both certificated and uncertificated teachers in elementary schools, as well as the teachers in all other schools aided by the Board of Education, including those training colleges which are not departments of universities. The benefits will consist of annuities, together with lump sums, for those who retire at the age of sixty or later after thirty years of service, and for those who retire disabled after ten years' service; and of gratuities payable on the death of a teacher in service after five years of service. No difference will be made between the sexes in the conditions of pension, except that in order to provide for women teachers leaving the profession to be married and afterwards returning to it, provision is made for the substitution of twenty years' service for thirty as a condition of pension in such cases. Pension service will, as a rule, cease at sixty-five. Service to be pensionable must be full-time service in schools which are grant-aided at the time of service, or in secondary schools which, though not grant-aided at the time, become grant-aided within five years of the passing of the Bill. Power is reserved to the Board of Education, however, to reckon as pensionable service a limited amount of service in certain other schools rendered before the commencement of the operation of the Bill. Other matters dealt with in the Bill include medical examination for future teachers before admission to recognised service and the power to withhold or reduce benefits in case of misconduct.

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, August 12.—M. P. Painlevé in the chair.—J. Boussinesq: Confirmation of the principle of the approximate theory of punching for a thick block.—G. Bigourdan: The observatories of the Harcourt College, to-day the Lycée Saint-Louis.—H. Douvillé: The strata containing Orbitoids in North America.—E. Ariès: The saturated vapour pressures of bodies containing a large number of atoms in the molecule. The formulæ developed in previous papers for substances containing from one to eight atoms in the molecule are now applied to pentane, hexane, heptane, and octane, and the calculated vapour pressures compared with the experimental results of Young and of Young and Thomas.—J. Comas-Solà: Stereoscopic studies of stellar currents. Two pairs of negatives, taken 1912-18 and 1916-18, have been examined by the stereoscopic method, and show that for stars of the first ten magnitudes a proper motion in the form of a current is general.—G. Fayet: The third appearance of the periodic Borrelly comet. This was seen at Nice on August 6-7.—M. Baillaud: Note on the same. Positions given for August 7 and 10.—R. Combes: The immunity of plants with regard to the immediate principles which they elaborate. The saponine of *Agrostemma githago* (agrostemma-saponine) in concentration as low as 1:10,000 behaves as a poisonous substance for the roots of plants not producing this glucoside (pea, buckwheat, radish), but exerts no toxic action even with a much higher

concentration, 1:100, on the roots of *Agrostemma githago*.—J. Dumont: The aqueous reserves of the soil in periods of drought. Determinations of moisture in soil after drought were made at depths from 0 to 80 cm. from the surface, and for different crops with and without manure.—F. Maignon: The influence of fats on the toxic power of the food proteins: their rôle in the utilisation of nitrogenous materials. Applications to therapeutics.

SYDNEY.

Royal Society of New South Wales, June 5.—Mr. W. S. Dun, president, in the chair.—C. D. Gillies: The spine mode of *Centropyxis aculeata*, Stein. Material for the investigation of the spine variation in the test of this Rhizopod was obtained from six different localities in Queensland. It was found that the spine-frequency polygons were unimodal, and that the empirical mode varied from 3-5. From May, 1916, to December, 1917, material was collected at monthly intervals from the Brisbane Botanic Gardens. The modal value of the polygons was 3, hence for this locality the mode is a constant.—R. W. Chalinor, E. Cheel, and A. R. Penfold: A new species of *Leptospermum* and its essential oil. From evidence accumulated over a period of six or seven years, including the cultivation of a number of plants and the chemical investigation of the essential oil, which is shown to consist principally of the two aldehydes, citral and citronellal, the authors have proved that at least one more of our native tea-trees is new to science, and give the name *Leptospermum citratum* to this new species.—C. Laseron: Notes on some Permo-Carboniferous Fenestellidæ, with description of new species. The fossil polyzoa of Australia, though abundant in many formations, are as yet but little known, and this paper deals with ten more or less common forms in the Permo-Carboniferous rocks, mostly in the Hunter River district. Six new species and several old types are described.

July 3.—Mr. W. S. Dun, president, in the chair.—J. H. Maiden: A contribution to a history of the Royal Society of New South Wales. The earliest recorded effort to form an improvement society was in the year 1818, when Judge-Advocate Wyld's attempt to form an agricultural society failed because Governor Macquarie demanded the admission of emancipists. In December, 1821, Governor Brisbane formed a scientific club under the name of the Philosophical Society of Australasia. Some of the papers read were printed by Barron Field, while the bronze plate at Kurnell celebrates the foundation of this society and the jubilee of Capt. Cook's visit. This was succeeded by the agricultural society in the following year, which also became a horticultural society in 1826. The author showed the direct descent of the Royal Society of New South Wales from the Australian Philosophical Society, founded January 19, 1850. On July 30, 1855, it was resuscitated under the name Philosophical Society of New South Wales, and received its present title on December 12, 1866.—Prof. H. S. Carslaw: Note on the theory of a simple progressive tax, and its bearing on the Federal income-tax schedules. This paper dealt with the system of tax in which the amounts paid on each successive pound form an arithmetical progression, and incidentally showed that without material change in the incidence of the tax such a system could be substituted for the complicated schedules of the Federal Income-Tax Acts.

MELBOURNE.

Royal Society of Victoria, June 13.—Mr. J. A. Kershaw, president, in the chair.—J. T. Jatton: The sand ridges, rock floors, and other associated features at Goon-