the Federal or State Governments or commercial establishments; another duty is to appoint committees for fixing standard methods of chemical analysis, for the publication of memoirs or bulletins, and for the standardisation of fees for professional work. It is intended to apply for a charter for the institute. A number of the professorial and professional chemists in Australia are fellows of the Institute of Chemistry of Great Britain and Ireland, and probably one of the principal reasons for forming a similar institute in Australia is in consequence of the difficulties connected with the holding of the former's examinations in Australia, due to the great distance and other causes now increased by the war.

CHILD-STUDY AND EDUCATION.[1]

THE special merit of the "Memorandum on the Educational Principles upon which should be based all Future School Reform" is that it dwells on the need for basing education upon a true theory of child-nature. It consists of an introduction by Prof. Adams, five sections written by "experts," and a series of "recommendations." All who are interested in educational progress should urge these "recommendations" on education authorities.

From the title one might suppose that these "principles" have been stated once for all by the council of the society. Fortunately this is not so. In the recommendations we find two "principles" only, viz. that reform must be based on knowledge, and that knowledge must be obtained through real investigation.

The suggestions as to how additional data are to be sought are both wise and practical, though there is much that is unscientific and altogether out of place in sections 3 and 4, which, as Prof. Adams puts it, "have the special merit of correlating age and advancement," and he adds that teachers will read with some eagerness what the experts have to say on this. But, in this memorandum, "merit" should be replaced by "*de*merit." If there were such a correlation, the only way to improve education would be to extend the period of pupil-age. The basis of the memorandum is that there is no such correlation—that with a truer psychology, intelligence and knowledge will be greater at a given age. Naturally, then, no trace of these excrescent sections appears in the "recommendations."

The memorandum is called for. There is considerable evidence that, under the influence of traditional beliefs, we are to-day perpetuating mistakes in education no less serious than those in medicine before Pasteur's discoveries overthrew the traditional wisdom of physicians. One instance may here be given. The writer knows of a boy, three years eight months old, who, never having *lessons*, has been brought up in an environment providing as free and full opportunity for mental as for physical development. At two he did the Montessori exercises with ease and accuracy when presented to him, and did not care to repeat them more than once or twice. At two and a half his guardian wrote:—"He has a scrupulous sense of order, great carefulness, and a deft handling of everything he touches. He is allowed to explore and handle everything he wishes, even the most delicate articles, merely enjoining on him to be very careful," and more in the same strain, and he scarcely ever broke anything. Later, at three and a half:—"Whenever he sees anything new to him, he at once wants to know its name and all about it; he is quick to observe the different leaf buds on the trees, and can distinguish and name many trees by their buds alone; sometimes he will bring in a little branch, run to our 'Nature-book,' and compare it with the pictures, finding out which it is for himself. He is also full of interest in birds and knows twenty different kinds by name," and so on. This child has been remarkably free from ailments, as have been all the other children whom the writer can trace who have been brought up in this way, being allowed the free choice of mental as well as of physical occupations; treated always as intelligent, but never forced to mental exertion. And we find among the products of this method great *old* men such as Lord Kelvin.

This is the method indicated by Nature. The brain of the very young child is proportionately far more developed than any other part of his physical system; why should we assume that it is the part to be given the least opportunity for early growth and development through the exercise of the activities peculiar to it? As in such matters experience is the only guide, the writer would be very glad if those who have trustworthy data on the question of early education would communicate with him at Trinity College, Dublin.

E. P. CULVERWELL.

[1] Published by the Child-Study Society, 90 Buckingham Palace Road, London, S.W.1. Price 4*d*. post free.

THE HYDRAULIC RESOURCES OF FRANCE.

IN view of the partial dependence of France on other sources for her coal supplies, the question of utilising water-power becomes an increasingly vital factor in her economic development. Considerable interest therefore attaches to an article appearing in *La Nature* for June 23, which incidentally furnishes also a comparison with the resources of other countries in this respect. Various computations have been made as regards France; one made in 1911 places her resources at 9,200,000 horse-power of water-power available for a minimum of 180 days in the year. This is against Norway's 7,500,000 h.p., Sweden's 6,750,000 h.p., Austria-Hungary's 6,450,000 h.p., Italy's 5,500,000 h.p., Spain's 5,000,000 h.p., Switzerland's 1,500,000 h.p., Germany's 1,425,500 h.p., and Great Britain's 396,000 h.p. In this connection Norway's available supply is 36·60 h.p. per square kilometre of area, that of Sweden 20 h.p., of Austria-Hungary 19·46 h.p., Spain and Italy 10 h.p. each, England and Germany 2 to 3 h.p. each. France's resources, according to recent estimates, are about 25 h.p. for the same area. The quantity of water available in the Alpine regions alone of France represents about 4,000,000 h.p.

The value of the water-power resources of France has long been recognised, and while she has utilised them to a greater extent than certain other European countries have theirs, about nine-tenths are still unharnessed. Germany, on the other hand, though rich in coal, has utilised about 31 per cent. of her available supply of water-power.

Contrary to expectations, the war, instead of relaxing attempts to employ water for power-raising in France, has greatly stimulated activity in this direction, in spite of dearth of labour and materials. The article gives interesting details of plants already completed or in course of erection.

Much is hoped for by utilising barrage water at high pressures; especially is this the case in respect of the electrometallurgical and electrochemical industries, which are sure to develop when new works come into existence and more experience is gained.

France's annual requirements of coal are estimated in the near future to be thirty million tons per annum, and as prices are likely to increase considerably, the author's plea for the extended applications of water-power is justifiable. He asks what this 9,000,000 h.p. of available "white coal" represents in terms of

ordinary coal. According to calculations which were made at one time by M. Loucher, each horse-power-hour produced on a locomotive is equivalent to a consumption of 2·5 kilos. of coal. Consequently, the water-power yet to be utilised represents 20,000 tons of coal per hour, or, say, 180,000,000 tons per annum.

The author admits, of course, that certain industries cannot dispense with coal, but suggests the use of hydro-electric power wherever applicable. Railways such as the Midi, the Paris-Lyons-Mediterranean, and the greater part of the Orleans should be electrified. Large cities, like Paris, should follow the example of Lyons. He pictures the advantages to Parisians in respect of suburban transit, their industries, and lighting, had the Rhone barrage at Genissiat been completed before the war.

Certain trades, as has been said, can dispense with coal if electric power is available, such as the textile, chemical, and paper trades. Metallurgy, glass-making, pottery, and zinc refining use up enormous quantities of coal. But this state of things will not always persist; synthetic pig-iron will one day replace the present commodity; the electrometallurgy of zinc is now a practical proposition; the ceramic art is capable of modernisation; and electric bakeries are not merely utopian.

In addition to being a source of heat, "white coal" is also a source of cold; low temperatures are necessary for obtaining synthetic nitrogenous products, cyanamide, electrolytic potassium and permanganate—substances which could, under the new *régime*, be produced cheaply in France. Further, "white coal" would help agriculture, not only by providing manures, nitrates, and cyanamides, but for driving tractors, lighting farms, irrigating pasture land, working pumps, ventilators, drying plants, separators—and in a host of other ways. E. S. HODGSON.

ETHNOLOGICAL WORK IN QUEENSLAND.

IN vol. xxix., part i., of the Proceedings of the Royal Society of Queensland, the president, Dr. R. Hamlyn Harris, under the title of "Some Anthropological Considerations of Queensland and the History of its Ethnography," supplies an interesting review, with a full bibliography, of the ethnological work which has been done in the State. In 1914, at Talgai, on the Darling Downs, a skull was found in a river deposit in which remains of Diprotodon and other extinct marsupials had already been discovered. The geological evidence is not quite satisfactory, but there are some reasons for believing that it belongs to the Pliocene period. Dr. G. A. Smith, of Sydney University, believes that it is the skull of a young Proto-Australian which is practically indistinguishable from that of a present-day native. It shows a very primitive facial skeleton, the jaw and teeth of which display remarkable features, even more primitive than those hitherto described in any human skull, except in Piltdown. In particular are noticeable the great squareness and enormous size of the palate and teeth, and the semi-anthropoid nature of the articulation of the upper canines with their mandibular opponents. In the same neighbourhood, in 1906, a couple of rough implements of Palæolithic type were unearthed.

In the same paper Dr. Hamlyn Harris discusses some other interesting questions. The principal centre of mummification in Queensland was on the east coast, around Cairns and the Johnstone river, extending in a southerly direction. This singularly restricted area suggests that the habit of mummification was not introduced from Malaysia, nor *viâ* Cape York, but that it was brought from the far islands of Torres Straits by natives who were carried on to the north-eastern coast of Queensland, more or less by chance. This in some measure corroborates the views of Prof. Elliot Smith, who suggests the Cape York Peninsula, *viâ* Torres Straits, as the hypothetical route in the migrations of the culture bearers who were responsible for the diffusion of the "heliolithic culture complex." Dr. Hamlyn Harris suggests that in geological times Australia was in land connection with Asia, not only with New Guinea, but probably also with Timor, and certain Queensland birds and animals are more closely allied to Asiatic than to Papuan species. He fully accepts the conclusion of Dr. Rivers and Prof. Elliot Smith that the oceanic cultures have been mainly derived from contact with other races. Mornington Island, on the Gulf of Carpentaria, preserves an almost unique example of Australian aboriginal culture which has not been affected by foreign influences.

THE SOILS OF HAWAII.

THE island of Hawaii is the largest of the group of Sandwich Islands, which were formally annexed to the United States in 1898. It is mountainous and volcanic, and the soil is highly productive; sugar and pineapples are the staple industries, but coffee, honey, hides, sisal, bananas, rice, wool, cotton, and rubber are also exported. As usual with American possessions, a strong agricultural experiment station has been developed; in this particular case the work was done under the auspices of the Sugar Planters' Association. The director, Dr. H. P. Agee, and the staff have carried out some excellent investigations on the problems connected with the local agriculture. The latest publication is by the chemist, Mr. P. S. Burgess, and deals with the soils of the island. These are of special interest because they are of volcanic origin, and are situated in a different climatic zone from our own, so that they differ in many respects from the ordinary soils of Great Britain or America, especially in their large content of oxides of iron and aluminium, and their small content of silica. Thus the average of a number of analyses is :—

	Fe_2O_3	Al_2O_3	SiO_2
Hawaiian soils ...	28·0	20·7	32·6 per cent.
American soils ...	3·8	5·1	85·5 ,, ,,

The soils to which we are accustomed have been formed in such a way that their chief constituent is insoluble silica or silicates; the Hawaiian soils, on the other hand, contain large quantities of iron and aluminium oxides; they are known as laterites; other instances occur in Java. This difference in composition especially affects the finest grade of material, the clay, which in the Hawaiian soils consists mainly of iron and aluminium oxides, while in the soils of temperate zones it consists chiefly of silicates. In consequence the behaviour to water is profoundly modified, and the hygroscopic coefficients and other constants are quite different from those obtained on normal soils.

Bacteriological investigations have been put in hand, but, as usual with American stations, the work is mainly concerned with the amount of decomposition effected by the organisms, and not with the organisms themselves. The results suggest that a detailed comparison of typical organisms would be of considerable interest.

So far as we know, the Hawaiian Sugar Planters' Experiment Station is the only station issuing English bulletins which has the opportunity of fully investigating laterite soils. It has, therefore, an unusually good range of problems. There can be little doubt that a detailed comparison of these soils with typical soils of the eastern seaboard of the United States would throw much light on the problems of soil chemistry and soil physics. E. J. R.