

for more than ten degrees of longitude, certainly for about half the debated region between Knox and Kemp's Lands, and perhaps for the whole. At least, for the actual determination of the westerly tract, observations are now at hand by which light may be shed on the specified question. An important factor is the steep fall of the land down to a deep sea discovered by us; important, also, is the structure of the land, which consists of old crystalline rocks; lastly, it is important to find that this margin of the continent is occupied by a volcanic formation the lavas of which contain molten gneisses which have been forced up with them from the bed-rock.

The inland ice covering the continent presents a picture of our former Ice age, and is undoubtedly the vastest Glacial area now existing. Yet it was still more extensive in former times, as shown by traces on the Gaussberg.

To this continent we directed our operations, and endeavoured to study all the phenomena presented by it. In the biological field, these studies ranged with Prof. Dr. Vanhöffen from the large marine mammals and the flocks of rare birds on the seaboard, through the numerous species of the smaller marine fauna to the bacteria which Dr. Gazert was able to detect, if not in the Glacial sea itself, at least in its organisms, as well as in the rookeries of the stormy petrels on the Gaussberg, and in its few lichens and mosses. On the physical side, our observations extended from Dr. Philippi's studies of the Gaussberg lavas and of the continental boulders borne to great distances by the ice, through the numerous properties of the Glacial sea and of the Glacial formations by myself, up to determinations of the force of gravity, and to Dr. Bidlingmaier's determinations of the most delicate oscillations of the terrestrial magnetic forces, both in their normal periodicity and in their stormy perturbations, such as are displayed especially during the appearance of the southern auroras.

But should anyone doubt that we there lived and worked in a new region on the fringe of the south polar continent, conviction will be afforded by the climate. In the north we left behind us the zone of west winds and crossed a trough of low barometric pressure, remaining on its southern slope, where the pressure again rises to a maximum over the continent. Hence the prevalence of the easterly winds, which sweep down from the south over the vast uniform and but slightly inclined surfaces of the inland ice, and appear on the seaboard as easterly, Föhn-like gales.

These gales impart to the south polar region its character and its limits; by their frequency and uniformity they reveal the immensity and the homogeneous nature of those Antarctic lands. Their northern confines may have some importance for practical navigation whenever there is a question of circumnavigating the zone of the Austral west winds.

EDUCATION IN INDIA.

THE promulgation of an elaborate and comprehensive State document by the Home Department of India, already referred to in NATURE (April 7, p. 550), exhaustively reviewing the subject of education in all its branches and laying down the policy adopted by the Government in regard to each, and the recent passing of the Universities Act in the Viceroy's Legislative Council in India, naturally direct attention to the efforts being made in the Indian part of our Empire to place every grade of education upon a satisfactory basis. The various stages in the agitation which preceded the adoption of the Universities Bill by the Legislative Council have already been referred to on several occasions in these columns. In the following brief summary of the distinguishing characters of each of these efforts to advance education in India, continual reference has been made to the columns of the *Pioneer Mail* of Allahabad.

First to deal with the official minute with which Lord Curzon is naturally conspicuously associated. We find the system of public instruction in India includes five universities, those of Calcutta, Bombay, Madras, the Punjab, and Allahabad, which prescribe courses of study and examine the students of affiliated colleges. These colleges are widely scattered throughout the country, and number in all 191

(exclusive of some colleges outside British India, which are not incorporated in the provincial statistics), with 23,000 students on the rolls. In them provision is made for studies in arts and Oriental learning, and for professional courses of law, medicine, engineering, teaching and agriculture. Below the colleges are secondary schools, to the number of 5493, with an attendance of 558,378 scholars, and primary schools numbering 98,538, with 3,268,726 pupils. Including private institutions, there are about 4½ million scholars, maintained at a cost of 400 lakhs, of which nearly one-half is derived from public funds. The total grants from public funds fall short of 1,300,000l. a year, and the extension and improvement of education in India are chiefly a matter of increased expenditure.

In India, far more than in England, the majority of students who frequent the higher schools and the universities are there for the purpose of qualifying themselves to earn an independent livelihood; Government service is regarded by the educated classes as the most assured, the most dignified, and the most attractive of all careers. It is, however, justly complained by competent authorities that higher education is too much pursued with a view to Government service, that excessive prominence is given to examinations, that studies are too literary in character, that the memory is trained rather than the intelligence, and that in the pursuit of English education the vernaculars are neglected, and so fail to become the vehicles for the diffusion of western knowledge among the masses. But it is clear from the minute that the Government of India holds that the multiplication of competitive tests for Government service neither results in advantage to Government nor is consistent with the highest interests of a liberal education. In fixing the educational standards which qualify for appointments, it is stated that the natural divisions of primary, secondary, and university education should be followed. School and college certificates of proficiency should, so far as possible, be accepted as full evidence of educational qualifications, and due weight should be attached to the recorded opinions of collegiate and school authorities regarding the proficiency and conduct of candidates during their period of tuition. The questions as to what subjects should be taught and by what means proficiency in them should be tested are considered as a part of the larger problem of the true object of secondary education. The Government of India thinks that the solution of the difficulty will be found in adapting to Indian conditions the system of leaving examinations, held at the conclusion of the secondary course, which has been tried with success in other countries.

Referring to technical education, the minute points out that the first call for fresh effort is toward the development of Indian industries. Technical instruction directed to this object must rest upon the basis of a preliminary general education of a practical kind, which should, as a rule, be imparted in schools of the ordinary type. In fixing the aim of the technical schools, the expansion of the existing Indian markets is of superior importance to the creation of new export trades. As a step towards providing men qualified to take a leading part in the improvement of Indian industries, the Government of India has determined to give assistance in the form of scholarships to selected students to enable them to pursue a course of technical education under supervision in Europe or America. The Government hopes that the technical schools of India may in time produce a regular supply of young men qualified to take advantage of such facilities, and that the goodwill and interest of the commercial community may be enlisted in the selection of industries to be studied, in finding the most suitable students for foreign training, and in turning their attainments to practical account upon their return.

Agricultural education in India is then passed in review. India possesses no institution capable of imparting a complete agricultural education. The existing schools and colleges have neither produced scientific experts nor succeeded in attracting members of the land-holding classes to qualify themselves as practical agriculturists. Both of these defects must be supplied before any real progress can be expected. In the first place an organisation must be created by which men qualified to carry on the work of research, and to raise the standard of teaching, can be trained in India itself. The Government of India has therefore under its consideration a scheme for the establishment

of an Imperial Agricultural College in connection with an Experimental Farm and Research Laboratory, to be carried on under the general direction of the Inspector-General of Agriculture, at which it is intended to provide a thorough training in all branches of agricultural science, combined with constant practice in farming work and estate management (see p. 564). There will be courses of instruction extending to five years, which will qualify men to fill posts in the Department of Agriculture itself, such as those of assistant directors, research experts, superintendents of farms, professors, teachers, and managers of encumbered estates.

In conclusion the Governor-General in Council states in the minute that the system of education thus extended makes provision in varying degrees for all forms of intellectual activity that appeal to a civilised community. It seeks to satisfy the aspirations of students in the domains of learning and research; it supplies the Government with a succession of upright and intelligent public servants; it trains workers in every branch of commercial enterprise that has made good its footing in India; it attempts to develop the resources of the country and to stimulate and improve indigenous arts and industries; it offers to all classes of society a training suited to their position in life; and for these ends it is organised on lines which admit of indefinite expansion as the demand for education grows and public funds or private liberality afford a larger measure of support. It rests with the people themselves to make a wise use of the opportunities that are offered to them, and to realise that education in the true sense means something more than the acquisition of so much positive knowledge, something higher than the mere passing of examinations, that it aims at the progressive and orderly development of all the faculties of the mind, that it should form character and teach right conduct—that it is, in fact, a preparation for the business of life.

The aspirations of the Government of India, so far as university education in particular is concerned, may be gathered both from the minute already referred to and from the Viceroy's speech at the meeting of his Legislative Council on the occasion of the passing of the Universities Act. The minute points out that it has been realised in India that universities which are merely examining bodies tend to accentuate the defects of the Indian intellect—the disproportionate development of the memory and the incapacity to observe and appreciate facts. It is proposed to reconstitute the unwieldy senates of the universities, and to define and regulate the position and powers of the syndicates. The universities are to be empowered to provide teaching, while collegiate teaching will be tested by inspection in addition to examination, and a higher educational standard will be enforced from collegiate colleges. Government is prepared to afford liberal financial aid to enable universities to adapt themselves to the new conditions, and it is hoped that such aid may stimulate private beneficence.

Lord Curzon, in his speech to the Legislative Council, said that the fact that the Government had taken the power of the last word in the entire programme of reconstruction of Indian universities is the best guarantee that the programme will not be inoperative, though he regretted that the Government is compelled to be so dominant a factor in the settlement of Indian problems. But, he continued, if the Government had not taken up this particular problem of higher education, who would have done it? and if the Government had not made itself responsible for seeing it through, who could give any guarantee that it would not have proved abortive? It is quite likely, said the Viceroy later, that the senates and syndicates of the universities of India will be perfectly competent to stand by themselves and will make no mistakes, but if not, and until they are created, the matter must necessarily be in doubt, and the Government must, in common prudence, retain the power.

It is consequently clear enough that the improvement of education in India in the immediate future is now fully assured, and it may be expected with confidence that the result of this development will in our eastern empire be identical with that in other countries, viz. an increased prosperity and national well-being.

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PLATING UPON ALUMINIUM.

MANY attempts to plate other metals upon aluminium have been tried, but although apparent success has—for a short time—attended some of these efforts, the film of metal plated on has not been of such a nature as to stand wear or rough usage. Messrs. C. F. Burgess and Carl Hambuechen publish a new method in the March number of *Electrochemical Industry*. The difficulty of plating on aluminium is generally, and probably correctly, attributed to the invisible film which forms upon that metal when exposed to air. Therefore most of the methods previously described depend upon the removal (or attempted removal) of this film by means of solvents, such as acids or alkaline hydroxides, and the rapid transference from the pickling to the plating bath.

An ideal method would be to plate in a bath containing some substance which would dissolve off the film of oxide from the aluminium and thus leave it clean for the deposition of the metallic film. Messrs. Burgess and Hambuechen find that the presence in the bath of soluble fluorides, such as sodium or ammonium fluoride, or preferably a small quantity of free hydrofluoric acid, dissolve off or prevent this film formation.

The next important point is to plate as a base metal, upon the aluminium, one which will adhere tenaciously to its surface, or partially alloy with it. Zinc appears to possess this property of adhesion to a high degree.

The method of procedure is first to clean the aluminium by immersion for a few minutes in a bath of hydrofluoric acid; this produces a suitable roughening of the surface; the adhesion to a perfectly polished surface is not satisfactory. On removal from this bath the aluminium is rinsed in running water, dipped for a few seconds in a bath consisting of a mixture of sulphuric acid 100 parts and nitric acid 75 parts, again rinsed in water, and placed in the plating bath.

The plating bath consists of a mixture of zinc and aluminium sulphates, which is very slightly acidified, and contains about 1 per cent. of hydrofluoric acid and an equivalent amount of potassium fluoride. After the deposition has continued for a few minutes with a current density of 10 to 20 amperes per square foot the article is taken from the bath, washed and dried. Other metals, such as copper or silver, may now be deposited upon the zinc coating, using the ordinary precautions commonly observed in the deposition of such metals upon zinc.

If gold is to be deposited upon it, it is necessary first to plate on a thin coating of copper, otherwise in a short time the gold sinks into the zinc and in a few weeks almost disappears.

The authors do not state whether aluminium coated with zinc can be readily soldered, but probably there would be no difficulty in doing this.

F. M. P.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

WE learn from *Science* that Mr. John D. Rockefeller has given 100,000*l.* to the Johns Hopkins Hospital, in order that the work of the institution may not be curtailed owing to the losses from the recent Baltimore fire. The Maryland Legislature has voted 5000*l.* annually for two years to the Johns Hopkins University. By the will of Mrs. Farnham, widow of the late Prof. Henry Farnham, Yale University receives 10,500*l.* for the endowment fund of the medical school and 7900*l.* for the endowment fund for the library.

It is announced in *Science* that the Assembly has passed a Bill appropriating 50,000*l.* for the New York State College of Agriculture at Cornell University; that President C. E. Miller, of Heidelberg University, Tiffin, Ohio, has secured pledges to the amount of 30,000*l.* for the fuller equipment of this university, 10,000*l.* of this amount to be expended in buildings, and 20,000*l.* to be added to the permanent endowment; and that Mr. Andrew Carnegie has given 6000*l.* to Berea College in Kentucky.

At a recent meeting of the New York section of the American Chemical Society a discussion on the training