

THURSDAY DECEMBER 5, 1895.

THE ORGANISATION OF SCIENCE.

AS we are accustomed in this country to look on the *Times* as a political barometer, the appearance in it of the very admirable article to which we drew attention last week must be regarded as proof that the exigency of the situation in which the nation is placed is likely soon to attract some share of the attention it imperatively demands. And the question arises how we may best secure that "scientific organisation in the field, in the workshop, in the laboratory, and in the conduct of national policy" which the *Times* so fully and justly recognises to be essential to our national safety.

It is just twenty years since the Royal Commission on Scientific Instruction and the Advancement of Science, presided over by the Duke of Devonshire—father of the present Duke—issued their final report in which they emphatically recommended the appointment of a Ministry and Council of Science. The report is full of evidence of a most convincing character, given by witnesses of the greatest eminence and wide experience; and when we recollect that it was signed by such men as the late Duke of Devonshire, Lord Lansdowne, Huxley, Sharpey, Henry Smith, Stokes, Bernhard Samuelson and Lubbock, it is more than surprising that its provisions should have been so completely neglected. In point of fact, and most unfortunately, nothing has yet been done to bring the State thoroughly into touch with science, and to lead it to regularly avail itself on all possible occasions of the services of qualified scientific advisers.

Had such a Council been called into existence, it would undoubtedly have operated in two ways. In the first place, its members would inevitably have had their attention drawn to public affairs, and the narrowness of purview which too often characterises the work and thoughts of men devoted to science, as well as of business men, would have given place to broad conceptions of civil duty, so that an ever-widening influence would have been secured to them. On the other hand, by gradually bringing about the introduction of scientific methods of regarding and treating State problems, they would have conferred inestimable service on the nation, and the growth of a system of rational statesmanship would have been encouraged. We are indeed able to form an effective estimate of what might have been the result of their labours—for, having commenced to organise our public service at about the same time, and pursued similar methods, we should not improbably have attained to a position comparable with that in which the Japanese appear now to be placed.

It would certainly have been impossible for the minister at the head of our educational affairs to gravely argue in 1895 in favour of granting to a small group of irresponsible individuals a post-card veto on the finding of a Statutory Commission, which his Government are begged to appoint to finally adjust the claims of the various parties concerned in the foundation of a University in London. Nay more, our minister would have been in a

position to say that sheer force of circumstances compelled him to recognise that it was of the utmost national importance to immediately secure the effective organisation of all the higher educational interests of the capital of the empire—indeed, our Government would long since, at the instigation of its scientific council, have taken the matter into its own hands, and have brought about such organisation, instead of requiring to be positively compelled to act.

The existence of such a national council of scientific advisers—the words are used intentionally, as we are thinking of a council of men scientifically trained and of proved ability and originality—would infallibly have exercised a most potent influence on public opinion: in forming it and educating it. It would have spread abroad the spirit of inquiry by making it operative in every branch of the public service. The manufacture of red-tape would have fallen into oblivion instead of that of aniline dyes; agriculture would have been cared for, as it would have been foreseen that the lowering of freights, consequent on improvements in shipbuilding and the introduction of steam, made it necessary to relinquish wheat-growing into the hands of those who can command cheap labour and constant sunshine; and probably we should have learnt to make butter and grow onions at home.

Each of our public departments would have had a scientific staff, charged not merely with the duty of carrying out its routine work, but also expected to contribute to the growth of scientific knowledge, in order both to maintain touch with the outside world, and preserve and extend their interest in the subjects with which they were concerned. Only those can institute progress who themselves progress, and it is clear that this was fully recognised to be the case by the Duke of Devonshire's Commission, as it is stated in so many words in the report, that there was a general concurrence of opinion that, even in the interests of the Government Departments themselves, more ought to be done by the Government in the way of investigation.

The condition of our public service in these respects is nothing less than deplorable, and yet, when the example set by Kew—which, during many years past, has always been in the hands of highly-qualified scientific administrators—is taken into account, the advantages to be derived are so obvious. Where are the scientific men connected with our great departments of national defence in evidence? Most important researches on explosives have issued from Woolwich in days gone by; and Froude's great work under the Admiralty was epoch-making. What is being done at the schools where naval and military officers are being trained to make an atmosphere of research not only possible but essential? And when we pass to our colossal Indian empire, what is being done there to encourage the growth of the scientific spirit among those concerned in the administration of its affairs? We believe that at the present moment there is but a single agricultural expert available for the whole of India, and yet agriculture is the one industry on which the country is practically dependent. Why is engineering considered to be the only branch of science worthy of introduction into the public service?

As the present President of the British Association

said in his evidence to the Duke of Devonshire's Commission, "Our statesmen do not appreciate properly the value of scientific advice or scientific inquiry, and they are very much fonder of experiments made upon a large scale with no defined system, than they are of experiments which have been brought out as the result of a carefully studied previous inquiry." This is as true now as it was twenty years ago, and probably many hundreds of millions which might have been gained have been sacrificed in consequence.

The *Times* pointed out last week that, on his first appearance as Member for Foreign Affairs, M. Berthelot asked for money for the establishment of six new consulates in China. M. Berthelot may be properly described as the most original living chemist; he is certainly also the most prolific in ideas. As his Government will probably soon be thrown out in the natural course of affairs French, it might be well for us to consider whether a man who is capable of conceiving so daring an idea immediately on entering into political office might not—although a member of a class considered incapable of governing in this country—be invited over here to leaven our public service.

Reflections such as these should, however, give food for thought, not only to men of affairs, but also to those who are engaged in scientific work, and should lead the latter to ask themselves whether they are doing their duty in all respects—and this is especially the case at a time when we are seeking to appraise the value of Huxley's labours. Important as was his scientific work, and much as we are disposed to agree with Mr. Balfour as to the inestimable public service he rendered in making the doctrine of evolution plain and popular, the work he did in displaying the meaning of scientific method to people generally was, if possible, of even greater value. Yet how few follow his example—how few are prepared to be unselfish and to withdraw themselves from the fascination of their private investigations to labour in the cause which Huxley and also Kingsley made holy. If more had followed their example, we should now have far less cause to deplore the failure to apply scientific method in the public service which has led to the present break-down.

THE GROWTH OF THE BRAIN.

The Growth of the Brain. A Study of the Nervous System in Relation to Education. By H. H. Donaldson, Professor of Neurology in the University of Chicago. "Contemporary Science Series." (London: Walter Scott, 1895.)

THE "populariser" of science (who differs widely in kind from a Helmholtz or a Tyndall—the writers of popular science) labours under great disadvantages. He is compelled to give a scissors-and-paste account of the work done by other people in different departments, and to summarise a number of perfectly distinct monographs, omitting all the experimental evidence which alone gives value to the conclusions. He must not express any original criticism, and he usually has to bring in a moral. To say the best of it, he writes about science with an object, whereas science must be trodden for itself, like a Swiss mountain. It is a little sad to

think that neurology is going to have an object—judging from the essay before us. It will become the lumber-room for histological details, weight statistics, architectural dimensions, a little physiology—very little—and some educational cobwebs to weave them all together. But such a collection should at least be up to date at the time it is offered to the public. An account of "localisation of cerebral function," with no reference to Munk and Goltz, no suggestion that opinions differ as to the extent of localisation, or that the expression "sensory *vs* motor" (tracts), has previously been termed "misleading," no hint that in the absence of the higher centres, function may be taken on by the lower, in any less long-suffering animal than the "brainless frog," does not lead one to anticipate much neurological pabulum.

The account of nutrition, again, is very inadequate; cell diffusion is referred to in almost purely mechanical terms, with little reference to the physiological activity of the epithelium. "Thyroid feeding," too, is casually introduced in a foot-note, with a couple of references to medical journals. Yet Brown-Séguard's name is not unknown, and we have lately heard a good deal about "internal secretion." Nor is the account of metabolism in the nerve-fibre very satisfactory. We are told that "it is possible to assume that there are metabolic changes which have not yet been detected, or that the nerve impulse is not accompanied by such changes." And again: "Physiologists have been busy at the same time seeking to determine how far the passage of a nerve impulse along a fibre causes fatigue-changes in it"; (no conclusion given).

Another loose statement is to the effect that the beat of the heart is an example of the automaticity of the nervous system. How then does it come about that rhythmic contractility appears in the embryonic heart before the nervous system has been developed?

Weismann has been assimilated, and is written out large for the "growth period of races and nations": so that, as Prof. Donaldson says, "the germ-plasm wears the appearance of immortality."

But we look in vain for any reference to recent French studies in experimental psychology, in which there is a fund of suggestion for "the parent, the teacher, and the physician," who are to "seek light" from the "facts within these covers." The question of types of perception—and of memory—is one of the most interesting in modern educational psychology. Instances are being classified every day of the visual, or auditive, or motor temperament; and surely we all know which is the particular language of our own translation of experience? Yet Prof. Donaldson can only suggest that "it is now recognised that thought can be carried on in terms of the several senses. In this connection Fraser (*Am. J. of Psychol.*, 1892) has made an examination of certain philosophic writers, which indicate that particular writers, or schools, prefer sense-images of one mode in their speculative thought, and he suggests that much of the failure to be mutually comprehensible depends on the fact that tactual and visual images, for example, are by no means capable of being manipulated in the same manner, and hence that relations conceivable in the terms of one are often not so in those of the other. With the employment of one sort of mental image comes precision; but it is precision gained at the price of limitations. Fortunately