

THURSDAY, OCTOBER 21, 1915.

## SCIENCE IN NATIONAL AFFAIRS.

WE printed last week a valuable address by Prof. J. A. Fleming on "Science in the War and after the War." Though the address was an introductory lecture at University College, London, and was open to the public without fee or ticket, only the briefest mention of it appeared in the periodical Press, and the points of national importance dealt with in it were unrecorded, except in our columns, in which it was our privilege to publish the address almost in full. We understand, of course, that the demands made upon the space available in the daily papers are many and insistent, yet we should have supposed that during the progress of a war in which victory will depend as much upon science and machinery as upon men, a summary of some of the points made by a leading authority upon applied science would be of greater public interest and importance than much of the unsubstantial chatter with which we are supplied daily.

In the course of his address, Prof. Fleming himself supplied a reason for the neglect of scientific aspects of national affairs, in comparison with the attention given to the superficial views of politicians and other publicists. While success in science is measured solely by discovery of facts or relationships, in politics and public life generally it is secured by fluent speech and facile pen. In scientific work attention must be concentrated upon material fact, but the politician and the writer attach greater importance to persuasive words and phrases, and by their oratory or literary style are able to exert an influence upon public affairs altogether out of proportion to their position as determined by true standards of national value. Power, as regards government of the affairs of the nation, does not come from knowledge, but from dialectics: it is the lawyer who rules, with mind obsessed by the virtues of precedent and expediency, and to him men of science and inventors are but hewers of wood and drawers of water.

Under a democratic constitution it is perhaps too much to expect that Parliament will pay much attention to scientific men or methods; yet, as was shown in the debate upon the scheme for the institution of an advisory council of scientific and industrial research last May, the members of the House of Commons are ready to support plans for bringing science in closer connection with industry. The monies provided by Parlia-

ment for this purpose are to be under the control of a committee of the Privy Council, which will be advised by a council constituted of scientific and industrial experts. The scheme was conceived rightly enough, but when it passed into the hands of officials of the Board of Education much of its early promise was lost. Most people would regard it as essential that the executive officers of a council concerned with the promotion of industrial research should know what is done in this direction in other countries, and have sufficient knowledge of science and industry to formulate profitable schemes of work. The success of such a body depends largely upon the initiative of the secretary; and in an active and effective council we should expect him to be selected because of close acquaintance with problems of industrial development along scientific lines. But what is the position in this case? The scheme is issued by the President of the Board of Education, Mr. Arthur Henderson, a Labour member, who owes his post entirely to political exigencies, the secretary to the committee of the Privy Council is the Secretary of the Board, Sir Amherst Selby-Bigge, whose amiability is above reproach, but who knows no more of practical science and technology than a schoolboy, and the secretary of the Advisory Council is Dr. H. F. Heath, whose interests are similarly in other fields than those of science.

The belief that the expert—whether scientific or industrial—has to be controlled or guided by permanent officials having no special knowledge of the particular subject in hand is typical of our executive system. While such a state of things exists, most of the advantages of enlisting men of science for national services must remain unfulfilled. The various scientific committees which have been appointed recently have, we believe, been able to give valuable aid in connection with problems submitted to them, but they would be far more effective if the chiefs of the departments with which they are associated possessed a practical knowledge of scientific work and methods. Without such experience the executive is at the mercy of every assertive paradoxer and cannot discriminate between impracticable devices and the judgment of science upon them. While, therefore, the country has at its disposal the work—either voluntary or nearly so—of experts in all branches of applied science, it cannot use these services to the best advantage unless the departments concerned with them have scientific men among the permanent officials; and that is not the case at present.

The unbusinesslike methods of Government departments have received severe criticism lately, but nothing has been said about the unscientific method of appointing committees of experts without well-qualified officers to direct or co-ordinate their work. The reason is that, with scarcely an exception, no daily paper has anyone on its staff possessing the most elementary knowledge of the meaning of scientific research. Our guides and counsellors, both on the political platform and in the periodical Press, can scarcely be expected to interest themselves greatly in subjects beyond their mental horizon, so when scientific matters are involved they confine themselves to a few platitudes, or say nothing at all. They are unable to distinguish a quack from a leading authority in science, and prefer to exercise their imaginations upon sensational announcements, rather than discuss the possibilities of sober scientific discovery. In all that relates to the interests of science—and that means in the end the interests of the nation—the men who influence public opinion and control the public Services are mostly unenlightened and therefore unsympathetic.

The tacit assumption that public committees or departments concerned with scientific problems must have at their head officers of the Army, Navy, or Civil Service is responsible for delay in taking advantage of available expert knowledge and for the neglect to make effective use of science in national affairs, whether in times of war or peace. Just as a member of the Government may serve in turn as president of the Board of Education, Board of Agriculture, Board of Trade, or any other department, without possessing any special qualifications to comprehend the work of either, so a public official may be placed in a position to dominate activities of which he cannot understand the significance. Some day we hope that this mad system will be swept away, and that the men who exert control in all Government offices will be those whose training or experience make them most capable of doing so effectively.

Neither the political nor the official mind in this country yet realises the power which science can give to the modern State; because classical and literary studies still form the chief high-road to preferment in Parliament or in public offices. From the elementary school to the university truly scientific work occupies but a very secondary position in comparison with the humanities. In these days the material advancement of a nation must depend upon the developments of science and technology; and care should be taken, there-

fore, to create interest in these subjects and foster attention to them throughout the curriculum or course of school and college. Many people no doubt believe that this is being done, but it is far from being the case, and the promise of a generation ago is likely to be unfulfilled while the power over expenditure upon practical education remains in the hands of men who have no sympathy with it. Men who are distinguished for their scientific work, or have had a practical training in science, are on the staff of the Board of Education, but they are all subordinate to officers whose interests are in other fields; and scientific education suffers accordingly. Thus it comes about that Mr. C. A. Buckmaster, late Assistant Secretary under the Board of Education, could say in an address to the Educational Science Section of the British Association last year:—

“There can be no doubt that there is less real systematic science teaching in our elementary schools than was the case twenty years ago, and that the proportion of the total expenditure on elementary education which can be looked upon as spent in promoting science instruction is decidedly less, not only in proportion, but in amount. . . . It is not too much to say that the weight of official recognition has passed from the scientific to the literary side of the secondary school, and that the time and energy devoted to instruction and practical work in science have shown a remarkable decrease.”

Was there ever a more severe indictment of the literary official's inability to prepare the citizens of a modern State for the struggles before them than is contained in these conclusions as to the position of science in our schools? A quarter of a century ago scientific studies were gaining increased attention in the curriculum, and there was reason to hope that one generation would succeed another with greater ability to compete with other progressive peoples, and with increased distrust of political obscurantists and the pretensions of literary culture. We have not gained this power because the control of our educational system from bottom to top has been, and is, in the hands of men without knowledge of modern needs or of the essential difference between the study of words and of things. To the deadening influence of these official representatives of the humanities must be ascribed the deplorable fact that public interest in scientific matters or appreciation of the worth of scientific research is less intelligent, and relatively less extensive, than it was fifty years ago.

To the literary mind, a man of science is a

callous necromancer who has cut himself off from communion with his fellows, and has thereby lost the throbbing and compassionate heart of a full life; he is a Faust who has not yet made a bargain with Mephistopheles, and is therefore without human interest. Scientific and humanistic studies are, indeed, supposed to be antipathetic and to represent opposing qualities; so that it has become common to associate science with all that is cold and mechanistic in our being, and to believe that the development of the more spiritual parts of man's nature belongs essentially to other departments of intellectual activity.

When scientific work is undertaken solely with the object of commercial gain, its correlative is selfishness; when it is confined to the path of narrow specialisation, it leads to arrogance; and when its purpose is materialistic domination, without regard to the nobler deeds of humanity, it is a social danger and may become an excuse for learned barbarity. But research is rarely inspired by these motives, nor does devotion to it necessarily inhibit interest in other notes with which a well-balanced mind should be in resonance. Direct contact with Nature and inquiry into her laws do, however, produce a habit of mind which cannot be acquired in literary fields, and they are associated with a wide outlook on life more often than is popularly supposed. Science is not only able to increase the comforts of life and add to material welfare, but also to inspire the highest ethical thought and action; and a prominent place should be given to it in all stages of educational work as much on account of its ennobling influence as because it is a creator of riches.

Success in science means the birth of new knowledge. Patient observation and productive thinking are what the world needs for progress, and what true scientific study demands. There are now so many opportunities of obtaining ready-made opinions that the habits of independent thought, caution in accepting assertion, and critical inquiry into evidence, are suffering atrophy by disuse. *Vox populi, vox Dei*, may be a sound democratic principle for political platforms, but it stands for nothing in science. The men who have advanced the human race throughout the ages are they who have stood for individuality as against the voice of the crowd. We need such leaders now, men who will guide the people instead of waiting for a mandate from them before embarking upon any enterprise; and we need, above all, that the chief officials of departments of State should have had a training in scientific methods before being entrusted with the control of national

affairs. While indifference to these things is the distinguishing characteristic of our statesmen and administrative officers, it is useless to expect that the nation's business will be conducted efficiently or its scientific forces be organised on the large scale which modern conditions demand.

#### ANALYTICAL CONTROL OF MODERN DYES.

*The Analysis of Dyestuffs and their Identification in Dyed and Coloured Materials, Lake Pigments, Foodstuffs, etc.* By Prof. A. G. Green. Pp. ix+144. (London: C. Griffin and Co., Ltd., 1915.) Price 8s. 6d. net.

MODERN developments in the manufacture of synthetic colouring matters have now rendered it possible for the dyer to obtain any desired shade of colour in many different ways, but the suitability of the colour to the conditions under which the dyed material is to be employed depends entirely on the blend of dyes selected. It is evident that some analytical control is desirable in order that the most favourable result can be guaranteed.

Largely owing to the labours, extending over many years, of the author and his collaborators, a method has now been devised which is sufficiently comprehensive and elastic to cope not only with all the known dyes, but also with mixtures of these substances.

The three introductory chapters of this work treat of the chemistry of colouring matters and of the classification of these materials according to their chemical and tinctorial properties. In regard to theories of the colour of organic dyes, Prof. Green seems still to be a faithful adherent of the "quinonoid" hypothesis, in spite of the fact that he has himself discovered at least one dyestuff, namely, primuline (p. 21), to which he has not ascribed a "quinonoid" chemical constitution. It should, however, be added that the practical scheme of analysis presented in this manual is based on the tinctorial properties of the dyes, and not on hypothetical views in regard to their chemical structure. An interesting table serves as the summary of these introductory chapters, in which the chief series of colouring matters are doubly classified in accordance with their chemical nature and their dyeing properties. This tabulation indicates in a striking manner the lines along which future research may lead to many still missing groups of dyes.

The analysis of the dyes in bulk leads to a division into four main classes, in which solubility in water, affinity for unmordanted cotton, and precipitation by tannin form the distinctive