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TRAINING OF METALLURGISTS

A CONSIDERABLE amount of attention is being given at the present time to the general problems of education and training in Great Britain, and various groups such as the physicists, chemists, etc., have been reviewing existing arrangements for their professions. Recently, the subject of the supply, training and status of metallurgists has been examined by the Council of the Iron and Steel Institute, and a report giving its conclusions has been issued*. Although the Iron and Steel Institute as a body is primarily concerned with ferrous metallurgy, many of the recommendations given in the report will be found to apply to metallurgists destined for the non-ferrous industry. The report is a comprehensive one, and will be of value to all those concerned with the recruitment of metallurgists and with their employment in industry.

A severe shortage of trained metallurgists is expected at the end of the War. Various factors have contributed to this. The science of metallurgy is relatively new; one may recall that the primary principles involved in the heat-treatment of carbon steels were still a subject of debate at the close of the War of 1914-18, and it is only during the period between the Wars that the metallurgist, as distinct from the chemist, has won real status in industry. Coupled with this possible lack of appreciation, both the demand and the supply has been limited by the severe depressions to which the industry has been subjected. Meanwhile, great progress has been made in steel-making processes, in the development of new and stronger materials, etc., and changes in technique which involve the employment of more highly trained metallurgists. It is envisaged that continued technical development will be necessary if British industry is to thrive in the highly competitive markets of the post-war period, and thus a still higher proportion of trained men will be required.

To cope with the expected shortage, the following steps are recommended to stimulate recruitment: direct contact with schools, attractive initial salaries, good prospects, etc. It is surprising how little information the average schoolboy receives which in any way interests him in metallurgy, and consequently, except for the districts where metallurgical industries are located, a metallurgical career seldom receives consideration. Publicity of the right type will undoubtedly cure this; but to produce permanent effects, remuneration and prospects will be expected comparable with those in other professions, and adequate to eliminate concern regarding the violent depressions suffered periodically by the industry.

The report considers the training of personnel under three main headings: university training, education below university standard, and adult training. For the university trained man, it recommends that the degree course should be divided into two parts. The first should be directed to higher study of the basic scientific subjects, physics,

* The Training of Metallurgists, with Special Reference to the Iron and Steel Industries. Pp. 32. (Iron and Steel Institute, 4 Grosvenor Gardens, London, S.W.1, 1944.) 2s. 6d.

chemistry, some mathematics, and engineering, and the second to a continuance of study in these fields and to the particular study of metallurgy. This emphasis on a high standard in the basic sciences will no doubt be given appropriate consideration by the university authorities. Great importance is attached to early experience of industrial operations during a university career, and it is suggested that works courses during vacation should form part of every university course. Careful consideration will need to be given to the extent to which such courses can be instituted without leading to 'over training' of the undergraduate.

For the training of process metallurgists, the report concludes that existing facilities are inadequate; and it is suggested that Great Britain should legislate for training many of the men needed to develop our Empire resources. The primary metal-producing industries throughout the British Empire form a large potential market for British manufactured products, and the development and sale of such products will be facilitated if the personnel in control are British trained.

Once in the works, the training of a graduate should be continued for some years, through arrangements which permit him to work for periods in all the various departments in which he may be particularly interested. This will increase his experience, give him a grounding in the internal administration and enable his employers to form a good idea of any special aptitude he may have. Such training schemes are in progress in some of the larger organizations and are successful. Perhaps insufficient attention has been paid in the past to the latent possibilities in new employees; thus it sometimes happens that a man is taken on for a specific job, and although he may turn out ultimately to be not specially suited for the particular work concerned, he has to continue with it; in large organizations there are much greater possibilities for manoeuvre in such matters. Employers are recommended to encourage their men to write papers, to join in discussions and pay visits, and generally to participate in the professional activities associated with their particular branch of industry. For the keen man such facilities are well worth while, since they lead to rapid development of a sound critical faculty.

The importance of postgraduate education is not sufficiently emphasized in the report. The report indeed urges the need for improved facilities, and suggests that each university should specialize in some subject appropriate to the local industry. Postgraduate research is likely to be more productive for the individual if it is carried out where there is an active 'school' of research. Under such conditions a man, merely by keeping in touch with his fellows, can get a wide knowledge of research methods, etc., in a very short time. Again, it is essential that the professor should be keenly interested in research and not weighed down with administrative duties and normal teaching. The whole subject of postgraduate research needs reviewing by the authorities, to ensure that research facilities and atmosphere are really satisfactory.

Many of the recruits to industry come direct from school, and will no doubt continue to do so for some time. Their subsequent education takes the form of part-time courses or evening classes, and suggestions for improvement are made, including the institution of courses leading to the award of a national certificate in metallurgy. Such an award would be a desirable objective for the student, and a useful qualification to the employer. The report suggests that industry should encourage part-time education and limit the attendance necessary at evening schools to the absolute minimum.

The position with regard to part-time training should be simplified when the proposal is implemented that all persons who show sufficient ability at school should automatically receive a university training. Then the amount and type of training appropriate to the remainder will be more limited in scope than at present, and may conceivably be carried out by the envisaged young people's colleges or similar institutions. It is most desirable that men with first-class ability should be saved from the onerous task of educating themselves through evening classes and of suffering from "an impoverishment of initiative and intellectual quality at a period of life critical for the full development of the powers and capacities of the individual"*. In the meantime, a broadminded attitude from industry and close collaboration with the universities and technical colleges are necessary to achieve the best results from the promising material that enters industry direct from school.

On the question of adult education, the report mentions the need for refresher courses on specialized subjects for managers and staff, and refers to short courses to be held at universities with residential facilities. The Bristol conferences on metals and the Cambridge crystallographic conferences are successful examples of such meetings held by physicists. Interchange of senior staff between university and industry is considered to be very beneficial; but no practical methods for achieving such an interchange have yet been put forward. There are obvious difficulties, and various substitutes, such as interchange lectures and visits, probably represent the extent to which such suggestions can be implemented.

The training of workmen either for posts of higher responsibility or to give them better insight into their normal work is considered, and reference made to the outstanding success of the educational efforts of the Sheffield Trades Technical Societies. This organization works in the closest co-operation with the University of Sheffield, where lecture courses are provided "to enable workers to study the commercial and technical side of their work and to receive the latest scientific information which may be applied to their trade". Similar organizations might well be set up in other large manufacturing centres.

Satisfactory operation of all these educational schemes depends to a very large extent on the existence of the requisite number of able teachers; and, especially in the case of part-time courses and

* See p. 8 of "Industry and Education—a Statement". From Nuffield College. (Oxford University Press, London, 1943.)

evening classes, teachers are required who can make their subject interesting. The report directs attention to an existing shortage of teachers, and suggests that both remuneration and status should be raised so that more men will become available.

Very little advice is offered regarding the selection of men to be trained. This subject should be given serious consideration. All will agree that educational arrangements should be such that every person has facilities readily available appropriate to his abilities. On the other hand, efforts made to train people beyond their capabilities are largely wasted. Many evening school candidates probably fall into this category, and some attempt should be made by means of psychological tests to restrict facilities in technical training to those persons who can benefit.

EDUCATION AND THE WORLD STATE

The World We Mean to Make

And the Part of Education in Making It. By Maxwell Garnett. Pp. 264. (London: Faber and Faber, Ltd., 1943.) 10s. 6d. net.

IN times of comparatively rapid social change, there tends to be more thinking about education than in periods of comparative quiescence. Those who seek to control the development of society, in whatever aspect of it they are interested, are apt at some stage in their thinking to see in education one of the main forces which can bring about the conditions they desire. This is natural, for one of the chief functions of education is to transmit to the young what the older members of society most value in their culture, as the basis of the new world in which the young will live. Dr. Maxwell Garnett is concerned with the world "during the next two generations", and he adopts Mr. R. A. Butler's dictum that "education is the main arm with which to win the next peace".

Dr. Garnett has a plan for education in England; but to add another to the many plans which have been published during the last few years is not the primary purpose of his book. It has been a weakness of recent planning in education that the aims of education have not usually been thought about enough or expressed explicitly enough, and with the ends obscure it has been difficult to evaluate the means proposed. It is a great merit of Dr. Garnett's book that he presents a reasoned statement of the functions and processes of education as he sees them. His aims in education are an integral part of a philosophy, and the means he proposes take cognizance of political and social trends and the evidence of psychology. Not all will agree with his philosophy or with his view of the facts, but they do constitute a reasoned position which is both tenable and arguable.

A few sentences may summarize Dr. Garnett's position, though it cannot do justice to the wide range of his information and his thinking. The War should be followed by a general settlement, based upon the Atlantic Charter and President Roosevelt's four freedoms, which should bring into being an international authority, the Commonwealth of United Nations. This Society of States should promote human welfare, and should maintain the rule of right by administering international law. It should have

at its command the sanction of armed force. But the Commonwealth cannot be maintained merely by the fear of power: it must depend on the enlightened loyalty of its citizens and their will to serve its purposes. Enlightenment by itself will not serve: "The mere intellect", wrote Aristotle, "has no motive power". Free will, "something from outside space and time", "a spirit which can alter the course of our lives", will play its part, but since such interventions are comparatively rare events we cannot rely too heavily on them. We must in the main depend on the development of a 'sentiment' of loyalty to the Commonwealth as the single wide interest which will move men to act in the ways required. But are the values which the Commonwealth enshrines and which are to command our loyalty true as well as good? They appear in our inner world, "the ordered world pictured by the man with a single wide interest", as desirable ends: does our inner world correspond with the outer world, "the world as it really is, or as it is partially known to science", so that our ends can be regarded as not only good but also true? We do not know. We can only believe, by adopting a hypothesis "beyond the so-called 'discoveries of human reason'", which we may find among "the essentially similar 'divine revelations'". Most of the seven or eight great religions of the world offer the hypothesis that the supreme good is also the supreme reality. The Commonwealth, which must depend on the loyalty of its citizens, should therefore foster religious education. In Great Britain this means Christian education. The aims of education in England may be summed up as Christian faith, political loyalty and economic efficiency.

This is not a novel position. Dr. Garnett himself relates his ideal to that of Dr. Arnold a hundred years ago, to train Christian gentlemen. It is probably the position of a majority of those in Great Britain who are articulate about education. The plan for education which Dr. Garnett bases on it is accordingly not a revolutionary one. It resembles in many of its details the proposals of the Education Bill, which itself represents the highest common factor in the attitudes of those who have power to legislate for education. Dr. Garnett wants, for example, grammar schools, technical schools and modern schools, with some experiments in multi-lateral schooling. He finds good reasons why compulsory attendance should cease at fifteen rather than sixteen. He wants attendance at young people's colleges on one day a week. His plan need cause no alarm or despondency among the supporters of preparatory schools, public schools, direct grant schools, or the Oxford and Cambridge open scholarship system. He does not hesitate to apply to the schools the hypothesis he has adopted about religious truth. For example, "Local education authorities or managers will have to choose the head teachers of their primary schools from among those members of the profession who are zealous for Christian education". He refers, of course, to rights of conscience. "This practice should not be enforced by law. This is eminently a case for Plato's 'victory of persuasion over force'". The appointing body would merely ask the prospective head-teacher certain questions, and "A candidate who gave no adequate answers to these questions or to others of the same sort would not be appointed as head teacher". In certain directions, such as adult education and the regional organization of educational administration, Dr.