

NATURE

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MAN-POWER IN GREAT BRITAIN

2. SCIENTIFIC RESEARCH, TECHNICAL TRAINING AND THE UNIVERSITIES

THE debate on Defence Policy in the House of Commons on March 4 and 5, while focused on the Statement Relating to Defence (Cmd. 6743. London: H.M.S.O. February 1945. 2d. net), was essentially a continuation of that during the previous week on economic affairs in relation to man-power. Both were equally concerned with the means of answering the Prime Minister's call for increased efficiency in production and for a higher output. But whereas the first debate was concerned essentially with the means for securing the maximum output and the most efficient use of industrial man-power in Britain once it is distributed, the second debate was concerned with the more fundamental question of the right distribution of available man-power between the Armed Forces themselves, the industries which supply these forces with equipment and weapons, the Government and other public services and the industries which supply the needs of the civil population and the export trades.

Nothing was said in this debate to suggest that efficient management is not of first importance; on the contrary, concern was expressed as to whether the Services, which have so much to teach industry about the selection of men and women, are making the most efficient and economical use of their own personnel. The importance of providing very much larger numbers of administrators, business managers, scientific workers, teachers, architects, medical men and others of the professional and managerial classes to meet the post-war needs of Great Britain in reconstruction and production was fully recognized, and more than one speaker was anxious as to the manner in which the re-distribution or re-allocation of scientific men is being conducted, with the closing down of certain branches of research effort inaugurated to meet war-time needs. The general recognition of the supreme importance of an adequate research policy and effort was one of the features of a debate of special interest to scientific workers.

The White Paper itself puts concentration on research first among the four principles guiding the Government in regard to the supply of equipment. Scientific and technical progress at the present time is so rapid that safety lies far more in the maintenance of an adequate organisation for pure and applied research than in the building up of stocks of obsolescent equipment. This declaration was generally welcomed in the debate, and, in pursuing the idea, Sir Ralph Glyn stressed the vital importance of association between young men and women in universities and technical schools, and contact between the best brains in the universities and the General Staff, the Admiralty and the War Office. Other speakers urged that everything possible should be done to keep us not only abreast but even ahead of other countries in research. Brigadier Head suggested that the

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greater part of the money for scientific research should be held in a central pool and used to investigate the major scientific questions of the day. Allocations, and applications of the results to the respective Services, could be arranged later.

Brigadier Head was also among those who raised the question of continuity of service in defence matters of the leading men of science, and while, as Mr. Herbert Morrison said in the House of Commons on March 18, the need for scientific workers in the universities and the teaching profession and in industry is so pressing that the Government would not be justified in delaying the release from Government service of any one of them whose retention is not absolutely essential, some uneasiness is evident as to the manner in which their release and re-allocation are being effected. Two questions directed to the Lord President of the Council on March 18 both appear to have been prompted by the manner in which scientific and technical staff at the Royal Aircraft Establishment has been declared redundant, and it was suggested in these questions that there is a lack of overall co-ordinated planning of scientific research which will prejudice any action on the expected report of the Committee on Scientific Man-power.

What is possibly most encouraging in this debate to the man of science is the extent to which the implications of the policy advocated have been grasped. The first line of approach is that the major concentration must be upon the scientific research and technical training, and the use of the most modern technical equipment. The second line of approach is that the man-power must be the best that is available. The third is that we must achieve the utmost economy in the administration of the Services. Beyond this, of course, defence policy depends on foreign policy and the sum total of national resources; but what is satisfactory is to find explicit recognition that remuneration of the scientific worker must be adequate, that administration both in the Services and in industry requires continual overhaul if it is to be efficient and make appropriate use of modern methods of training and experience, and yet again that the new conditions demand a higher standard of education for those entering the Services, particularly for officers. A wide general technical and scientific education, knowledge of administration, and some kind of liaison with industry and opportunities for study in scientific and engineering concerns—these desiderata for the training of officers put forward by Lieut.-Colonel M. Lipton forecast growing responsibilities for the universities and technical colleges in this matter of defence.

This second debate in fact threw into even stronger relief the serious shortage of trained industrial leaders and professional men of all types for defence, for production and for the administration of the new services which the State is coming to render. To provide such educated men and women is pre-eminently the function of the universities, and if the demand cannot at present be met, it is to the universities that the community must look to replenish the supply. Yet the strongest criticism of the White Paper and of the Government's policy is

that it is making it impossible for the universities to plan even for the coming academic year.

It is true, of course, that the Government has already announced that the grant to the universities for 1946-47 will be £9,450,000—an increase of £3,000,000 on last year, a sum which includes two and a quarter million pounds for capital grants, a re-vote of £1,200,000 not spent in 1945-46 and an additional £100,000 for dental education. It is true also that the Minister of Education has taken steps leading up to the appointment of regional academic boards and that a national college of technology is to be established to marry pure and applied science, as recommended by the Percy Committee on Higher Technological Education. But so long as the Government refuses to decide the period of call-up for national service, neither the universities nor the technical colleges can make adequate plans.

If the permanent level of the British Armed Forces is to be of the order of three quarters of a million, with an annual intake under national service of some two hundred thousand, a period of service of no more than a year to eighteen months should suffice, in accordance with opinion expressed in the debate. Such a period would enable the student to complete his national service before proceeding to the university or technical college. It may well be desirable to allow some latitude in the date of calling up, as both Mr. R. A. Butler and Sir Arthur Salter urged. Mr. Butler was on very debatable grounds, however, in suggesting that eighteen is an unsuitable age for calling up those proceeding to a university. The evidence is rather that delay of a year in proceeding to a university would be of general advantage and lead to the average student profiting more from his university course.

A notable feature of the references to the continuation of national service in this debate was the recognition of its educational opportunities. No man-power or defence policy which neglects those opportunities can be regarded as adequate; and any policy of university expansion must clearly start from this assumption of a period of national service, of defined length and to be taken within certain specified ages. If that period of training is conducted in accordance with ideas expressed so well in this debate, there can be little doubt that the normal student will enter the university or technical college very much better equipped and much less prone to the weaknesses of excessive specialization than in the past.

The prominence thus given to this question of university students as part of the problem of allocating the man-power resources of Great Britain directs fresh attention to the quantitative aspects of university expansion. That question has been briefly considered in various reports on the universities and scientific research, and was the subject of a special article by Sir Ernest Simon in the *Political Quarterly* in December 1944. It has been examined more recently from a fresh point of view in a series of three articles in the *Economist*. These articles start from the basic assumption that more university graduates are required for the country as a whole. Before a large increase in the size of the British university

system is decided upon, however, the preliminary question must be asked: Is there a sufficient supply of potential students capable of profiting from a university education? That question can really be resolved into two: first, is there enough innate capacity in the population; and secondly, whether a sufficient number of those innately qualified managed to stay the course to the age of eighteen. Sir Ernest Simon, touching briefly on the former question, pointed out that we do not know whether 1.5 per cent or 14 per cent of the population are worthy of a university education. A two-year research project now being undertaken at the University of Manchester under the direction of the professors of education, psychology and economics, has yielded results which suggest that, on a conservative estimate, 10 per cent of the population are of a level of intelligence to justify entry to a university.

While there is thus no question of a shortage at the original source, there is still an enormous leakage of the innately qualified at the age of fourteen, and another great efflux at sixteen. The Education Act of 1944, to provide secondary education for all, should partly remedy this position; but much will depend on the way in which the Act is implemented—how quickly the leaving age is raised to sixteen, and how generously local education authorities provide inducements to the boy or girl of talent to stay on until eighteen and become potential university material. Some years will be required before the new secondary school system yields its fruits, and in the meantime the universities have to deal with those released from the Forces and seeking to complete or even initiate their training.

A substantial increase in the university population is thus possible within a comparatively short period, and to these two factors—the urgent need for more trained minds and the existence of untapped capacity—the *Economist* adds a third and imperative reason: the need for more scientific workers. Both the Hankey Committee and the more recently appointed committee under Sir Alan Barlow have yet to report, but the *Economist* is on sure ground in suggesting that the war-time impetus will push the universities a long way along the road of expansion, whether they wish it or not. It is the more important therefore that, if the drive towards the expansion of their science departments is likely to be so powerful, the universities should look to the healthy development of their arts faculties. Even before the War, art students were outnumbered by science students (counting those of medicine, agriculture and architecture)—22,000 as against 27,000. In the interval, there has been the almost complete stoppage of seven years to repair on the arts side; and to maintain a sound balance in the intellectual achievement and outlook of Britain, any increase on the science side should be accompanied by an only slightly smaller increase on the arts side.

The *Economist* article contributes a much closer analysis of the order of magnitude of the increases than is to be found in Sir Ernest Simon's article, or the reports from the British Association Committee on Post-War University Education, and the Parlia-

mentary and Scientific Committee, and looks at the problem in two stages—short-term and long-term. For the short-term programme of ten to fifteen years, after pointing out that without much expansion in the universities, the ratio of full-time students to that of live births twenty years earlier was improving rapidly, it suggests that the pace will be set by the demand for scientific workers. Subject to the findings of the Barlow Committee, doubling the flow of science graduates within the next few years should be a conservative and not too difficult programme. Science faculties have been kept almost at full strength during the War, and are much more fortunately placed than the art faculties to overcome the most acute bottleneck in any scheme of expansion, namely, that of staffing. Probably fifteen years will be required by the arts faculties to achieve the same proportional increase, and the two together would give as a short-term target a student population of 100,000 in 1960, or about 4.75 per cent of the children born in 1940 would reach the university.

This figure is considerably beyond Sir Ernest Simon's estimate, though of the same order as that contemplated by the Parliamentary and Scientific Committee and the Association of Scientific Workers; but for the long-term programme, which if well planned should be less hampered by the immediate problems of man-power and buildings, the *Economist* suggests as a *prima facie* target a further 50,000 in the following fifteen years. This would raise the ratio to more than eight per cent, or close to the estimated ten per cent of the population possessing the innate capacity. Moreover, it would involve a much more than proportionate increase in the number of women students—probably something like six-fold in thirty years—if the ratio for men is not to rise to twelve, a figure which is possibly higher than can be sustained.

In the second of the three articles, the *Economist* discusses in some detail the way in which these large increases could be effected in terms of the size and number of universities and the total cost of such an expansion. The approach adopted in these articles makes the discussion much more practical, and indicates what is involved in the application of principles that have too often been discussed in the abstract without serious attempt to see where they would lead in practice.

As to the size of a university, a unit of 5,000 students is accepted as near the limit, and a university of this size is indeed regarded as undesirably large unless there is a substantial residential element. On this showing, Oxford and Cambridge are both already large enough; but with the acute pressure on university space and in view of their special advantages, it is reasonable to expect them to make some contribution to the overall problem. The suggestion in the *Economist* is for an increase of about a thousand at each, and mainly by the endowment of two new colleges for women at each university. Of the provincial universities of Britain, it is suggested that five could expand up to 5,000 students within fifteen years and that a number of others could expand to 3,000–4,000 in the same period, those, such as Reading, without a large population within daily

travelling distance acquiring a distinctive character by ample provision of halls of residence. A target of 29,000 students is suggested as a reasonable aggregate for 1960 for Birmingham, Bristol, Durham, Leeds, Liverpool, Manchester, Reading and Sheffield, while the University of Wales with its four constituent colleges might expand to 7,000. The four Scottish universities, on the other hand, already attract a higher proportion of the population, and a like proportionate expansion is not to be expected; the figure for the Scottish universities is put at 15,000. It is next suggested that the existing university colleges at Exeter, Nottingham and Southampton form a valuable nucleus for expansion and, whether or not they are given university status, they might well expand to 6,000 students in the period.

The University of London provides a special problem, with a student population on paper of 13,000 in colleges separate academically and geographically. The bold suggestion is made that the single university might be divided into four or five universities, each with a maximum of 5,000 students, utilizing the existing geographical groupings. With a total of 20,000 students in London thus attained, and some 10,000 from new foundations in centres of population such as Stoke-on-Trent, Leicester, Norwich, Plymouth, Bolton, Blackburn or Preston, Bradford or Huddersfield, which might eventually acquire university status, the *Economist* arrives at a total of 100,000 for 1960. No attempt is made to analyse the distribution of the 150,000 students suggested for 1975. It is, however, indicated that attainment of the 1960 figures will bring at least some universities to the optimum size. Any long-term policy of university expansion should therefore provide for the foundation of a few residential universities.

It is only at this stage that the *Economist* begins to look at the cost of such a programme, the main burden of which must inevitably fall on national funds. On the basis of the £6½ million which supported 50,000 students in 1937-38 and a permanent rise of at least 50 per cent in the level of prices, a total of £30 million in 1960 and £45 million in 1975 is suggested as probable, of which £24 million and £35 million might fall directly on the Exchequer. Grants for capital expenditure would be additional.

These are of course substantial sums, though even the larger is only about half of one per cent of the present national income and is minute compared with a contemplated expenditure on old age pensions in 1975 of £452 million. What is most impressive about the figures is indeed the smallness of the expenditure required to provide Great Britain with its full supply of trained minds for scientific research, for technology and industry and administration in the Government service or elsewhere and for the professions. Nevertheless, the sums are large enough, and the ancillary problems of planning expansion and keeping the balance in intellectual questions as well as material matters are far-reaching enough to call for some new administrative organisation, and the *Economist* reiterates a proposal which has frequently been voiced for strengthening the University

Grants Committee and providing a new body representing the universities.

In the last of the series of articles the problems of planning, recruitment, specialization and the like are not discussed in the detail of other recent reports, but the right questions are asked and the main issues are stated. The series as a whole is in balance and shows clearly not merely what is really involved in a policy of university expansion, but also the challenge that it presents to fundamental thinking within the universities themselves. Further, it emphasizes the need for the Government to evolve a constructive policy as a matter of urgency and to overhaul all departmental regulations and practices which needlessly waste intellectual ability. The questions raised must be faced as a whole, with all that is involved from the point of view of the re-training and transfer of those released from the Armed Forces and other Government service, of maintaining an adequate Scientific Civil Service as an element in defence policy and public administration, encouraging scientific industrial research on an adequate scale and also fostering creative thought and intellectual life and culture. The comprehensive review of the situation is essential to determine the wise use of man-power and woman-power; and to avoid, above all, waste of trained minds and scientific and technical skill which are so urgently needed in every section of the national life to-day. Such a review underlines the need for an early report from the Committee on Scientific Man-power and for the widest publicity for its findings and recommendations.

ADVANCES IN BIOCHEMISTRY

Annual Review of Biochemistry

Edited by James Murray Luck and James H. C. Smith. Vol. 14. Pp. xi + 856. (Stanford University P.O., Calif.; Annual Reviews, Inc.; London: H. K. Lewis and Co., Ltd., 1945.)

DURING the past few decades, progress in biochemistry has accelerated to such an extent that few active workers in the subject can afford the time to keep abreast of all the major advances by reading original papers. This particularly applies to the university teacher, who, if he is, as he should be, also a research worker, may find that his free time from the laboratory is nearly fully occupied in reading original papers relevant to his own field of research, leaving him little leisure in which to keep his lectures up to date. The recognition of this state of affairs by a group of Californian biochemists led to the publication in 1932 of the first volume of the "Annual Review of Biochemistry". The intention of the editors, as is clearly stated in the preface to this first volume, was to provide some relief from "the task of constantly referring to original works" by providing, annually, critical and up-to-date surveys of the literature in some twenty to thirty major fields of interest in biochemistry.

The "Annual Review of Biochemistry" for 1945 is the largest volume that has so far appeared in the series, running to 856 pages inclusive of the indexes. The twenty-eight articles which it contains are on the average well up to the standard that has been set in the past; and the new volume, like its thirteen predecessors,