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The Highway to the University.¹

THE report on the accessibility of university education to poor students prepared by Mr. G. S. M. Ellis for the Stapley Trust, for which Lord Haldane has written an appreciative foreword, reopens an ancient controversy on a basis of modern needs. The author's case, reduced to its bare bones, is that the percentage of the population of England educated at a university is far behind that of Scotland or Wales; that the wider opportunities in Wales and Scotland are reflected in the larger numbers of pupils from elementary schools who reach the university; and that the scholarships offered by local education authorities in aid of university education in England are inadequate in number and, on the average, insufficient in amount.

The remedy proposed is that a uniform minimum provision of university scholarships should be made a statutory obligation on all local education authorities. Incidentally, the author criticises severely the Board of Education for neglecting to bring up-to-date statistics of scholarships such as were supplied for 1911-12 to the Royal Commission on the Civil Service, and published in 1914. The author apparently had not seen, before his booklet went through the press, the recently published Statement of Expenditure on Maintenance Allowance Awards incurred by local education authorities in 1923-24 (Cmd. 2415). It would have warned him of the unreliability of any conclusions drawn from the figures of 1911-12 being applicable to the conditions of 1924-25. The limitation also of the report to one—though no doubt the largest—source of supply of scholarships, namely, those offered by local education authorities, makes impossible any kind of estimate of the adequacy or inadequacy of the supply as a whole. A general review, however, is a task for the Board of Education, and not for an individual worker. The most valuable part of the author's case is that he has shown the pressing need for such a survey.

Mr. Ellis calculates that 21 per 10,000 of the Scottish population were full-time university students in 1922-1923, the figures for Wales and England being 12 and 8 respectively. The actual numbers were 27,994 (England), 2650 (Wales), and 10,294 (Scotland). It is long since Scotland acquired the university-going habit. It was the outcome in the past of the excellence of her parish schools, of inexpensive university education, of the inducement of hundreds of small university bursaries, of parental sacrifice, and, above all, of the fact that to poor and able Scottish youths the university became the gateway to the world. In more recent days, the extended provision of secondary school education

¹ "The Poor Student and the University." By G. S. M. Ellis. Pp. xi + 60. (London: The Labour Publishing Co., Ltd., 1925.) 2s. 6d. net.

and assistance from the Carnegie Fund, have strengthened the traditions of earlier generations. A telling example comes from the Hebrides. The island of Lewis has a population of 28,000 persons, 4000 of them in the town of Stornoway. In 1894 the Nicolson Institute in that town was a small elementary school of 256 pupils with a handful of ex-standard children included. The newly appointed headmaster organised a secondary course, and a few school bursaries were made available from county funds to bring in the landward children. Four years later the school sent its first two students direct to the university.

The same headmaster, about to retire, reports a roll of 400 secondary school pupils (half from country districts), and that in the interval the school has sent 250 boys to the university and 240 girls to training colleges for teachers. These students were the sons and daughters of townsmen, crofters, and fishermen, with here and there one from the schoolhouse or the manse. The maintenance bursaries at the school vary from 5*l.* to 24*l.* About 180 country pupils are living in lodgings. That number includes 50 girls in the hostel provided three years ago by the Carnegie United Kingdom Trust (charge, 12*s.* per week). The county (university) bursaries, in any individual case, do not exceed 30*l.*, to which may be added the Carnegie fees grant of 9*l.* A few of these scholars hold in addition a small bursary from the Highland Trust or other granting body. The balance of the cost is made up in many cases with much effort and self-denial on the part of parents, brothers, and sisters. It is often a family concern, with uncles and aunts and cousins also helping. The old students of that school are so much scattered over the globe that a much-travelled Scot who has an intimate knowledge of it said recently that the island of Lewis was the most cosmopolitan rural area in Great Britain.

Until two generations ago, higher education in England was the privilege of the middle and upper classes. But the progress made in the present century has been remarkable. By the end of last century the School Boards had done their work of providing elementary schools and getting the children into them. The Education Acts of 1902-3 empowered the new authorities to supply or aid higher education and to organise a system by means of which pupils might pass from the elementary schools to the secondary, and from these to the university. In 1904-5 there were 95,000 pupils in secondary schools in England and Wales: twenty years later the number in schools on the grant list had risen to 359,000. Since 1914 the figures have been doubled. The Board of Education estimates (Report, 1923-24) that in 1900, 5500 children were being assisted to proceed from elementary to secondary schools;

to-day the free places in secondary schools on the grant list number 110,000, 36 per cent. of the total. Moreover, the school life is lengthening; the proportion of pupils above eighteen years of age is steadily growing, and the candidates for the higher school certificate examinations are increasing annually at a great pace. In the present year the number reached 5000: six years ago it was only 2000. The number of university scholarships awarded in 1911-12 was 464, the total maintained at universities in that year being 1327, the average value 43*l.*, and the total 57,000*l.* Mr. Trevelyan stated in the House of Commons in April 1924 that in the year 1922-23 the local education authorities had expended 220,000*l.* in scholarships to universities and other institutions of university rank. We now learn from the Statement of Expenditure (Cmd. 2415) incurred by local education authorities in maintenance allowances under Grant Regulations No. 14, that allowances of 127,000*l.* were made to undergraduates in 1923-24, the number of awards being 2756, while other awards to technical colleges and other institutions of university rank amounted to 81,594*l.* Lastly, whereas in 1908-9 695 boys and 361 girls proceeded to a university from grant-earning schools in England and Wales, by 1920-21 the numbers had risen to 1674 boys and 1214 girls, nearly three times as many. In the former year one-third of the schools contributed; in the latter, two-thirds.

This array of figures does not prove that the number and value of scholarships in 1924-25 are greater than they were in 1911-12. But it does suggest with certainty that a profound change has been effected, and that it would be unwise to frame any policy on figures so completely out-of-date as those of 1911-12. The splendid record of the progressive authorities must not, however, be allowed to hide the parsimonious attitude of a good many others whose contributions to university education are nil or negligible. In this connexion, one of Mr. Ellis's subsidiary points deserves greater attention than it usually gets: the possibility of higher education has come to depend overmuch on accidents of birthplace and residence, and the exact position of the county or borough boundary has assumed a fortuitous and unreasonable importance.

Space forbids much further consideration of this very interesting pamphlet. "Obviously," says the author, "the provision of scholarships does not meet the national need for trained men and women." Again, "it would be difficult to maintain that only this small percentage (0.73) of elementary school boys and girls who reach the university has outstanding ability." The crux of the problem is the bringing together of ability and opportunity. The concern in the homes of poor students is with the opportunities that follow a

university course. Here is a task for the Appointments Boards, which have already done much to facilitate the process of getting graduates placed. When conditions become such that a high percentage of honours graduates has little difficulty in obtaining posts with reasonable prospects, the story of such successes will soon reach the schools, and there will be no lack of graduates of "outstanding ability." The desire to reach the university will then react on the scholarship system and help to expand it.

The road to the university is not, however, the only outlet to the poor student. Among others, some attention might have been given to the technical colleges which provide full-time three-year courses for 4500 students.

Radioactivity and Geology.

The Surface-History of the Earth. By Dr. John Joly. Pp. 192 + 9 plates. (Oxford: Clarendon Press; London: Oxford University Press, 1925.) 8s. 6d. net.

IN this brilliant and stimulating book, Prof. Joly has conveniently brought together the results of many years' work and thought on the radioactivity of the rocks. Its central theme is an illuminating hypothesis, according to which the radioactivity of the rocks has been the dominant influence in controlling geological history. The search for adequate causes and convincing explanations is beginning to be rewarded, and theoretical geology need no longer grope in a maze, albeit a fascinating one, of unco-ordinated observations. Prof. Joly's inspired originality should henceforward lead geology into a new phase, the more mature phase that lies beyond the initial observations and their classification.

The present Lord Rayleigh's pioneer work on the distribution of radium in rocks showed nearly twenty years ago that the earth must gain from radiothermal energy at least as much heat as it is losing by radiation into space. It was difficult, indeed, to believe that the earth was not actually growing hotter. In 1921 Lord Rayleigh again expressed the guarded opinion that the internal temperatures should be rising, but he added, "we are puzzled to explain the existing state of things" (*NATURE*, October 27, 1921, p. 280). In 1915 the present writer elaborated a cooling hypothesis that has since been widely adopted, involving a distribution of the radioactive elements that permitted the earth to have cooled from a molten state since the beginning of geological time, and allowed for internal temperatures that were thought to be adequate to explain vulcanism. Further consideration of the implications of this hypothesis have led to its abandonment for the sufficient reason that they were found to be in contradiction with

the known facts of geological history. It should be said, however, that Dr. Harold Jeffreys still considers that any departure from this hypothesis in the direction of admitting more radioactivity leads to consequences that flatly disagree with observations. Apparently it is as impossible to believe that the earth is cooling as it is to believe that the earth is not cooling.

A way out of the impasse has been found by Prof. Joly. He persuades us to believe that both heating and cooling have taken place. There would be a touch of Irish humour here, were it not that the two processes do not occur at the same time. They alternate; and in the alternation lies a clue to the cause of the mysterious heavings and crumplings that have periodically affected the outer shell of the earth.

From the known data of seismology, and the well-established theory of isostasy, Prof. Joly concludes that the continents are essentially composed of granitic rocks having a thickness of about 32 km., and a density of about 2.67; and further, that they are submerged in a deep substratum of basaltic composition which rises around them to form the ocean floor, and has a density when solid of about 3.0. The materials of the continents and the substratum respectively are supposed to contain substantially the same proportions of the radio-elements as actual specimens of them, represented by granites and basalts from various parts of the globe. From the data adopted, and there seems here to be no possible flaw, the temperature at the base of the continents is easily calculated to be approximately that of the fusion-point of basalt, while the heat emitted is equivalent to that lost from the surface of the lands by radiation. It follows from this that the heat generated in the underlying basaltic layer by the radio-elements must accumulate; and since the substratum is solid at the present day, it evidently lacks only latent heat to become fluid. In about forty million years it must become so throughout. Similarly, at and below a certain depth beneath the ocean floor, the substratum must also pass sooner or later into a fluid condition.

Geological time is to be measured in at least hundreds of millions of years, and consequently this accumulation of latent heat in basalt must have occurred in the past; and as the substratum is now solid, the excess of heat must in some way have been dissipated. Tidal action is ingeniously invoked to provide a mechanism whereby the accumulated heat can be for the most part harmlessly discharged into the oceans. When widespread fusion supervenes, a slow westerly drift of the still solid crust begins, and the deep, possibly superheated magma formed beneath a continent thus comes to underlie the ocean floor to the east. The ocean floor is then stoped and melted away from below, until the upward loss of heat by conduction becomes sufficiently rapid to bring