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Schools and Universities.

“On the truth which Science has revealed, and is revealing, we build the new humanism of our age.”—Dr. BARNES, Bishop of Birmingham.

RETURNING in 1925 from a world tour, Haber, concerned with the economic plight of Germany, her lack of raw materials, the considerable increase of agricultural efficiency, delivered this message to the German people: “Man kann nämlich den Reichtum nicht nur aus dem Boden holen, sondern auch aus dem menschlichen Verstande.” He declared this ‘invisible item’ of the national balance sheet, the trained human intelligence, to be of vital importance for the resuscitation of his country. He claimed, and rightly, that the German system of higher education has proved more effective than that of any other country in producing men of creative achievement in technical science; they are the geese which lay the golden eggs. That it has not failed in pure science is amply evidenced by the list of Nobel prizemen. He disclaimed any intelligence for his own people higher than in other countries; he attributed the success to the method by which the intelligence has been trained and then utilised, France being inferior in the higher education, England lacking co-operation between university and industry, America being deficient in depth and patience though replete with cash and equipment.

How, indeed, is it with us? In the ten years preceding the War we had made rapid strides in secondary and university education, during the War we envisaged still greater progress, but we chose the policy of the ‘knock-out blow’ and must wait for the fabric of the vision. Just seven years have slipped away since the Peace Treaty was signed, and we do not yet know whether our ship is slowly sinking or will right herself. Our cousins, over yonder, say we are ‘down and out.’ They relish exaggeration; yet who can study the events of 1926 and remain blind to the threat that Britain’s days as the workshop of the world are numbered? The coal and iron and engineering genius, which together with our coast-line placed us far in the van of industrial development, can keep us there no longer, but our industrial population remains. Trained intellect alone can enable us to hold our own until the transformation of our social organisation shall have been accomplished without catastrophe. Trained intellect—not only, nor even chiefly, trained in technical science. It is true that science furnishes the key to Nature’s storehouse of power, that the trained intellect has made man a

creator, but of even greater importance is the use he makes of the power and the kind of life he creates. Science is determining the material conditions; the new humanism must rise to the occasion and teach us how to live. Creative thought is what the world is needing in all departments of life; it will express itself in literature and other arts, and it will issue in new hope and energy in all ranks of society. The destiny of Great Britain, and even its immediate future, hang upon the success we can achieve in leading the right men to devote their lives to science, in supplying the needs for their work, and in permeating the nation with a sense of responsibility that the gifts of science shall not be misused.

Great Britain has indeed been exporting much of its 'invisible item' for many years to India and other parts of the globe, carrying the white man's burden. There are obvious signs that this export, like others, will diminish in the near future—no other country has suffered such a drain—and with this leak stopped, the home level may be expected to rise.

No one can doubt that the talent is there. Does any one claim that we make the most of it? The practical problem is beset with difficulties, complexities, incompatibilities. There is no single simple solution possessing all the virtues and omitting none; and time is precious. Ought boys to leave school and approach their university studies fresher in mind? Is too early specialisation in schools a cause of sterility later; and when is *too* early? Is our conception of the university as a sort of examination mill wholly mistaken, if not immoral, and the German plan wholly right, with its freedom from mark-grubbing, and only a *viva voce* on subjects subsidiary to a thesis? And if not absolutely ideal, is it not at any rate more effective in developing the right man and discouraging the rest? The fact is that we are even now engaged on a new synthesis in education, one which bids fair to spare the wheat and straw the chaff. Our national genius is not logical but practical—logic thrives on narrow premises. We have succeeded in producing a multiplicity of types of schools and universities, and rightly used this multiplicity will ease the problem; it may go far to solve it.

The time between educational seed-time and harvest is long, but intensive culture in the last years at school and during the university period may bring forth fruit in a few years. Further, school and university interact rapidly; the effect is like that of the 'reaction' on a radio receiving set,

and if judiciously applied the result is harmonious 'amplification,' for the man fresh from the university brings new life back to the schools. Unfortunately, at present the effect of the university on some of the most promising boys is as though the coils were wrongly connected; we get not amplification but *damping*. Many a teacher, not alone the science master, knowing the keenness and capacity of his most brilliant scholars, has felt sick at heart as he noted the effect upon these boys of the enforced repetition of work done years before at school.

The universities do their best to deal with the heterogeneous crowd that presents itself, but the lecturers are frequently overworked and underpaid and are possibly not adequately aware of the thoroughness and high standard of the teaching in many schools. They wearily resist all suggestion of exemption from the first-year courses, or complain that the students are packed with much knowledge but little intelligence. Ought the boys to leave school earlier? Some universities think they ought, and prefer them not to have taken the higher certificate; others regard it as equivalent to their intermediate examination and grant exemption accordingly; some accept it in lieu of the first M.B. if the appropriate subjects are taken, and the reason is a good one, for it is based on the long period of later medical courses.

Obviously the problem of the best development of a *person* is a personal matter, and whenever possible a personal solution should be sought; but schools and universities are institutions, and organisation is paramount. For the purpose of this discussion boys may be divided into the precocious clever and the slow-maturing capable. If the leaving age is eighteen or nineteen, as is usual in the best schools, both types will benefit greatly in character by the sense of responsibility developed in the last year of school life; this would not be very seriously reduced if all boys left a year earlier, for the responsibility would be the same; but if two years were cut off, the boys would not be mature enough and would lose something of great value. Going up to a university at nineteen, the clever boy finds he need not work hard in order to get a good degree, and may seize the wider social and educative opportunities of university life—he may seize them too hard if thwarted in his keenest interest, his life's work; the slower boy, faced by an examination test unsuited to his type, makes inconspicuous progress. If both boys were to go up at seventeen, the slow boy would have to work harder for his degree and the clever boy would do well in his

examination, but both of them would have two more years to spend at the university free from the warping strain of examinations, free to develop under guidance along lines of natural inclination and innate ability. The fact that the two boys are being compared after the degree examination means that the clever boy has as good a chance as ever of showing what is in him, and the slower maturing boy is being given his chance, at the latest possible academic period and under the most favourable conditions of concentration, to show his capacity. A third plan suggests itself. If nineteen years were adopted as the leaving age, a two-year degree course might be a possibility, ending with an examination, but followed by two more years of post-graduate training of some creative kind and a thesis.

The age at which specialisation should be allowed in schools might also be regarded as dependent on the precocity or otherwise of the boy. On the other hand, it is a matter of experience that the obvious development of the less precocious boy dates from the moment when he was allowed to specialise on a subject of his own choice. The precocious boy is quite usually, though not always, blessed with wide intellectual interests which continue throughout life, and concentration does him no harm. But something more may be required of the university than satisfaction with courses all severely scientific. All science students should be expected to attend at least one course such as philosophy, English literature, and history or economics, preferably in the post-graduate period when their minds will be free to enjoy them, and not for an examination test but for an essay. Similar courses in the sciences might prove of inestimable value for students in arts, if the right men were chosen to create them.

At present, if a student goes up to the university younger than his competitors, he risks getting a poorer degree and making a poorer impression on his teachers, and with it he reduces his chance of post-graduate opportunities. While this remains so, it is scarcely fair to leave the momentous decision to the individual; the handicap is too heavy.

One further point arises. The schools like to keep boys until nineteen years of age. The British type of university does, at least, produce science teachers whose enthusiasm and ability is a great asset to the country. Compared with German universities, where there is almost no routine teaching for degrees by examination and everything is ordered for what we treat as post-graduate work, the science staff of our universities is lamentably small, and the

salaries much lower than in the schools. If the universities continue to have to provide instruction, which in Germany is done in the schools, by men who have in addition to master the mass of literature and prosecute research, they will need a corresponding increase of staff or find the task an impossibility. If the schools send their boys at seventeen, then possibly some of the science masters might return to the university with riper teaching experience than the ordinary lecturer can ever hope to acquire; but unless the university authorities cease to override the recommendation of the Treasury Grants Committee, they would do so at heavy pecuniary loss.

The introduction of the Ph.D. degree has created a new situation: the universities must make adequate arrangements for post-graduate work. The crux of the question is the relative value to a man leaving the university at twenty-two years of age, of two more years at school or two years' post-graduate work at the university. Under one system the absorptive sponge may prosper, readily yielding its secreted information under pressure of examinations, but for the development of creative thought the post-graduate years are incomparably more fertile.

The Interior of a Star.

The Internal Constitution of the Stars. By Prof. A. S. Eddington. Pp. viii + 407. (Cambridge: At the University Press, 1926.) 25s. net.

ATTEMPTS to construct theories about the physical conditions inside a star need, of course, no excuse. Such theories are on the same footing as other physical theories, inasmuch as many intermediate steps will be inaccessible to the test of observation. They have, therefore, the right to a fair and serious judgment on a par with ordinary physical theories, according to agreement with observation, inner consistency, or beauty and simplicity.

In his recent book Eddington attempts to give a complete review of current theories concerning the state of things in the stellar interior. This field of theoretical investigations was, in fact, first opened up seriously by Eddington himself not more than ten years ago; and although quite a number of investigators have entered the field since that time, still his own work predominates, and 'Eddington's theory' has become a popular abbreviation for prevailing, and sometimes conflicting, views on this subject.

The growth and development of the theory of