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Lord Haldane in Science and Education.

THE autobiography of Lord Haldane recently published throws a flood of light on several questions of scientific and educational interest. Mr Sidney Webb once expressed the view that men of science who had entered the field of politics had not as a rule distinguished themselves in Parliament, a judgment which, with commendable impartiality, he extended to historians and economists. This view was challenged at the time. Playfair and Lubbock, it was suggested, had rendered valuable services as members of Parliament, and Huxley as a member of the first London School Board. Ought we not to regard these instances as exceptions proving the rule ? To the man of science, groping with his taper along the rugged pathway towards truth, the eclectic arts, the rhetorical triumphs—and at times the overweening confidence—of the politicians make no strong appeal.

Whatever view may be taken on this question, it will be agreed that politicians who concern themselves with the promotion of science and education are fulfilling a useful rôle in our national economy. With increasing specialisation and increasing demands on both public and private funds for the promotion of research, science needs sympathetic interpreters, missionaries—propagandists, if you will—to whose warnings and exhortations the public will listen with due respect. Haldane, as a man of outstanding intellect and untiring industry, as a politician who attained the highest offices in the State, as an active participator in the gravest decision which our nation was ever called upon to make, had many of the qualifications for this essential work. That he discharged his duty with conviction and disinterestedness, the reader of the autobiography will admit. His success was partial, as he himself admits. A man is a hero to his autobiographer, one would suppose ; but Haldane writes candidly in his final chapter entitled " Looking Backwards " : " I have no sense of success on any very large scale in things achieved. But I have the sense of having worked and of having found happiness in doing so." That guerdon is not withheld from the humblest of the world's workers. " One touch of Nature makes the whole world kin." Haldane's posthumous candour should induce a tolerance which was not shown by the public during his life.

Asked by Cecil Rhodes, " What have you done in your life ? " Haldane replied, " I got the London University Bill through the Houses of Parliament " ; on which Rhodes remarked, " That seems to be a very curious thing." The reference was to the

Bill of 1898, introduced by the Conservative Government to transform the examining university into a teaching university. Haldane was justified in his proud boast. Politically, the subject was thorny; the supporters of the old system of impartial examinations exercised powerful political influence; and the proposed scheme of re-constitution bore many of the scars of compromise. Unless some politician of strength and honesty of purpose had espoused the cause, we can well believe that the reform would never have been accomplished. The tragedy was that Haldane so soon showed a sort of Red Queen animosity towards his own offspring. We must await the publication of further biographies and autobiographies before this mystery is fully explained.

An interesting chapter in the history of higher education relates to the breaking-up of the old Victoria University, the federal university seated at Manchester. In this important development, Haldane took an active part. Birmingham, under the influence of Joseph Chamberlain, had established the first civic university in 1900. Soon afterwards, Liverpool petitioned for a separate university. "Manchester somewhat half-heartedly supported the prayer of Liverpool, but Leeds strongly opposed it, and was backed by a number of persons who were eminent in the field of higher education in those days." The hearing of the petition by a Committee of the Privy Council lasted three days. Haldane was precluded from acting as counsel for Liverpool, as he had been appointed a member of the Privy Council a short time before the hearing; but he was able to plead the cause as a witness. His arguments for civic and educational personality were accepted. The Committee recommended the grant of university charters to Liverpool and Manchester, and the grant of a charter to the University of Leeds followed a year later. Haldane remarks with truth: "It has always seemed to me that the decision of the Government as advised by the Privy Council in 1903 was a step of the first importance in the history of higher education." But, as he says, little notice was taken of the matter at the time by the public or by writers about English education.

The decision gave a deathblow to the federal idea in higher education in its application to our great cities and started the growth to full university stature of institutions such as the Universities of Sheffield (chartered in 1905), Bristol (1909), of which Haldane was the first Chancellor, and Reading (1926). Several university colleges are in the later stages of adolescence, including those at Nottingham, Exeter, Hull, Southampton. No one would now be found to question the wisdom of the policy advocated by Haldane in this matter.

Haldane's work in the promotion of science and technology at South Kensington is well known. The entry in the index under the author's name states summarily—"Founds the Imperial College of Science and Technology." King Edward VII. inspired this great development in a spirit of filial piety, and Haldane was brought into close personal touch with his Sovereign. Haldane's original scheme of a 'London Charlottenburg' suffered a sea-change. No doubt he was offered a surfeit of 'expert' advice. Curiously, Haldane's investigations in Germany had impressed him unfavourably with the separation existing there between the universities and the technical colleges, and he tells us he decided to press for the application of a different principle in London. "The new college was to be fashioned so as to be brought as quickly as possible into a re-constituted University of London." There must be some lapse of memory here, for, in the letter which Lord Rosebery as Chancellor of the University of London addressed to the London County Council in 1903 to explain the Charlottenburg scheme—the letter, we may safely presume, was drafted by Haldane—there was no reference to the question of re-constituting the University and this issue did not arise until some years later. Lord Rosebery, indeed, expressed the hope that it might be possible to follow up the Charlottenburg scheme "by taking further steps towards developing the University in such a fashion as to make it worthy to be the University of the metropolis of the Empire"—but the reference here is obviously to other educational rather than to constitutional developments.

Exasperating delays occurred and an unhappy controversy arose as to the relations of the Imperial College with the University, a controversy which has not yet been brought to a final conclusion. It led directly to the appointment of the abortive Royal Commission on University Education in London over which Haldane presided. The autobiography does not indicate that Haldane derived much satisfaction from his attempt to re-constitute the University for a second time. He is singularly reticent on the whole subject. Nevertheless, he lived long enough to see the last stages of a re-constitution of the University which, the friends of the University hope, will remove some of the defects of the earlier compromise; and he must have watched with pleasure the recent purchase of the Blooms-

bury site by the University, aided by the Rockefeller Foundation, a site he had ineffectively recommended so long ago as 1912 for the great Imperial university he wished to see established in London.

Was science able to offer any return for all this effort and goodwill? We learn with pleasure from the autobiography that Haldane benefited from a great discovery in a university laboratory. He was a sufferer from diabetes and was treated in the first attack by a rigid diet, "the only palliative known in those pre-insulin days." Banting's discovery came at a happy moment, for Haldane would not have been able to count on good health without the discovery of insulin. He arranged to have an injection in his arm every morning, and this served admirably, he tells us, taking the place of the pancreatic secretion of the 'Islands of Langerhans.' Thus was prolonged a life which had rendered great services to the cause of science and had sounded the full gamut of human thought, emotion, and—may we not add, notwithstanding autobiographical diffidence—success, achievement.

T. LL. H.

A Neglected Genius.

The Collected Scientific Papers of John James Waterston. Edited, with a Biography, by Dr. J. S. Haldane. Pp. lxviii + 709 + 5 plates. (Edinburgh and London: Oliver and Boyd, 1928.) 25*s*. net.

IN 1892 the late Lord Rayleigh rescued from oblivion in the archives of the Royal Society a remarkable paper by John James Waterston which had been written in 1845 but had failed to obtain the approval of the Society, and had, therefore, not been printed in the *Proceedings*. So completely has his work been ignored that it will probably come as a surprise to the majority that his writings (published and hitherto unpublished), which have been collected and published by Dr. J. S. Haldane, extend to more than seven hundred pages.

Lord Rayleigh did ample justice to the 1845 paper on the physics of media that consist of perfectly elastic molecules in a state of motion. Concerning it he wrote: "What strikes one most is the marvellous courage with which he attacked questions, some of which even now present serious difficulties. . . . Waterston was the first to introduce into the theory the conception that heat and temperature are to be measured by *vis viva*. . . . In the second section the great feature is the statement that in mixed media the mean square molecular velocity is inversely proportional to the specific weight of the molecules. The proof which Waterston gave is doubtless not satisfactory, but the same may be said of that advanced by Maxwell fifteen years later." Boyle's law, Charles's law, Avogadro's law, and Graham's law of diffusion were all placed on a dynamical footing in this paper. The causes which contributed to it being denied publication in 1845 are difficult to find. At the present time it suffers from having been superseded in style and argument by the work of successors. When written, it apparently suffered from being in advance of its time. Joule's work on the dynamical nature of heat had been in part published, but the theory of conservation of energy was not authoritatively accepted until about six years later. Even so late as 1848, Thomson (Lord Kelvin) wrote: "The conversion of heat (or caloric) into mechanical effect is probably impossible, certainly undiscovered. In actual engines for obtaining mechanical effect through the agency of heat, we must consequently look for the source of power, not on any absorption and conversion, but merely in a transmission of heat."

Who was the man whose scientific insight drew from Lord Rayleigh such high praise? In answer, Dr. Haldane prefaces his collection by a short biography. His grandfather was founder of an important (still existing) firm of manufacturers of sealing-wax and other stationery; his grandmother was a niece of Robert Sandeman, a well-known religious leader and founder of the body known as Sandemanians—to which Michael Faraday and his blacksmith father belonged—and sister of George Sandeman, who was founder of the well-known firm of port wine merchants.

Waterston himself went from school to the University of Edinburgh and studied mathematics and physics under Sir John Leslie, and was medallist of his year in Leslie's class. He also attended lectures on anatomy and surgery—probably drawn to these subjects by his father's and his own interest in phrenology. His first published paper was written in his student days when he was nineteen years of age (*Phil. Mag.*, 1831). It was an attempt to explain gravitation on dynamical principles. It is interesting, because in it there is the germ of the ideas which he developed afterwards in his more important paper. No further publication occurred until 1843, when an anonymous volume appeared entitled "Thoughts on Mental Functions." Here he sought to study metaphysics as a branch of the physiology of the nervous system. Dr. Haldane remarks: "The book is a very acute essay, far ahead of its time. . . . The idea which guided him