JAMES ALFRED EWING (1855–1935)

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IN an age where extreme specialization in engineering is the rule rather than the exception, it is not always easy to realize that it was usual for engineers to be what might be broadly termed 'general engineers', that is, being equipped with a mixture of the major branches of engineering that was expected to serve them through their professional career. Many of the great engineers of the nineteenth century were such men, and perhaps the last of these was Sir Alfred Ewing, the centenary of whose birth occurred last month. But in Ewing's instance, his training served him for more than merely his professional career; it served him in his scientific researches and in his capacity as a teacher, for perhaps few men have had such a far-reaching effect on British engineering education.

James Alfred Ewing was born in Dundee on March 27, 1855, and received his early education at two of the schools of that city—the West End Academy and the High School. Following this, he won a scholarship of the value of £40 per annum which enabled him to enter the Universitv of Edinburgh, where he studied engineering under Fleeming Jenkin—a man who later exercised a great influence on his life. Jenkin was at the time engaged on research on submarine cables, under the direction of Lord Kelvin, and on his recommendation Ewing spent his summer vacations at Greenwich working on problems in this field. During 1874–76 he made three voyages to South America in connexion with this work, and on his return to Edinburgh completed his B.Sc. degree in engineering.

At the suggestion of Jenkin, Ewing accepted, in 1878, the offer to go to Tokyo as professor of mechanical engineering in the newly established university there. For the five years that he was in Tokyo he organized the chair and carried out researches on the measurements of earthquake movements, designing instruments for this. 1883 found him back in Britain, this time at Dundee, where he was professor of engineering at the then recently founded University College.

Ewing remained at Dundee until 1890, in which year he was appointed professor of mechanical sciences at Cambridge—an appointment which, unknown to him, was to have far-reaching results. At this time, however, the course in mechanism, as it was then known, had fallen into some disfavour, and the Senate would have been glad to drop the whole matter; but this was not possible. Under Ewing, the chair was completely reorganized, the course of instruction laid down, the Tripos established in 1892, and considerable extensions made to the laboratory buildings. While at Cambridge, Ewing carried out researches on the structure of metals, hysteresis, and designed instruments such as a permeability bridge and extensometer.

In 1903 Ewing was appointed director of naval education in Britain, and in this capacity he superintended the complete reorganization on engineering lines of the training of officers. In 1914, with the outbreak of the First World War, this came to an end, and Ewing was then in charge of "Room 40"—a department of the Admiralty entrusted with the decoding of enemy cyphers.

The association with the Admiralty came to an end in 1917, when Ewing was appointed vice-chancellor and principal of the University of Edinburgh. During his tenure of office there, thirteen new chairs were established, new buildings erected and the whole institution organized on modern lines. This vice-chancellorship may be said to be the climax of Ewing's active career. In 1929 he retired to Cambridge, where he spent his remaining years taking an active part in research bodies and learned societies and writing. He died on January 7, 1935.

In assessing the work of Ewing, it is seen that his greatest accomplishments lay in the founding of three engineering schools. It was his pioneer spirit that took him to Tokyo and it was his foresight and administrative ability that laid the foundation for the chair of mechanical sciences at Cambridge, for had a lesser man than he been appointed the development of engineering at Cambridge might have been delayed by many years, and certainly not have reached its present stature; however, it is not wise to speculate in such instances. It is to his everlasting credit that engineering at Cambridge has attained the high standard that it now holds. It was the experience gained from Tokyo, Dundee and Cambridge that stood him in good stead as vice-chancellor of the University of Edinburgh and enabled him to guide it to the eminent place that it holds among British universities.

The task with the Navy had educational features common with his work at the universities, in that the course of training was organized on engineering lines. This change might have been viewed with scepticism by some at the time; but at the Admiralty, men such as Lord Fisher realized the need for such a course, which was to serve the Navy well in two world wars.

The final years of Ewing's life might be said to be a period of retrospect, in which, in his addresses to learned societies, he looked back over the past progress of science, its developments, and its future implications for mankind. Delivering for the second time the James Forrest Lecture in 1928, Ewing voiced the thought that, although engineers had brought great benefits to humanity, they had at the same time created a great potential for ruin. To the British Association he posed the question, was science explaining to the layman that broad outlook it possessed in spite of specialization. He sounded a warning here that perhaps the effect of great discoveries was not altogether beneficial, since man was not altogether prepared for the bounty that Nature had bestowed upon him, for, although he commanded Nature, he did not seem to be able to command himself—a warning which has its significance to-day.

Ewing was the recipient of many honours, among them the Royal Medal of the Royal Society, awarded to him in 1895 for his researches in magnetism. In 1907 he was made a C.B., in 1911 a K.C.B. He was awarded honorary degrees by the Universities of Cambridge, Oxford, Durham and St. Andrews, and held executive positions in many learned societies.

Ewing was the author of many papers on scientific subjects as well as several books, such as "The Steam Engine and Other Heat Engines", now regarded as a classic, "Strength of Materials", "The Mechanical Production of Cold", and "Thermodynamics for Engineers", the last of which he was writing at the time of his death and which is still read to-day.

Ewing is remembered by those who knew him as a fine lecturer and a teacher who took a great interest in the work of students whom he taught, and as a scientist, in the work of those with whom he worked. To the end of his life he continued to maintain his interest in engineering research and education, and it is perhaps significant that his most fitting memorial is the James Alfred Ewing Medal, awarded by the Institution of Civil Engineers for noteworthy contributions to engineering science. Established in 1936 and first awarded in 1938, it remains to-day as a living monument to one who was scientist, engineer and educator.

ALCOHOL IN THE DIET

VARIOUS aspects of the advantages and disadvantages of alcohol as a dietary constituent were discussed at a symposium of the Nutrition Society on "Alcohol and its Nutritional Significance", held on March 12 in the Wright-Fleming Institute of St. Mary's Hospital Medical School, London, under the chairmanship of Dr. H. E. Magee.

The extent to which alcohol is consumed varies widely, and Prof. E. M. Jellinek showed how misleading gross *per capita* figures can be unless they are broken down into their component details. For example, children make a negligible contribution to the alcohol consumption of a population, and must be allowed for accordingly. A theoretical maximum individual intake of alcohol can be postulated above which it cannot be metabolized and would therefore accumulate; on the commonly accepted figure of 100 mgm./kgm. body-weight per hour, this limit would be about 170 gm. per day. However, there is considerable variation in the rate at which different individuals metabolize alcohol. The frequency distribution of the rates is rather more flat-topped than a normal curve, and rates between 60 and 150 mgm./kgm./hr. are all common. With a high rate of metabolism in a heavy man, a total consumption of up to 400 gm. per day is not to be ruled out as impossible. After excluding children and perhaps impossible figures, it is necessary also to allow for abstainers and for alcoholics. Information from different sources about the incidence of abstainers in the United States are in good agreement, and the number of alcoholics is well known. For the rest of the population, it appears that men drink about three times as much as women, and on this basis the average alcohol consumption of adult Americans who are not abstainers or alcoholics can be estimated at about 46 gm./day for males and 15 gm./day for females. For the alcoholics, of whom there are about a million in the United States, the daily consumption is about 225 gm./day, so that these 8 per cent of all consumers account for about one-third of all the consumption of alcohol in the United States. The details differ, but similar pictures can be presented for other nations. It follows that, in general, alcohol makes a negligible contribution to a national calorie budget but that, when the figures are broken down, the contribution is appreciable at some levels as well as being serious as an interfering factor in overall nutrition at high levels.

The utilization of ingested alcohol was discussed by Dr. J. Tremolieres, who reported particularly the work of Dr. E. Le Breton and Dr. L. Dontcheff. By administration of alcohol to rats and then killing the rats and estimating the amount of unoxidized alcohol in the tissues, it is possible to measure the rate of consumption: in rats this rate is surprisingly constant, and agrees well with determinations based on the rate of decline of the concentration of alcohol in the plasma. The rate of metabolism of alcohol does not depend on the dose of alcohol, and the rate is also unaffected in homoiothermic animals by altering the environmental temperature or by muscular activity. On the other hand, in starvation the rate of utilization is decreased, and the rate can be increased by administering insulin. From experiments with alcohol labelled with isotopic carbon, it appears that metabolic products of alcohol are utilized in the synthesis of fat.

Among the consequences of ingesting alcohol are a sense of well-being, impaired self-criticism and impaired performance of many kinds of skilled action. The other pharmacological actions of moderate doses of alcohol, such as vasodilatation, diuresis and impaired sexual efficiency, are of less practical importance, and Dr. M. Weatherall concentrated on the immediate consequences of including alcohol in the diet, apart from its possible nutritional value. Loss of skill is important when complicated and potentially dangerous actions are performed under the influence of alcohol, and it is useful to assess how much alcohol can be consumed before detectable loss of efficiency occurs. One of the skilled actions most commonly performed under the influence of alcohol is driving motor vehicles, and evidence is available showing that alcohol contributes substantially to the incidence of road accidents. Laboratory studies do not localize the effects of alcohol to any particular part or function of the nervous system, but they permit estimation of threshold quantities for the impairment of various functions; and such studies generally indicate that loss of efficiency begins at about 0·04–0·06 per cent of alcohol in the blood. From such figures it follows that it is unwise to drive a car shortly after consuming more than a pint of beer on an empty stomach. Apart from impairment of skilled actions, there do not appear to be other objections to the consumption of small amounts of alcohol, and there is good evidence that in the long run moderate consumption of alcohol is associated with a greater expectation of life than that enjoyed by total abstainers.

The afternoon session was more directly concerned with nutritional aspects of the use of alcohol. Dr. H. M. Sinclair examined two questions: Does vitamin deficiency predispose to alcoholism? And does alcoholism predispose to vitamin deficiency? Evidence on the first point is unconvincing. When rats have a choice between drinking water and drinking dilute alcohol, they usually choose water if their diet is adequate in calories and alcohol if it is inadequate. On diets deficient in vitamin B_1 they commonly choose alcohol; but on such a diet their calorie intake is usually also inadequate because their appetite is poor, and so their choice of alcohol is not significant. Moreover, in alcoholic humans extensive dietary supplementation with vitamins usually has no effect on the intake of alcohol. On the other hand, vitamin deficiencies are well known as a sequel to alcohol consumption. Alcohol has an acute effect on vitamin A mobilization from the liver