SIR WILLIAM RAMSAY (1852–1916)

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THE present week marks the centenary of the birth on October 2, 1852, in Glasgow, of one of the most distinguished of the many famous British chemists, William Ramsay. Both his parents came from families of notable people; his paternal grandfather had been a chemical manufacturer in Glasgow, and his uncle on the father's side was Sir Andrew Crombie Ramsay the geologist. As a boy he showed already musical and linguistic talents; in later life, at scientific meetings abroad he spoke in several languages to suit the nationalities of those whose papers he was discussing, and in proposing toasts at more convivial gatherings he followed the same practice.

Ramsay's interest in chemistry developed in his student days at the University of Glasgow, but extramurally, since he had been educated for the ministry. In 1871 he went to Tübingen, where he took his doctorate, and on his return to Glasgow he became assistant in the chemistry departments of Anderson's College and then the University. His research work in this period was in organic chemistry, especially in relation to pyridine, an evil-smelling constituent of bone oil, stocks of which had been left in the cellar by a former professor, Thomas Anderson. His interest in physical chemistry (or, as he liked to call it, general chemistry) seems to have been aroused by E. J. Mills, then professor in Anderson's College (later the Royal Technical College). It was not until 1880 that Ramsay obtained his first professorial chair, at University College, Bristol. Here he showed another of his outstanding qualities, that of being an energetic and capable administrator, becoming principal of the College as well as professor of chemistry. His single demonstrator was Sydney Young, who later succeeded him as professor. Young was a very able experimenter and there is no doubt that he exerted a steadying and beneficial influence on Ramsay. Together they carried out work of outstanding importance on the vapour pressures and critical properties of liquids, which is still regarded as authoritative.

By now, Ramsay had become a chemist of international reputation. Always interested in teaching, he wrote in Bristol a small book, "Experimental Proofs of Chemical Theory for Beginners", on a very original plan. Another of Ramsay's traits was his open-mindedness towards modern theories; his early adoption of the Periodic Law as a basis of classification of the elements (which he adopted in his larger "System of Inorganic Chemistry", published in 1891), and of the theory of electrolytic dissociation at a time when it was bitterly criticized by most other chemists, are both good examples of his receptiveness and judgment. He also participated in the earlier developments of the electronic theory of valency.

In 1887 Ramsay succeeded Williamson as professor of chemistry at University College, London. At that time the College had become part of the University of London, but the latter was purely an examining body, having no concern with teaching or research. The conditions at University College were not so good as those in Bristol when he left it, and accommodation for research was practically non-existent. To some men such conditions are more stimulating and beneficial than succession to an 'institute' elaborately equipped and with a strong tradition of research in a special direction. Towards the end of Ramsay's life new laboratories, which in their time were models of what a university chemistry department should be, were erected; but all his important work was done in the old and modest accommodation. In 1888 he was elected a Fellow of the Royal Society, and in later life he accumulated a series of honorary degrees and memberships of learned societies which must be without parallel. He was a well-known personality both on the Continent and in the United States, numbering among his friends practically all the notable chemists of his time. His friendship with Ostwald, who did so much to further the cause of physical chemistry at a time when the preponderating interest was in organic chemistry, brought Ramsay into touch with a current of thought and of research which was changing the face of classical chemistry and must have influenced his own work.

Up to 1894 Ramsay's work was in the field of inorganic chemistry, in which he investigated oxides of nitrogen, and in physical chemistry, in which he investigated with Shields the effect of temperature on the surface tension of liquids, leading to the well-known equation of Ramsay and Shields and to a relation between surface tension and molecular weight. At University College also was carried out the work of Linder and Picton on colloidal solutions which is one of the foundation stones of modern colloid chemistry. It was in 1894, however, that Ramsay's great chance came. Lord Rayleigh was measuring the densities of gases and had found that nitrogen obtained from the atmosphere was appreciably denser than that obtained from chemical compounds. He suspected that the lighter nitrogen contained an unknown light gas, while Ramsay thought that the heavier nitrogen contained an unknown heavier gas. In 1894 he had a conversation with Rayleigh, who so far back as 1892 had asked chemists if they could solve the mystery, and in a very short time Ramsay was able to tell Rayleigh that by heating atmospheric nitrogen with magnesium, which combines with nitrogen, the residual gas was even heavier, suggesting that the heavier impurity in atmospheric nitrogen was a chemically inert gas. Even at that time Ramsay had realized that there was a possibility that the Periodic Table might be extended by a new group of gaseous elements, an event which he and his collaborators afterwards brought into being by the discovery of these elements.

Rayleigh was working on lines suggested by a forgotten experiment of Cavendish in 1785, who had found that on sparking a mixture of air and oxygen over potash solution the gas slowly disappeared and a solution of saltpetre was formed from the alkali and the oxides of nitrogen produced by the sparking; but always a small residue of gas was left, about a per cent of the original volume of the nitrogen. By his magnesium method Ramsay also obtained this inert gas, and at the meeting of the British Association in

1894 the two announced to an incredulous audience that the atmosphere contained a new gaseous element. Working independently, the two had reached the same result and the discovery was announced by them jointly. The full account of the work was given to a meeting of the Royal Society in January 1895. By then the density of the gas was found ; it had been shown to be monatomic from the ratio c_p/c_v of its specific heats as approximately 1·66, and its atomic weight was 39·9. The new gas was given the name 'argon'.

The day after the paper was read, Henry Miers, the mineralogist, directed Ramsay's attention to a gas evolved on heating uranium minerals and thought to be nitrogen. It might, he said, be argon. Ramsay prepared this gas, found that it gave a bright yellow line in the spectrum, and was inert. Crookes, with a sample of the gas sent him by Ramsay, identified the spectrum line with one which had been observed in the solar spectrum during the eclipse of 1868 by Lockyer, and supposed by him to belong to an element present in the sun to which he gave the name 'helium'. The new gas had, therefore, already been named. By the end of 1898 Ramsay, working with Travers, had discovered three more inert gases, neon, krypton and xenon, and with one exception the new group in the Periodic Table was filled. The remaining element linked this work with another field in which Ramsay made notable discoveries.

The year 1898, when the tale of the atmospheric inert gases had been told, saw the beginning of an epoch of scientific discovery without parallel in anything which had gone before. Radium was discovered by Mme. Curie. It was soon shown that radium emitted a radioactive gas called the emanation of radium (now radon). This was of great interest to Ramsay, who began work on the subject. His splendid manipulative skill, highly developed by having to deal with minute volumes of rare gases, was needed in handling extremely small quantities of radioactive emanation. In collaboration with Soddy, Ramsay soon showed that radon is an inert gas and that on standing it slowly changes into helium. In 1912 Ramsay and Whytlaw-Gray published the results of a determination of the density of radon in which only about a tenth of a cubic millimetre of gas was weighed on a micro-balance sensitive to two-millionths of a milligram. The atomic weight of radon found agreed with the assumption that it was formed from radium, atomic weight 226, by the emission of an alpha-particle which was chemically the same as a helium atom of weight 4 ; hence the atomic weight of radon should be 222, while the value 223 was found from the density on the assumption that it was monatomic. Radon then took its place as the last element in the inert gas group.

Ramsay's later work in the field of radioactivity was less successful and he was led astray by supposed transformations of elements, such as copper into lithium, under the influence of radioactivity. He realized, however, that the great concentration of energy made available in radioactivity was likely to lead to such transformations, a prediction achieved by later workers in this field. Ramsay took a great interest in the earlier applications of radioactive materials in medicine.

Ramsay was knighted in 1902 and his work on the inert gases gained for him the Nobel Prize in 1904. His administrative talent has already been mentioned, and during his tenure of the professorship at University College he was a president of the Society of Chemical Industry, of the Chemical Society, and of the British Association. He also took a keen interest in the character of the University of London, as a result of which and of the efforts of others, the University changed its former character of being a purely examining body and incorporated the constituent colleges as teaching institutions, at the same time giving their teachers a share in the examinations and the determination of the places of the candidates. Since then, the internal side of the University has greatly increased in importance and influence.

Ramsay had the keenest interest in research, inspiring his students and encouraging them by his example. Many of them have filled positions of distinction. At the end of the session of 1912 Ramsay retired from the professorship at University College. He was looking forward to the continuation of research ; but this was not to be. He died on July 23, 1916, after a painful illness.

Kindly and sympathetic towards his students, friendly and courteous to his colleagues, enthusiastic and active in his work, Ramsay left memories of a great man, which he undoubtedly was. After his death, funds raised by public subscription were partly devoted to the building of a Chemical Engineering Laboratory at University College and partly to the foundation of a Ramsay Memorial Fellowship for advanced students of chemistry. At present, owing to monetary depreciation, the number of fellowships has had to be reduced to half the original number, and the University College Committee and the Ramsay Memorial Fellowships Trustees decided that the centenary of the birth of Sir William Ramsay should be made the occasion of a joint appeal for a total of £100,000, partly to restore the number of fellowships and partly to extend the chemical laboratories at University College. Both these objects, it is believed, would further the interests of the extension of scientific knowledge which were Ramsay's interests, and also, since the fellowships are international in principle, are in harmony with his constant desire to advance friendship and helpful collaboration among all scientific men. The Appeals Secretary, Ramsay Centenary Appeal, University College, Gower Street, London, W.C.1, will receive contributions from all who wish to help this cause and will give further information about the appeal. The Science Museum, South Kensington, has also organized a Ramsay Centenary Exhibition in collaboration with University College, which was opened on October 2 by Lord Woolton, Lord President of the Council, and will remain open to the public for three months (see p. 562).

FACTORS AFFECTING CHOICE AND JUDGMENT

IT had been the intention to take advantage of the meeting of the British Association at Belfast to follow up the work of the informal conference on "Subjective Judgments" held in London in October 1950. It proved, however, to be difficult to realize this object within the present framework of the British Association, so that instead a series of papers were given which were not directly related to the work of the previous conference, the general title of the papers being "Some Factors affecting Choice and Judgment". Two of the papers, from the Road