# OBITUARY NOTICES.

## THOMAS HILL EASTERFIELD.

**1866—1949.**

T. H. EASTERFIELD was born in Doncaster on March 4th, 1866, and died in Nelson, New Zealand, on March 1st, 1949. At an early age he entered the Yorkshire College (University of Leeds) and as early as 1883 published two papers, one chemical and one geological. Later he became a Senior Foundation Scholar of Clare College, Cambridge, and in 1886 was awarded a First Class in the Natural Science Tripos. He was a prominent long-distance runner, gaining his athletic blue. After graduation he worked in the University of Zurich and later under Emil Fischer at Würzburg, where he was later awarded a Ph.D. for a dissertation on citrazenic acid. He had returned to Cambridge in 1888 as a lecturer under the University Extension Movement, and he worked in the University Organic Chemistry Laboratory.

His varied experience, particularly in laboratory techniques, and his enthusiasm and lecturing to lay audiences, fitted him admirably for the post of Professor at the newly established University College at Wellington, New Zealand, to which he was elected in 1899, and it is notable that his inaugural lecture was entitled " Research as the Prime Factor in Scientific Education." Until 1908 his Chair also included that of Physics, but, in spite of the width of subjects upon which he was called to lecture, and the calls on his time for technical advice to local industries, and in spite of the primitive laboratories and conditions in scattered and unsuitable buildings, he immediately set about to conduct research on the chemistry of New Zealand flora, at that time a field relatively untouched. Within three years he had written eight papers on the subject, to be followed by many others until he resigned the Professorship in 1919, when he became director of the newly established Cawthron Institute at Nelson. In the meantime he had stimulated a large number of students into whom he had inculcated the research spirit; also he had exerted a profound influence on scientific matters in a number of local industries.

To this new post at Nelson he brought his characteristic enthusiasm, energy, and broad outlook, so that, when he retired in 1933 at the age of 66, it had become an institution favourably known throughout the Commonwealth. In his retirement he continued to devote his attention to research, his main interest being renal calculi and the reactions of permanganates in concentrated sulphuric and phosphoric acids.

Professor Easterfield took a leading part in the organisation and administration of scientific affairs in New Zealand. He was President of the Royal Society of New Zealand in 1921—22, and a Hector Medallist. The New Zealand Institute of Chemistry owed much to him in its formative years. For his services to science in New Zealand he was created a K.B.E. in 1938. He was a life member of the Royal Institute of Chemistry.

It may truly be said that through him Britain gave to New Zealand one of her most promising sons, and one who had a profound influence on the growth of more modern chemistry in that Dominion.

E. MARSDEN.

---

## EDMUND GEORGE VINCENT PERCIVAL.

**1907—1951.**

EDMUND GEORGE VINCENT PERCIVAL, younger son of Albert Henry and Elizabeth Percival, was born at Hinckley in the county of Leicester on November 10th, 1907. He received his early education (1918—1925) at the King Edward VII Grammar School, Coalville, and afterwards became a student in the University of Birmingham where he read for an honours degree in Chemistry. These three years (1925—1928) showed him to be a brilliant scholar and his First Class Honours degree in 1928 was a true indication of his promise as a scientist. At this stage he decided to gain experience in several fields of research before choosing one in which to specialise, and in the autumn of 1928 he joined Dr. (now Professor) William Wardlaw's group at

Birmingham, working on the chemistry of inorganic co-ordination compounds. In 1929 he was awarded a Research Fellowship by the Canadian Pulp and Paper Association tenable at McGill University, where he worked in Professor Harold Hibbert's laboratory on physico-chemical problems concerning addition compounds of cellulose. Before returning to this country he visited numerous research centres in Canada and the United States, learning much and making many lasting friendships.

In the autumn of 1930 he returned to Birmingham in the capacity of senior research assistant to Professor Sir Norman Haworth. His interest in the chemistry of the carbohydrates, which was first awakened at Montreal, now developed rapidly and he soon decided to make this his main field of work. Three years later (1933) he was appointed to a lectureship in organic chemistry in the University of Edinburgh. Here he settled very happily, so much so indeed that it seems probable that he made no serious attempt to seek promotion by moving elsewhere. In 1934 he married Ethel Elizabeth Kempson whom he had first met in the chemistry laboratories at Birmingham, and in Edinburgh Mrs. Percival collaborated with her husband in much of his work on the sugars. She and their two children survive him. So great was Percival's interest in his research that he could not bear to be far away from the laboratories, and his home in Edinburgh was within a few minutes' walking distance of the Chemistry Department at King's Buildings. This nearness however brought with it additional advantages, since on the same site there were facilities for tennis and badminton and it was characteristic of Percival that when he was not hard at work he was usually to be found playing games with a similar intensity of purpose. Perhaps his only real regret over living in the north was occasioned by the lack of first-class cricket and the distance from Lord's.

He took a full part in the social and scientific life of the City and University. He became a member of the Faculty of Science and a Director of Studies. In 1948 he was promoted to a Readership in Chemistry in the University and in 1951 he was chosen to serve on the Senatus Academicus. His ability was such that awards came to him early—the Fellowship of the Royal Institute of Chemistry in 1936, the D.Sc. degree of Edinburgh in 1938, and the Fellowship of the Royal Society of Edinburgh in 1941. He gave freely of his services to various scientific societies and at the time of his death he was a member of Council of the Chemical Society and was serving on its Committee on Carbohydrate Nomenclature. For many years he was actively engaged in work for British Chemical Abstracts. He was interested also in the work of the Pharmaceutical Society and of the Institute of Brewing. He was one of the pioneers in the research work sponsored by the Scottish Seaweed Research Association on the chemistry of the marine algal polysaccharides, and he served with distinction from its inception on the Association's Chemical Advisory Committee. He was a member also of the Edinburgh and district committees of the Royal Institute of Chemistry and of the Society of Chemical Industry and for two years he acted as Chairman of the Edinburgh and South East Scotland section of the Institute. He rendered valuable service also as Local Representative of the Chemical Society. In 1948 when the annual general meeting of the Society of Chemical Industry took place in Edinburgh, and again in 1951 when he was Local Secretary for Section B of the British Association for the Advancement of Science, Percival's unselfish and unremitting work played a notable part in the success of the local arrangements for the meetings. He was a good lecturer and in consequence he received many invitations to visit other Universities and scientific societies, finding very special pleasure and satisfaction in those which involved considerable travelling. He was a most successful teacher, particularly for students of quick perception who could follow without difficulty his clear but somewhat rapidly developed exposition. Post-graduate students found in him an inspiring leader and director, friendly and approachable, supremely generous in all his actions, fertile in ideas and suggestions, and possessing an encyclopaedic memory for details. Especially characteristic of him were his kindliness, his deep sense of loyalty, and the capacity to see and appreciate the humorous side of everyday occurrences. Outside the laboratory he had many interests, prominent amongst which were his knowledge of painting, his passion for cricket, and the pleasure he took in holidays spent in the Border country near Kelso where he owned a small bungalow most delightfully situated within sight of the Cheviot hills. His students and colleagues will long remember the delightful hospitality accorded by Dr. and Mrs. Percival in their home in Mayfield Road. At the age of 43 he was at the height of his powers as a teacher and investigator, and his sudden death in Edinburgh on September 27th is a tragic loss to British Chemistry.

Percival's first research was carried out under Professor Wardlaw's direction at Birmingham (1928—1929) and was concerned with co-ordination compounds of cobalt (*J.*, 1929, 1317, 1505, 2628). Next came his work with Hibbert at Montreal where he studied the constitution of

soda-cellulose and showed that the adsorption of aluminium ions on cellulose was a base-exchange process (*J. Amer. Chem. Soc.*, 1930, **52**, 3257, 3448, 3995).

During the three years (1930—1933) which he spent in Sir Norman Haworth's laboratories Percival's attention was directed more and more to the structural side of carbohydrate chemistry, and he took part in the pioneering work of the Birmingham school on the molecular structure of the polysaccharides. Amongst the more important of the results he obtained at this period reference may be made to the evidence he provided by purely chemical means that the main structural feature of starch and glycogen is a chain of 1 : 4-linked glucopyranose residues. The method of approach was to subject the methylated polysaccharide to acetolysis, whereby a partially methylated disaccharide was obtained, which was then oxidised to the aldobionic acid and subjected to further methylation. Hydrolysis and identification of the products then showed that the maltose structure must be present in starch and glycogen. By similar methods the presence in xylan of chains of 1 : 4-linked xylopyranose units was demonstrated (*J.*, 1931, 1342, 2850; 1932, 2277). He applied the end-group method to inulin—a polysaccharide to the study of which he devoted much attention later—finding the proportion of non-reducing terminal fructofuranose residues to be 1 in 32, and to this period also belongs his important contribution to the work of the Birmingham school on the structure and synthesis of vitamin-C (*J.*, 1932, 2384; 1933, 1270, 1419).

After moving to Edinburgh in 1933 he continued his work in the carbohydrate group, and the numerous articles he published during the succeeding 18 years cover a wide variety of topics and are recognised as a major contribution to the development of sugar chemistry. The earlier work included studies of the addition compounds of carbohydrates with alkali-metal hydroxides, by which it was shown that the point of attachment of the inorganic and organic molecules could be determined (*J.*, 1934, 1160; 1935, 648; 1936, 1765; 1938, 1690). Reference compounds were needed for this work and Percival proceeded to study the structure of various monomethyl hexoses. He turned his attention also to the problem of the structure of the sugar osazones and by using the methylation method he obtained evidence that the osazones are not straight-chain compounds but possess a ring-structure, this being of the 2 : 6-type in glucosazone. During this work several new anhydro-osazones were isolated and studied (*J.*, 1935, 1398; 1936, 1770; 1937, 1320; 1938, 1384; 1940, 1479, 1511; 1941, 750; 1945, 783). Other activities in the monosaccharide field included the determination, by the application of conductivity measurements in boric acid solution, of the configuration of the groups attached to $C_{(1)}$ in derivatives of mannose and other sugars. In this way confirmation was obtained of the *trans*-arrangement of the hydroxyl groups on $C_{(1)}$ and $C_{(2)}$ in α-mannose derivatives (*J.*, 1937, 1920).

Much of Percival's most important work was, however, concerned with polysaccharides, and he had become an internationally recognised authority on the chemistry of plant mucilages and seaweed polysaccharides. He was one of the pioneers in the structural study of the carbohydrate components of the marine algae, with publications from 1936 onwards dealing with the structure of agar-agar. In the course of these difficult and complicated studies he demonstrated that 2 : 4 : 6-trimethyl D-galactose and derivatives of 3 : 6-anhydro-L-galactose are obtained on hydrolysis of methylated agar, but no detailed solution of the structural problem can yet be given (*J.*, 1937, 1615; 1939, 1844; 1942, 749). This was followed by investigations on the polysaccharides of *Chondrus crispus* (carragheen) and *Gigartina stellata*, in which some of the main structural outlines became manifest. In particular, evidence was obtained that the molecule contained a backbone of 1 : 3- or 1 : 6-linked galactopyranose residues similar to that present in many of the gums and naturally occurring galactans, but relatively rich in the case of carragheen in L-galactose residues (*J.*, 1943, 51; 1947, 1622; 1950, 1994).

These researches revealed the need for a more detailed knowledge of the properties of carbohydrate sulphate esters, and Percival published several papers (*J.*, 1938, 1585; 1940, 1475; 1941, 830; 1945, 119, 874; 1947, 1675; 1949, 1597) on the preparation of these compounds and their transformation into 3 : 6- and 5 : 6-anhydro-sugars on alkaline hydrolysis. Other work connected with seaweeds included the development of convenient methods of analysis for the various organic constituents, much of this being carried out in collaboration with the Scottish Seaweed Research Association (*J. Soc. Chem. Ind.*, 1948, **67**, 161, 420; 1950, **69**, 317). He was interested also in the chemistry of alginic acid, laminarin, and fucoidin (*J.*, 1950, 717, 827, 3494; 1951, 720), and in the interesting xylan present in *Rhodymenia palmata* which was found to differ markedly from other known xylans in containing both 1 : 4- and 1 : 3-linked xylan residues as main structural features (*Nature*, 1950, **166**, 787). But, even before this, Percival had become involved in the chemistry of xylose as the result of his extensive studies of the seed mucilages in the seeds of various members of the plantain family (*P. lanceolata*,

*P. arenaria*, *P. ovata*). These mucilages proved to be extraordinarily complex in structure, that from *P. arenaria* being composed of residues of galacturonic acid, arabinose, xylose, and galactose. Little is known as yet concerning the mode of attachment of the uronic acid portion but it is clear that in these mucilages the xylopyranose residues are linked in almost every possible way. For example, in the mucilage for *P. lanceolata* the following types of xylose residue were found to occur as building units: X1, 3X1, 4X1, $^{4}_{2}$X1, $^{4}_{3}$X1, and $^{3}_{4}X^{2}_{1}$ (*J.*, 1940, 1501; 1942, 58; 1949, 1600, 1608; 1950, 528).

In the hemicellulose group, studies were made of the complex nature of the polysaccharides present in Iceland moss (*J.*, 1943, 54), and Percival took part also in detailed investigations of the xylan from esparto, which showed that no arabinose residues are present and indicated a molecular structure containing some 75 1 : 4-linked xylose residues with one branch point (*J.*, 1950, 1289). A somewhat similar structure, but complicated by the presence of a terminal glucuronic acid residue, was recorded for the xylan from pear cell wall (*J.*, 1951, 1240).

Recent publications include papers on barley starch (*J.*, 1951, 2259) which was found to resemble other cereal starches in structure and in the proportion of the amylose and amylopectin components, and on the chemistry of wood starches (*J.*, 1951, 3489). Another main interest which Percival was developing vigorously up to the time of his death was the structure of the natural fructosans. Work on inulin (*J.*, 1950, 1297) demonstrated that glucose residues present to the extent of about 6%, were an integral part of the molecule, and this was followed by a detailed study of the fructosan from couch grass (*J.*, 1951, 1822). In this substance both 1 : 2- and 2 : 6-linked fructofuranose residues are present, and the structure appears to combine features present in inulin on the one hand and the natural levans on the other.

Both in his research work and in lecturing to advanced students Percival came to realise the need for an up-to-date text book covering the structural side of carhobydrate chemistry. His remedy was to write such an account himself and his " Structural Chemistry of the Carbohydrates " (1950), whilst remaining interesting and readable, is a marvel of compressed information. It has been received with acclamation by chemists in many countries of the world.

The work thus outlined was carried out within a period of 20 years, with the inevitable interruption of research facilities during the war. It is a notable achievement, all the more remarkable because it was never part of Percival's procedure to use complex apparatus or techniques. He tended rather to use simple and direct methods and to achieve his results by carefully thought-out plans of experimentation. He had a flair for recognising what was practicable, and his output of published work, amounting to some 70 papers, was made possible by this economy of effort, the remarkable speed and accuracy of his own practical work, the generous encouragement and inspiration he gave to his collaborators, and, above all, by the power and insight he displayed in devising methods for the solution of the problems he chose for investigation.

E. L. Hirst.