

1803, he came upon the idea that atoms of different elements have different weights, and he probably presented the first table of atomic weights in a lecture in 1803 to the Manchester Literary and Philosophical Society, which was published in 1805. All the details of Dalton's chemical atomic theory are given, explicitly or implicitly, in an entry in his note-book on September 6, 1803 (his birthday), and he held these unchanged until the end of his life. Dalton calculated the atomic weights from the quantitative compositions of compounds and assumptions about the numbers of atoms of the elements in a particle of a compound. The numbers were not accurate, but they were based on analyses by well-known contemporary chemists, not by Dalton. He later said that he would publish only what he had confirmed, since he had often been misled, a statement which has erroneously been said to imply conceit on his part; there are, in fact, many assertions about Dalton based largely on ignorance.

The first printed statement of Dalton's atomic theory is that in the "System of Chemistry" (1807) of Thomas Thomson, who visited Dalton in 1804 and found him analysing marsh gas and ethylene, and Thomson afterwards said that Dalton's atomic theory was evolved to explain the results, which indicated a law of multiple proportions. The theory had, in fact, been arrived at in 1803. In 1808 Dalton gave a brief account of the theory in his "New System of Chemical Philosophy", with a table of atomic weights and plates of chemical symbols. He also gave some "general rules" for arriving at the numbers of the atoms of the elements *A* and *B* in a "compound atom" of a compound. If only one compound is known, it is  $A + B$ ; if there are two compounds they are  $A + B$  and  $2A + B$  or  $A + 2B$ , etc. Dalton had concluded from the combining volumes that equal volumes of gases cannot contain the same number of atoms (which is correct); but he did not consider the possibility that the particles of elementary gases may contain two or more atoms, and Avogadro's hypothesis (1811) was not used by chemists until Cannizzaro (1858) directed attention to it—it enables the numbers of atoms in a molecule of a compound to be found, and hence the atomic weights may be determined without ambiguity.

Dalton's atomic theory, it will be seen, differed in important respects from the modern theory, but it laid an enduring foundation for future progress. In addition to it, Dalton made important discoveries in chemistry and physics both before and after announcing his atomic theory. His work on the uniform expansion of gases by heat, on vapour pressures, on the law of partial pressures, and on gaseous diffusion was done in an early period (1800-04); later, important work was on the incomplete combustion of hydrocarbons (1805), on the volumes of solutions, and on the composition of the atmosphere at high altitudes, which he found nearly the same as at sea-level, explaining the result as due to convection (a theory proposed again in recent times). He was a skilful and accurate gas analyst.

Dalton became internationally famous after his publications in 1801. He was a *correspondant* member of the Paris Academy of Sciences in 1816 and one of the eight foreign associates in 1830, a Fellow of the Royal Society in 1826, a D.C.L. of Oxford in 1832 and in the same year an LL.D. of Edinburgh. In 1833 he began to receive a Civil List pension. He died suddenly in his room in 1844 and was buried in Manchester with civic honours. Dalton was greatly liked and

respected by his contemporaries, his two main characteristics being his constant truthfulness and his great originality, both of which are quite incompatible with the assertion of Higgins in 1814 that Dalton arrived at his atomic theory by reading Higgins's book of 1789. There is no evidence that Dalton owed anything to his predecessors except Newton; this charge originated with Higgins alone, and if it has afterwards been repeated, it has always been withdrawn.

## OBITUARIES

Prof. F. E. Fritsch, F.R.S.

F. E. FRITSCH, emeritus professor of botany in the University of London, died on May 23 at the age of seventy-five. Of German descent, but born in London, he became truly English, though in his remarkable thoroughness and the solidity of his literary work he betrayed mental features held to be characteristic of German scholars. Asked how he managed to make fewer mistakes in his quotations and references than almost anybody else, he answered: "I am very slow though". This reply indicates how much time and trouble he devoted to every task he undertook.

Prof. Fritsch was head of the Department of Botany in Queen Mary College (University of London) during 1911-48. He began his academic career as assistant in the Botanical Department of the University of Munich during 1899-1901, then lectured in University, Birkbeck and East London (Queen Mary) Colleges of the University of London before taking the chair at Queen Mary College. He was president of Section K (Botany) of the British Association in 1927, president of the Linnean Society during 1949-52 and chairman of the Council of the Freshwater Biological Association of the British Empire.

Fritsch's inclination and gifts were more like those of a philologist commenting on ancient texts, and drawing careful conclusions from them, than those of a biologist who puts, by experimental means, his questions to Nature itself. But in his own investigations he was as painstaking and accurate as possible.

Since he came to be interested in morphology, the immense variation in the shaping of the Algae became, in his later years, his main attraction. There was scarcely ever a person who knew so much about them, and his life's work, "The Structure and Reproduction of the Algae", could not have been written by anybody else with the same degree of comprehension and authority.

Frail in body but strong in mind, Fritsch was a personality not to be overlooked in any assembly, and it is not surprising that he was often made a chairman by his colleagues. People used to look up to him, although he was small in stature.

Fritsch was asked for advice by numerous people who knew of his reputation as a most reliable man, and he did not spare himself, but he always kept his superiority. So long as this remained untouched, he could be the friendliest, most considerate and helpful man. He was a great talker, critical but benevolent, and resourceful in council.

Since his teaching, literary work and many dignities, combined with travelling—sleeping away from home and working in the train—eventually took most of his time and energy, gardening and music which had been his favourite spare-time occupations

were gradually given up, but he did not rest much until near the end of his long life.

Fritsch's publications will remain standard works for some time to come. He himself will be missed by many as a strong supporter of order, prudence and loyalty.

E. G. FRINGSHEIM

THE botanical world, and more especially the phycological section of it, has suffered grievous loss in the passing of Prof. Fritsch. Few men have attained the degree of eminence to which, despite physical frailty, his intellectual power, human wisdom and qualities of leadership raised him.

His primary interest was in the freshwater algae, in the study of which he made notable contributions to knowledge; but his interests were wide, and in the related field of marine phycology, his encyclopædic knowledge and sound judgment made him one to whom research workers in Great Britain and overseas turned inevitably for opinion and guidance. Help was always given freely and generously. He had that faculty of detached consideration of other people's problems that is not only invaluable but is also heart-warming and stimulating.

Prof. Fritsch's work, whether designed for the needs of elementary students or research workers, was always characterized by meticulous accuracy and a wealth of detailed information. The two volumes, "The Structure and Reproduction of the Algae", must remain as classic for all time; the completeness of the bibliography would alone ensure their permanent value, and that, coupled with the breadth and precision of the text, establishes the volumes as a *vade mecum* for all phycologists.

Though valuable scientific contributions, remarkable both in quantity and quality, earned for Prof. Fritsch both respect and admiration, his delightful human qualities also drew forth affection. It was a privilege to be associated with him for more than thirty-five years, and to have received from him an early training in university examining, in which his breadth of scholarship, fair-mindedness—especially to those less gifted than himself in graceful expression—provided an example to be remembered and followed.

Prof. Fritsch found great relaxation in music, and many of his friends will cherish memories of delightful week-ends at his home in Surrey where he and Mrs. Fritsch dispensed gracious hospitality. At the outbreak of the Second World War, Prof. Fritsch moved to Cambridge, where his home became again a social centre and focal point for botanists, from Great Britain and overseas. He faced the problems of war, as indeed he faced all other difficulties, with calmness, merely taking every possible precaution to safeguard scientific material and then going on quietly with his work, adding still further to scientific knowledge. It is regrettable that he himself will not see the publication of his current work on the calcareous algae.

Those who were privileged to be admitted to the friendship of Prof. Fritsch will be glad to express personal gratitude for unstinted and generous encouragement and to join with vast numbers of those who knew him in extending their sympathy to Mrs. Fritsch and her son. She must surely find some measure of comfort and pride in the knowledge of the sincere esteem and affection in which her husband was held by scientists all over the world.

MARGERY KNIGHT  
LILY NEWTON

### Dr. Malcolm Burr

DR. MALCOLM BURR, whose death at the age of seventy-six, due to an accident, occurred on July 13 in Istanbul, was a most colourful figure. A mining engineer by training, he took part in the development of the Kent coalfield at the beginning of this century, prospected for coal in Angola and visited the Lena goldfields and manganese mines in the Caucasus between the two World Wars, not to mention many other professional tasks. His main scientific interest in life, however, was entomology, and even as a schoolboy he specialized in Orthoptera and Dermaptera. When only twenty years old, he visited Vienna and, under the stimulus of Dr. Brunner von Wattenwyl, produced a revision of the genus *Acrida*. A long series of articles on the systematics of other Orthoptera followed, as well as a monograph of the family Eumasticidae, the first of this group. His principal contribution was to the study of the Dermaptera, which he was the first to classify on the basis of the structure of the copulatory organs, and on which he published a classical revision in Wytzman's "Genera Insectorum", as well as a volume in the "Fauna of British India", apart from very numerous journal papers. Dr. Burr's valuable collection of world Dermaptera, containing many type-specimens, has been presented by him to the British Museum and his rich collection of European Orthoptera, including many collected by himself, to the Hope Museum, University of Oxford.

Financial misfortunes and a restless character made it impossible for Burr to settle down, and in his old age he became a journalist, author of delightful travel and natural history books and finally professor of English at Istanbul. One of his most remarkable abilities was the gift of learning languages—he spoke fluently all the European ones, including several Slavonic. His last letter to me, dated July 2, 1954, full of entomological inquiries, was written in a vivid, if not strictly grammatical, Russian, a language which he never attempted to learn, but merely 'picked up' during his visits to Russia more than thirty years ago and never forgot.

The Royal Entomological Society of London has lost in Dr. Burr one of its oldest Fellows, elected in 1896. Apart from his many publications, he rendered an important service to entomology by having been one of the active group which founded the International Entomological Congresses and the honorary secretary of their permanent executive committee until 1920.

B. P. UVAROV

### Dr. R. W. Pocock

DR. ROY WOODHOUSE POCOCK, formerly a district geologist of the Geological Survey of Great Britain and a member of its staff for thirty-six years, died suddenly on June 22, while on holiday in Brussels.

Pocock was born in 1887 and, after leaving school, he became an assistant in the Geological Department of the British Museum (Natural History), in the meanwhile working for an honours B.Sc. degree at evening classes at Birkbeck College, London. During this time he began an investigation of the Silurian inlier of Woolhope, Herefordshire, and discovered there a thin limestone largely composed of the remains of the crinoid *Petalocrinus*, previously known only from the Niagara Limestone of North America and the Silurian beds of Gotland. He presented specimens from Woolhope to the British Museum