

extended the conception of molecular association in liquids. He devised new methods of determining the molecular weights of substances in the liquid state and at the critical point. He attacked the study of molecular dissymmetry, and traced the connection between optical activity and homology in liquids, between isomerism of position and rotatory power, and with the aid of his pupils he accumulated a great mass of experimental material which served to extend and substantiate his generalisations.

In 1903 Guye turned his attention to the study of atomic weights, and, in particular, to a critical examination of the experimental basis upon which these magnitudes rest. He thereby followed and perpetuated a tradition with which the fame of the Geneva school of chemistry, as personified by Marignac, will always be connected. Practically the greater number of the 100 contributions to the literature of chemistry which we owe to Guye's pen during the past twenty years are devoted to this subject, upon which he lavished all the powers of his matured intelligence, his experience, ingenuity, and manipulative skill. Thanks to his organising capacity and the ability and enthusiasm of his collaborators, we have been furnished with a series of fiduciary values which are probably among the best determined of physical constants, in which every known source of error has been rigorously scrutinised, and, so far as possible, eliminated. Naturally the trend of modern developments of ideas concerning the essential nature of the elements, and their fundamental relations and possible interdependence, attracted Guye's alert intelligence, and at the Brussels meeting of the International Conference in June last he pointed out their significance in connection with the proposed re-organisation of the work of the International Committee on Atomic Weights, of which he was an enthusiastic advocate, and on which, had he lived, he would certainly have made his influence felt as a member.

It might be supposed from Guye's mental characteristics, and from the nature of his studies, that he would have little sympathy with the technical applications of chemistry. No such surmise could be further from the truth. Although not a professed technologist, he had a considerable knowledge of manufacturing chemistry, and he enjoyed the confidence and esteem of the leaders of chemical industry throughout Switzerland, to whom he was always accessible, and by whom his counsel and advice were highly appreciated. His name will always be associated with the extraordinary development of electrochemical synthesis in Switzerland, to which his lectures and writings largely contributed.

Guye exercised great influence in scientific circles in Geneva, and took a leading part in the organisation of Swiss science. He presided over the Swiss Physical and Natural History Society, was a member of the central Committee of the Helvetic Society of Natural Sciences, and president of the Swiss Chemical Society and of the Council of Swiss Chemistry. In 1903 he established the *Journal de Chimie physique*, in which the greater number of the communications from his laboratory after that year were published, and he was mainly instrumental in placing *Helvetica Chimica Acta*—now the leading chemical journal in Switzerland—upon a sound and permanent foundation.

Guye's merits as a man of science were widely recog-

nised. He was a member of the Scientific Academies of Petrograd, Madrid, and Bucharest, an honorary member of the Chemical Societies of France and England, a corresponding member of the French Institute, and a foreign associate of the Reale Accademia dei Lincei, and he shares with his countryman Marignac the honour of being a Davy medallist of the Royal Society. To the great regret of his many friends in England, the illness which ended in his death prevented him from coming to London to receive the medal in person.

He has another association with the memory of Davy, who died at Geneva, which British chemists will not forget. They are grateful to Guye for his pious care of the tomb which holds the remains of the great chemist.

T. E. THORPE.

PROF. W. B. BOTTOMLEY.

PROF. WILLIAM B. BOTTOMLEY, Emeritus Professor of Botany at King's College, University of London, died at Huddersfield on March 24, aged 58, after a long and trying illness which began in April 1918 with a seizure resulting from thrombosis. During the four succeeding years these seizures returned at intervals until the end.

Prof. Bottomley was born at Apperley Bridge, Leeds, on December 26, 1863, and was educated at the Royal Grammar School, Lancaster, and at King's College, Cambridge. He then studied at Heidelberg, where he received the Ph.D. degree. He was lecturer in biology at St. Mary's Hospital from 1886 to 1891. In the latter year he was appointed professor of biology at the Royal Veterinary College, and at the same time served as assistant in botany to Prof. Oliver at University College, London, and as a Cambridge University Extension lecturer. In 1893 he was appointed to the professorship of botany at King's College, London, which post he held until his resignation in 1920.

In 1905 Prof. Bottomley made a journey round the world in connection with University Extension work. He did a great deal of extra-mural lecturing under various auspices, and was well known as an excellent lecturer before either a scientific or a popular audience.

Prof. Bottomley's chief scientific interests were in connection with plant nutrition and the relation of these problems to agriculture. Towards the end of the nineteenth century he actively concerned himself with various co-operative agricultural movements, such as the Agricultural Banks Association and the English Land Colonisation Society. He was a man of great enthusiasms, and it is much to be regretted that he was unable to complete the important work with which his investigations were concerned. His name will always find a place in the history of plant nutrition, along with those of Boussingault, Lawes, and others. His most important contribution to the subject of plant nutrition was probably the discovery of what he called auximones, or growth-promoting substances, in materials such as peat which had been subjected to the action of nitrifying bacteria. The acidity of the raw peat had first to be neutralised by the action of ammonifying organisms. Experiments at Kew and the Imperial

College of Science, as well as King's College, showed that a striking increase in growth occurred when small amounts of this bacterised peat were added to the soil. This led to the chemical fractionation of such treated peat, the extract being used to test the stimulus to growth of the aquatic plant *Lemna*, and other plants, in culture solutions. It was found that 368 parts per million added to the culture solution gave in six weeks an increase in weight of 62 times the control plants. Other equally remarkable results were obtained. Various papers on the subject were published in *Proc. Roy. Soc.* and the *Annals of Botany*.

The method was patented, and in the early years of the war great hopes were entertained that peat deposits in many parts of the world could thus be made of direct service in stimulating food crop production. The controversies to which this commercialising of the process led, together with the loss of a son in the war, no doubt contributed to Prof. Bottomley's subsequent breakdown.

The discovery of auximones will remain a landmark in the long history of plant nutrition. These substances differ from vitamins in that they will withstand a temperature of 150° C., while the latter are largely destroyed by boiling. Moreover, unlike vitamins, auximones apparently have no effect on animals. They are probably derivatives of nucleic acid, and appear to be generated in soils through the activity of soil bacteria. Their presence indicates that these bacteria stand in somewhat the same relation to plants that plants do to animals; for the auximones appear to be bacterial products stimulating plant growth, while the vitamins are plant products which are essential for healthy animal development.

It is greatly to be hoped that these remarkable growth-stimulating substances can be isolated, their composition determined, and the method of their production standardised. They would then be of the utmost value to agriculture.

Prof. Bottomley was a member of the Council of the Royal Botanic Society, Regent's Park, where some of his experiments were carried out. He leaves a widow and two sons at Huddersfield, where the family removed from Hampstead a few months before his death.

R. R. G.

DR. H. N. DICKSON, C.B.E.

HENRY NEWTON DICKSON, born in Edinburgh in 1866, studied at the University of Edinburgh and came under the influence of the remarkable activities in experimental physics, meteorology, and oceanography directed by P. G. Tait and G. Chrystal in the University and by A. Buchan and John Murray outside. Like many other Edinburgh students of the later 'eighties of the last century Dickson seized the opportunity of acting as volunteer assistant in the work of the *Challenger* Commission, the Scottish Marine Station, and the Ben Nevis Observatory, and by this practical training in physiography he was fitted to take up the reviving study of geography on a basis of sound physical science. Thus, while his researches dealt exclusively with the special fields of meteorology and oceanography, his appointments were mainly in

the teaching or the application of geography in its wider aspects.

In 1891 Dickson was engaged at the Marine Biological Association's laboratory at Plymouth in investigations on the salinity and temperature of the English Channel, and on his removal to Oxford in 1893 he extended this work to the whole surface of the North Atlantic. The water-samples were obtained by the officers of Atlantic liners and analysed by Dickson in the University chemical laboratory. It took several years to bring the methods of collection and discussion to perfection, and finally, with the co-operation of the Meteorological Office, Dickson produced his most important work, "The Circulation of the Surface Waters of the North Atlantic Ocean," which appeared in the *Philosophical Transactions* for 1901, and included monthly maps of temperature and salinity for the two complete years 1896 and 1897. This won him the Oxford D.Sc. degree in physical geography.

At Oxford Dickson joined the lecturing staff of the School of Geography and was very successful as a teacher. He moved to Reading in 1906, where he acted as professor of geography in the University College until 1920. During the war he gave practically his whole time to work at the Intelligence Division of the Naval Staff, where, amongst other duties, he undertook the preparation of an important series of handbooks descriptive of regions in which military operations were being carried on or where they might occur. For this he was decorated with the C.B.E.

In 1893 Dr. Dickson published a small volume on "Elementary Meteorology," which showed originality in conception and presented the principles of weather study in a very attractive form. This was followed in 1912 by a little book on "Climate and Weather," which was equally happy. He also wrote a book on "Maps and Map Reading." Dickson devoted much time to the study of underground water in the chalk formations near London, and the outbreak of war interrupted a most important investigation on which he was engaged with regard to the evaporation from an exposed water-surface. For this purpose he devised an automatic recording evaporimeter, which, so far as can be ascertained, was never made available for general use.

For many years Dr. Dickson was regular in attending the meetings of the British Association, acting as Secretary and Recorder of Section E, and in 1913 he was President of the Section. He was also a member of Council of the Royal Meteorological Society for many years and was President of the Society for 1911-1912.

His last work was in the Editorial Department of the additional volumes of the "Encyclopædia Britannica" for the 12th edition. Into this, as into all his other work, he threw his whole heart, and probably the most remarkable feature of his character was his indefatigable energy in whatever he undertook. He was married in 1891, and leaves a widow, a son in the Royal Navy, and a daughter.

H. R. M.

WE much regret to learn from the Lister Institute that Mr. A. W. Bacot, head of the department of entomology, died at Cairo from typhus on April 12.