

the same mineral species. Stupendous chemical formulæ have to be assigned in order to explain even approximately the relative proportions of the different elements in some well-known types.

It seems to me that the position becomes clearer when we consider the compounds as an embroidery of the metal atoms upon an oxygen framework. We may compare the oxygen framework to the steel girder system of a large ferro-concrete building in course of construction, which is intended to be divided into sets of flats. Before the girder system is filled in, its configuration is very simple indeed. Then certain blocks of it are partitioned off into sets of rooms, each comprising a flat; these flats are the more complex units of pattern in the crystalline structure. The arrangement of the rooms in each flat corresponds to the selection in our oxygen framework of certain spaces in which to put the metal atoms. We can go one step further, and rent our flats to families of slightly different composition, so that a census of the whole building shows a bewildering proportion of types of inhabitants difficult to represent by a definite family formula. This is really the state of affairs with which the chemist is confronted when he

attempts to give a formula to many of the silicates.

Some of the very earliest structures which were analysed caused us to revise our ideas of what was meant by the 'molecule' of the chemist. In sodium chloride there appear to be no molecules represented by NaCl. The equality in numbers of sodium and chlorine atoms is arrived at by a chess-board pattern of these atoms; it is a result of geometry and not of a pairing-off of the atoms. This is, of course, not universally true, for this absence of the molecule in solids is in general only found in inorganic compounds. It would appear, however, that the silicates are of this non-molecular type, and that in seeking to assign formulæ to them, and to the hypothetical acids of silicon on which they are based, it should be borne in mind that they are really extended patterns. The relative numbers of their constituent atoms are characteristic of the extended pattern, and essentially a result of their solid state, so that it is doubtful whether a grouping of the atoms into molecules has in this case a meaning. It will be very interesting to see what further light the X-ray results can cast on the relationships in this fascinating series of compounds.

Obituary.

PROF. RUDOLF MAGNUS.

THROUGH the sudden and untimely death, at the age of fifty-three years, of Rudolf Magnus, professor of pharmacology in the University of Utrecht, the world of science loses one who had for some years past been one of the outstanding figures in experimental medicine. At this moment there is nearing completion in Utrecht, and to be opened this autumn, a fine new Institute of Pharmacology, given by the Rockefeller Foundation with the primary object of widening the opportunity for and increasing the influence of his investigations. These, for some eighteen years past, have issued in an imposing series from the picturesque laboratory which Magnus had evolved, with great ingenuity, from a small monastic plague-hospital. The many who knew and admired him had thought of him carrying on his brilliant work for at least two further decades, and touching a growing circle with his ideas and his enthusiasm, under material conditions at last worthy of his genius.

Magnus is most widely known for the work which he, with a brilliant group of collaborators, has carried out during the past eighteen years on the functions of the central nervous system, and, in particular, on the reflex mechanisms involved in the assumption and maintenance of bodily posture, in normal relation to the earth's surface. He had spent several periods in British laboratories, with Schafer in Edinburgh, with Langley in Cambridge, and with Sherrington in Liverpool. From the last-mentioned association he received the stimulus which resulted in this best known and most important phase of his work. In Utrecht he had invaluable co-operation in this line of investigation from De Kleijn, Raademaker, and others; Dr. de Kleijn has won eminence as an otological surgeon

without relinquishing his position as assistant in Magnus's department of pharmacology. The results of this work have appeared in a long series of papers, and have been embodied by Magnus in a masterly monograph on "Körperstellung," published in 1925. In the same year he gave a brilliant summary of the work in the Croonian Lecture to the Royal Society.

This work on the central nervous system, which attracted physiologists and neurologists from all over the world to Utrecht, represents, however, only one side of Magnus's scientific activity. Before his appointment to the Utrecht chair, he had been for a long term of years attached to the department of pharmacology at Heidelberg under Gottlieb. During this period he published a series of important papers of a more definitely pharmacological interest. Among the items of this earlier work may be mentioned his introduction of the method of studying the activity of mammalian unstriated muscle, by the simple technique of suspending the organ containing it in warm, oxygenated Locke-Ringer solution. Magnus, unlike some of the many who have since used it, always had clearly in view the true value and limitations of the method, and even in recent years his pupils were still busy with its application to isolated layers of the intestinal wall, with results leading to revision of his earlier conclusions as to the neurogenous nature of intestinal rhythm. By the use of this method also, in the Utrecht period, he and his pupils reached important conclusions concerning the significance of choline as a natural hormone of intestinal activity.

It is an astonishing fact, indeed, that Magnus made his Institute a centre of world interest in experimental neurology, without relaxing his

activity or his interest in ordinary pharmacology. He delivered his regular course on pharmacology, in a language newly acquired in middle life, served as a member of the commission for revising the Dutch pharmacopœia, and was one of the most active members of the two International Conferences on Biological Standards. In connexion with the latter he supervised important investigations on the standardisation of pituitary extract and digitalis, and made himself responsible for preparing the international standard sample of the latter. His laboratory, quite apart from its achievements in neurology, maintained a steady output of good pharmacological work. There lie on my table, at the time of writing, lectures on "The Experimental Pharmacology of the Lungs" and on "Choline as an Intestinal Hormone." These were two of the five which he had written for delivery in America on a visit projected for next year, and he had sent them to me for a final retouching, scarcely needed, of their English idiom. Presumably he had pressed himself too hard; but he left in good spirits for a holiday in Pontresina, where he died in his sleep after a day of active enjoyment.

Magnus was born in Brunswick, and, though domiciled since 1909 in Holland as a loyal and enthusiastic professor in Utrecht, he retained his German nationality and sympathies. During the War he returned to Germany for some years to conduct and organise research on defensive measures in chemical warfare. His strong national sentiment in no degree weakened his personal attachment to British colleagues, and he eagerly resumed the relations with British physiologists which had meant so much to him and to them, and had led them to regard him almost as one of their own community. He came as a welcome guest this spring to the fiftieth anniversary celebration of the Physiological Society, and was a candidate for election to its ordinary membership. Medical science has lost a great investigator, still in his prime, and a genial and inspiring personality.

H. H. D.

MR. G. C. CHAMPION.

THE death of George Charles Champion, coleopterist, on Aug. 8 at Horsell, Surrey, removes from the ranks of British entomologists one whose name has been a household word among them for more than half a century.

George Charles Champion, who was born in South London in 1851, began to collect and study beetles as a schoolboy, and before he was twenty years old he was recognised by the foremost coleopterists of that time as a field entomologist of more than ordinary energy and acumen. A large number of species were added by him to the British fauna previous to 1878, in which year he was offered a commission by the late F. DuCane Godman and Osbert Salvin to proceed to Central America and collect entomological material for the great faunistic work which they had recently commenced. Champion arrived in Guatemala early in 1879, and during the next two years traversed

many hundreds of miles on horse- and mule-back, from the Pacific coast to the Polochic Valley opening into the Caribbean Sea. The number of insects of all orders collected by him and sent home in first-rate condition from Guatemala was truly enormous, and even greater success attended his researches in Chiriqui, Colombia, where his last two years in Central America were spent. An admirable itinerary of his travels in this region appeared in the *Entomological News* for 1907, which is reproduced with additions in the introductory volume of the "Biologia Centrali-Americana."

Champion returned to England in 1883, and at once found congenial work as sub-editor of the "Biologia," and private secretary to Messrs. Godman and Salvin. Besides preparing, with the able assistance of the late Mr. Arthur Cant, the vast mass of Central American Coleoptera for the collaborators in the section of the great work devoted to the Insecta, he was entirely or mainly responsible for eight volumes dealing with that order, in which upwards of 4000 species of beetles were described by him as new. Another volume on the Rhynchota is also due to him, and his share in the production of the "Biologia" is generously acknowledged by the late Dr. Godman in the "Introductory Volume," which concluded the great undertaking in 1915.

Champion's favourite group of beetles was the Heteromera, and in 1895 he published in the Belgian *Annales* a list of the Tenebrionidæ supplementary to that of the great Munich Catalogue of 1869, which more than doubled the number of known species of that extensive family.

The name of Champion is especially associated with the *Entomologist's Monthly Magazine*. To the pages of this valuable serial he was one of the earliest and most constant contributors, and after he became a member of the editorial staff in 1891, his services in maintaining the high standard and character of the magazine have throughout been regarded by his colleagues as inestimable. He was also, for the last four years, one of the editors of the *Annals and Magazine of Natural History*.

In 1891, twenty years after his election as a subscriber, Champion succeeded the late Ferdinand Grut as librarian to the Entomological Society of London. He held this onerous office for nearly thirty years, and in 1893 he produced the first printed "Catalogue" of the Library, followed by a "Supplement" seven years afterwards. His modest and retiring character prevented his acceptance of the chair of the Society, but in 1925 he was one of the vice-presidents. He joined the Zoological Society in 1888, and in 1897 the Linnean Society elected him one of its associates. At the jubilee meeting of the South London Entomological Society in 1922, he was the sole surviving original member, having taken a leading share in the inception of this flourishing association. Steady, thorough, and meticulously accurate in all his work, and at all times ready to assist his friends and colleagues to the utmost of his power, his death leaves a gap in the ranks of British entomologists which it will be difficult to fill.

J. J. W.