Obituary.

PROF. W. WISLICENUS.

BY the death, on May 8, of Wilhelm Wislicenus, professor of chemistry at the University of Tübingen, organic chemistry lost one of its most fruitful research workers, who contributed in no small measure towards placing the science on the basis which it now occupies. He was born at Zürich on January 23, 1861, and was the eldest son of Johannes Wislicenus, that great organic chemist whose name stands on the roll of fame co-equal with those of Hofmann and Frankland. At the time of Wilhelm's birth his father, who had, in the previous year, moved from Halle to Zürich, where he had married Katherine Sattler, the granddaughter of Wilhelm Sattler, joint discoverer of "Schweinfurt green," held the chair of chemistry and mineralogy under the council of the Canton at the School of Industries. Wilhelm may be said, therefore, to have inherited his chemical genius both on his father's and mother's sides.

W. Wislicenus received his early scientific training at the University of Wurzburg, to which his father had moved, in succession to Adolf Strecker, in 1872, and it was from here that he published his first paper, "On a New Reaction between Potassium Cyanide and Phthalide," a reaction which he was able to prove to be of general application, and which he applied to a number of other lactones with fruitful results. In 1885 his father succeeded Kolbe at Leipzig, but Wilhelm continued to work at Wurzburg, and thereafter, until 1903, he published a series of important communications from these laboratories. In this year he removed to Tübingen, where he continued to work until shortly before his death.

The earlier work of Wilhelm Wislicenus is intimately associated with the behaviour of metallic sodium towards organic esters, a problem towards which the attention of many chemists of his time was directed, and in connexion with which his father had already published his epoch-making paper, dealing with ethyl acetoacetate and its application as a synthetic agent, in the "Annalen" of 1877. Indeed, we are told by W. H. Perkin in his Johannes Wislicenus memorial lecture that the laboratory at Wurzburg was, during the early 'eighties of the last century, busily engaged in carrying out syntheses by the aid of ethyl acetoacetate and ethyl malonate. It is not surprising, therefore, that the young Wislicenus should have followed the general trend, and that one of his earliest papers, published from Wurzburg in 1886, should have dealt with the interaction of metallic sodium on a mixture of ethyl acetate and ethyl oxalate, as an outcome of which he was able to discover ethyl oxalylacetic ester. Wislicenus at once realised the importance of this discovery, and he was able later, both by himself and in association with his co-workers, to apply the new reaction to the preparation of a large number of α-ketonic esters, and, indeed, our knowledge of these important substances is mainly due to him.

About this time, also, the general question of the movement of a hydrogen atom from carbon to oxygen, as illustrated by the behaviour of ethyl acetoacetate, and the co-ordination of this phenomenon with others, notably that exhibited by hydrocyanic acid, was receiving considerable attention, and, in 1885, C. Laar published his famous hypothesis in which he coined the word "tautomerism." Laar imagined oscillatory conditions within the molecule which caused the hydrogen atom to take up one or other position alternately. He therefore presupposed the simultaneous existence of both modifications, or, in other words, he considered that the phenomenon was intra-molecular and not inter-molecular. Even at the present time this problem is by no means solved, and it cannot yet be said that Laar was not right in regarding the basis of change as intra-molecular. Still, there is no doubt that, in one of its aspects, the Laar hypothesis did not provide for the existence of the tautomeric individuals, and it was, initially, due to W. Wislicenus that, in this restricted sense, the hypothesis was shown to be wrong. The discovery of the existence of two forms of ethyl formylphenylacetate was made by W. Wislicenus in 1887, during his experiments on the action of sodium on mixtures of organic esters. Earlier in the year Piutti had shown that when a mixture of ethyl acetate and ethyl formate was used in this reaction the expected ethyl formylacetate was not produced, or if produced, at once underwent inter-molecular condensation yielding the aromatic compound trimesic ester. In order to avoid this, Wislicenus replaced the ethyl acetate by ethyl phenyl acetate and obtained the open chain formyl esters. He showed that the two esters he isolated were distinct substances, one a liquid giving pronounced enol reactions, the other a solid which possessed the characteristic properties of the keto modification. Since that time many examples of the same kind have been recorded, several of which have been discovered by Wislicenus and his pupils. The whole question is summarised in a lecture given by him at Leipzig in 1897, embodied later (1898) in one of the Ahrens' Sammlungen, in which he clearly enunciates his view that tautomeric phenomena are reversible isomeric changes. Prior to this, in a paper published in the *Berichte* for 1895, the following passage occurred: "Über die Natur der Isomerie ist eine Entscheidung wohl erst nach ausführlicheren Untersuchungen zu treffen, wenn es mir auch am wahrscheinlichsten zu sein scheint, dass hier die bei den Aldehyden, Ketonen, und β-Ketonsaurenestern vermisste tautomeren Formen vorliegen"; a view which was to receive full verification in the later work of Kurt Meyer and Knorr.

Wislicenus continued to work on the general question of tautomeric change for many years after this, and in 1912 he published a further paper in the *Annalen* dealing with the chemistry of ethyl formylphenylacetate. By that time four isomeric modifications had entered the field, but, in the paper quoted, he strongly expresses his view that only two of these, namely, the liquid α-form (enol) and the solid γ-form (M.P. 100°, enol-aldo), are chemical individuals. The β-form (M.P. 70°) and Michael's modification (M.P. 50°) he regards as mixtures of the α- and γ-forms. In 1916, in a paper also published in the *Annalen*, he describes the two forms of the methyl ester of phenylformylacetic acid, both of which are solid, and discusses the curious property of the β-form of combining with methyl alcohol.

It was not, however, in this field only that the experimental skill and keen insight of Wislicenus found scope. His activities in other branches of the science, too numerous to mention in a short monograph such as this, find expression in upwards of one hundred communications, published chiefly in the *Annalen* and in the *Berichte*. Nevertheless, some of these cannot be passed over without comment. For example, in 1892 he discovered a new and simple method for the preparation of hydrazoic acid by causing ammonia and nitrous oxide to react in the presence of sodium. Later, in 1905, in conjunction with Otto Dimroth, he utilised the sodium azide thus formed for the preparation of the simplest organic azide, methylazide (CH_3N_3), by causing it to react with methyl sulphate.

One of the most frequently occurring phenomena met with during the course of organic chemical reactions is that which involves the movement of groups, such as the hydrocarbon radicals, from one element to another, a change which appears to be closely related to that which is associated with the movement of a hydrogen atom within a tautomeric system. Numerous well-known reactions, such as, for example, the Hofmann synthesis of primary amines, the Beckmann rearrangement, and so forth, involve a transference of this kind, and it is, therefore, of interest to note that Wislicenus was able to discover certain typical examples of the migration of an alkyl group from oxygen to nitrogen, and to study the conditions under which the change occurred. Thus, in 1900, he showed, in conjunction with M. Goldschmidt, that phenylformiminoethyl ether, $OEt.CH{=}NPh$, is converted, to the extent of about 40 per cent., into the isomeric methylformanilide, when it is heated at 230-240°. Later he was able to prove that the C-methyl ether of caffeine is readily converted into the N-methyl derivative.

Wilhelm Wislicenus was the distinguished son of a distinguished father. His name will always occupy a foremost place in the front rank of the organic chemists of his time. J. F. T.

DR. A. G. MAYOR.

THE death of Alfred Goldsborough Mayor, at the comparatively early age of fifty-four, deprives the scientific world of a worker whose experience in tropical marine biology was unrivalled. Mayor stood in the direct historical succession of American participation in this field, for as the mantle of Louis Agassiz fell on his son Alexander, so did Alexander's mantle fall on the shoulders of Alfred Mayor, who accompanied him as assistant on many of his wanderings in the Pacific. When, in 1904, Mayor was appointed director of the Marine Biological Department of the newly founded Carnegie Institution of Washington, he really entered into his inheritance, and though so many of the projects of his fruitful brain will never mature, the work which has been accomplished at his laboratory in the Tortugas, Florida, and during many expeditions, forms his imperishable monument.

This laboratory, where Mayor died on June 24, is situated at the southernmost point of the United States, 70 miles west of Key West, on a tiny island (Loggerhead Key) which is surrounded by the purest ocean water. It was selected for this especial reason, for Mayor felt that nowhere else in Florida could the proper conditions for the experimental investigation of marine animals be secured. The position is not without disadvantage, and it is generally considered advisable to close down for the autumn hurricane season and for the winter, during which Mayor carried out his expeditions to other seas and islands. The Tortugas Laboratory was generally only available between early May and the end of July. This, however, is the most suitable time for the university research workers of the United States, from whom Mayor drew his investigators by personal invitation. These invitations, to work free of all expense and with payment of travelling expenses, were freely issued to all those whom he felt had some problem which could be favourably attacked at the Tortugas, and until that problem was, as nearly as possible, solved, no pressure embarrassed the research, but season after season it was his custom to reinvite those who had studied with him before and put in their way opportunities which he felt they might have missed before.

The success of his policy is to be seen in the splendid list of researches which stands to the credit of the Tortugas Laboratory. His own publications range widely over systematic zoology ("The Medusæ of the World," published in 1911), comparative physiology (especially the series of studies on the jelly-fish Cassiopea), the physicochemical properties of oceanic water, and biological problems like the growth rate of corals, and reflect his many-sided personality and his abounding energy. The work of his colleagues in whatever subject shows his direct interest and influence and the pains which he took to provide the most complete and satisfactory equipment. Whatever novel line of investigation was likely to throw light on marine work was certain of his most enthusiastic co-operation, and in this connexion may be mentioned the encouragement given to workers on the bacteriology of sea-water, like Harold Drew and Lipman, and the development of scientific under-water photography by W. H. Longley.

The expeditions which Mayor organised and carried out are too numerous to mention, but those to Murray Island, on the Great Barrier Reef, in 1913, and to Tutuila, in American Samoa, in 1915–20, really broke fresh ground in the investigation of tropical marine faunas. At both places he made an intensive study of the coral reefs and was able to demonstrate certain very interesting relations between the physiological characteristics of the different reef corals and their position and development on the reef. These and many other problems of importance were attacked by Mayor and his co-workers, but all the results are not yet published.

Mayor was as faithful in friendship as he was fascinating as a companion. The energy and vitality of his body and mind, his dramatic sense, the tenacity of his memories of men and countries, the range and grasp of his knowledge, all never failed to rouse the admiration of his friends. Something has been said of the zeal with which he furthered the efforts of those who worked with him. It could even be stated that