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GERHARD KRÜSS.

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THE death of Professor Krüss at the early age of thirty-five, and in the midst of a career already remarkably brilliant and fruitful, will be keenly felt by all, and especially by those who have known him as teacher and friend.

He was born at Hamburg on the 14th of December, 1859, his father being the well-known optician A. Krüss. In 1879 he went to the University of Munich and entered upon the study of chemistry with Baeyer and Zimmermann as his teachers. The summer semester of 1881 he spent at Heidelberg studying under Bunsen.

His early acquaintance with physical instruments, and especially with the spectroscope, led Krüss to a series of investigations, begun while he was yet a student, in the field of spectroscopic chemical analysis. In his first paper, which appeared in 1882, he described a method for ascertaining, by means of the spectroscope, whether two colored solutions, when mixed, act chemically upon each other or exist together unchanged. Pursuing this question still further he obtained the interesting results which are recorded in the series of articles upon "The relation between the composition of organic compounds and their absorption spectra," wherein he proved by many measurements of the absorption bands of indigo and fluorescein and their derivatives that the introduction of methyl, oxymethyl, ethyl, or bromine in the place of an atom of hydrogen moved the absorption in the spectrum towards the red, while the introduction of a nitro

or amido group had the opposite effect. Krüss saw and clearly described the practical bearing of these discoveries, and as a result the spectroscope is now employed at Höchst, both for the examination of the purity of known dyes and as a guide to the production of new ones.

Krüss was also greatly interested in the application of the spectroscope to quantitative determinations, his researches upon this subject being largely recorded in the book which he and his brother, Hugo Krüss, published in 1891—*Kolorimetrische und Quantitative Spektral-analyse*. In 1892 appeared his book upon the use of physical methods in chemistry, entitled *Spezielle Methoden der Analyse*.

Krüss's first strictly chemical researches were taken up under the able guidance of Clemens Zimmermann, at whose suggestion he undertook the investigation of the sulphur compounds of molybdenum, thus continuing the studies in the chromium group which Zimmermann had so brilliantly begun by his researches upon uranium.

After the death of Zimmermann (March, 1885) Krüss turned his attention to the study of the compounds of gold. In these investigations, which extended from 1886 to 1893, he corrected the older statements concerning the gold oxides, showing that only Au_2O , Au_3O_2 , and Au_2O_3 exist, redetermined the atomic weight of the element, measured the spark spectrum given by a neutral solution of gold chloride, and, partly in connection with his students, investigated the compounds of gold with the halogens and with sulphur.

In 1886 he became Privatdocent at Munich, and in the following winter, 1886-7, he visited Nilson in Stockholm, beginning, under the guidance of that eminent investigator, his study of the rare earths. The remarkable industry with which they prosecuted their mutual researches is evidenced by the number and importance of the contributions appearing under their names in the *Berichte* for 1887.

The wide reputation which Krüss had thus so early won attracted to Munich many enthusiastic workers in the domain of inorganic chemistry, and the obtaining of a place in his private laboratory was a privilege that was eagerly sought. Upon those

who had the good fortune to work under his immediate direction the attraction exerted by his ability and wide and accurate learning was quite equaled by the charming personality of the man. Quiet and unassuming in manner, and never prone to dogmatic direction of the work in hand, he yet gave to each piece of research a critical attention and kindly and suggestive criticism that was wonderfully helpful and inspiring. Although he could scarcely be called either a graceful or a fluent lecturer, he possessed to an unusual degree originality and clearness in exposition. In May, 1890, he was advanced to the professorship of analytical and special inorganic chemistry in the University of Munich, and this position he held at the time of his death.

The latter part of Krüss's work lay chiefly in the obscure and difficult field of the rare earths, and while these researches are too numerous to admit of detailed mention here, a glance at the mere titles will suffice to show their variety and extent. Besides critically studying the characteristics of many of the different "earths," he greatly developed the methods of separation and examination of these allied elements. Among the many other admirable papers which appeared in the meantime there may be mentioned that with Moraht upon glucinum, with Ohnmais upon the sulpho-salts of vanadium, and with Thiele upon the condition of iodine in solution and the probable cause of the differences in color of its solutions.

The services of Professor Krüss to inorganic chemistry were still further increased by his founding in 1892 the *Zeitschrift für anorganische Chemie*, a journal which he edited with great skill and success. It met with very favorable reception from the beginning, and in the short space of three years it has fully attained what Krüss stated in his introduction to the first volume to be its goal—"to materially advance the development of inorganic chemistry."

The illness to which Krüss finally succumbed began as far back as last October, but in spite of bodily suffering he resolutely continued his lectures and instruction at the laboratory. With the new year, however, his strength began to fail and, gradually sinking, he finally passed away early on the morning of the third of February.

To those who knew Krüss and his work there will recur, as

aptly characterizing him, the words of Berzelius about Liebig—
 “The man unites, to an unusual degree, unassuming amiability
 with extraordinary industry and rare scientific ability.”

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