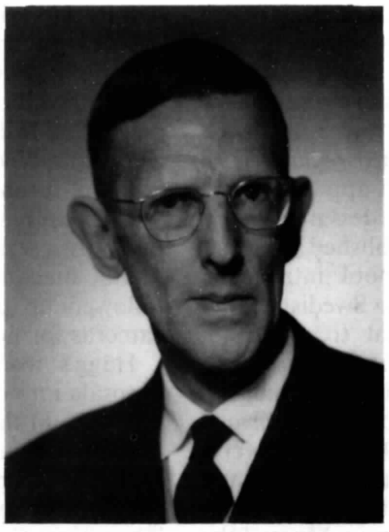
J. Appl. Cryst. (1987). **20**, 1–2

Obituary



Gunnar Hägg

14 December 1903 – 28 May 1986

When Gunnar Hägg died, chemical crystallography lost one of its great pioneers. The introduction of X-ray diffraction methods into inorganic chemistry produced a revolutionary transition and revitalization of the subject, and Hägg played a major role in this development.

He obtained his licentiate degree in chemistry at the University of Stockholm in 1926 with a study of the hydrolysis of sodium silicate solutions. Looking for a topic for his doctoral thesis, Hägg sought the advice of Professor Arne Westgren, who had been studying various alloy systems by X-ray crystallographic methods for some years together with Gösta Phragmén. Westgren enthusiastically described the thrills of the X-ray work: 'one nearly has the feeling of touching the atoms'; and so Hägg decided to start working in that field.

One of his first ideas, to investigate silicates as a kind of continuation of his previous research, was dropped in consideration of the breakthrough in that area by W. L. Bragg and his school. Instead, Hägg decided on a subject closer to those already being studied at Westgren's laboratory. Thus he was prompted to start with the system iron–phosphorus. His research was soon extended to include the other systems of iron combined with the fifth-group elements, and the results were presented in his doctoral thesis in 1929. Professor Gregori Aminoff was the 'faculty opponent' at the public defense, which earned Hägg the title of docent.

The kind of compounds found by Hägg in these alloys, with the small non-metal atoms occupying varying proportions of the spaces between the larger metal atoms, was very different from the idea at the time of what a chemical compound should be like. Hägg described the structures as interstitial solutions.

Further studies on metal–non-metal systems yielded deepening insights into the structural chemistry of important groups of non-molecular solids. Hägg found that the 'excess of sulfur' in the pyrrhotite iron sulfide is due, not to the assumed substitution of sulfur for part of the iron atoms, but rather to randomly distributed vacant iron positions. Hägg summarized and analyzed the various kinds of solubility mechanisms observed and their relations to compositional variations, in his classic paper on 'solid solutions with a varying number of atoms in the unit cell'. By this and other fundamental contributions to the crystallography of inorganic compounds, Hägg became one of the founders of structural solid-state chemistry.

The period up to 1936, which Hägg spent at Westgren's laboratory, was a scientifically most productive and fortunate time. He could concentrate on research in the stimulating company of Westgren and his co-workers. Besides studying crystal structures, Hägg had ample opportunities to make use of his unique talent as an apparatus designer. Together with Phragmén he constructed focusing powder cameras of the Seemann–Bohlin type, with remarkable resolving power and radiation intensity. He also built the first Swedish Weissenberg camera.

In 1936 Hägg moved from Stockholm to become Professor of (inorganic) chemistry at the University of Uppsala. This was a drastic change of environment, from the flourishing scientific milieu in Stockholm to a laboratory where almost no research in inorganic

0021-8898/87/010001-02$01.50

chemistry had been done for decades, and where the subject was taught in an outdated routine way. Hägg thus had to start from scratch in his efforts to transform the sleeping laboratory into an efficient modern unit of teaching and research. This meant that he had to give up his research almost entirely for a considerable period of time.

The theoretical background of much of the new experimental laboratory curriculum now introduced was presented in Hägg's textbook *Kemisk reaktionslära* (*Theory of Chemical Reactions*), which appeared in its first Swedish edition in 1940. (Besides nine more Swedish editions it has also been published in Swiss, Korean and Spanish versions.) The book introduced the acid–base concept of Brönsted into Swedish teaching and emphasized a mathematical treatment of chemical equilibria. A stringently logical approach to the subject was a characteristic of Hägg's teaching, as further evidenced in his great textbook *General and Inorganic Chemistry*, published in 1963, with several following Swedish editions and also an English one.

The building of a research laboratory at Uppsala proved to be a time-consuming operation. Most of the equipment was designed by Hägg and built in the laboratory or at other workshops. Thus, good X-ray machines, X-ray tubes and cameras became available and were used in the early forties by several young research students. From the mid-forties, the number of research papers from the laboratory grew at a high rate as the research staff expanded.

In the steady flow of papers, which soon earned the laboratory a high international reputation, it is striking to find that Hägg's name rarely appears among the authors. This observation might give an entirely wrong impression of his role in the research. In fact, Hägg was the inspiring and guiding leader, who showed an unusual generosity in giving away research ideas to his students, and who followed the progress of their work with advice and never-failing interest. However, he consistently refused to appear as a co-author if he had not contributed to the work in a decisive way. This was rarely possible for him, as the size of the staff grew and his duties as head of the laboratory and other tasks within and without the University expanded. In the choice between doing research of his own and developing and improving the research possibilities and facilities at the laboratory, Hägg gave priority to the latter activities. He designed a host of new instruments, such as Guinier-type and high-temperature cameras, various kinds of furnaces for preparative work, and together with T. Laurent, an analogue computer for summation of Fourier series, which was of invaluable help before digital machines came into use. As emeritus Hägg followed up this line of interest by building X-ray cameras for non-ambient conditions.

Hägg's work developed the X-ray laboratory at Uppsala into one of the best crystallographic research institutes in the world. This was not only a matter of first-class equipment, but no less a question of how Hägg, by his personal influence, was able to create a rare atmosphere of cooperation and solidarity at the laboratory. Over the years it attracted a large number of research students, many of whom now hold prominent positions in Swedish academic and industrial life.

Hägg was charged with many commissions of trust, and belonged to several academies. He served on the Nobel Committee for Chemistry 1965–1976 (as chairman in 1976). He was vice-president of the International Union of Crystallography 1951–1957, and during that period he was also a member of the Union's Commissions on Crystallographic Apparatus and on *Structure Reports*.

Gunnar Hägg's greatness as a scientist was combined with modesty and complete personal integrity. He was admired by his scientific colleagues and dear to his friends. He deserves to be remembered.

ARNE MAGNÉLI