I. FANKUCHEN

1904—1964

In Professor Isidor Fankuchen, death took from our midst, on June 28th, 1964, one of the most colourful professors, and a scientist of great competence and unfailing enthusiasm for his subject, Crystallography. Fully exhausted from the two-week summer school, while its ending was still being celebrated in the laboratory, he had to be taken to hospital; blood transfusions prolonged his life and at first justified moderate hopefulness. Then he succumbed to the cancer for which he had already twice undergone major operations in recent years.

Fan, as he was called by all his friends, was born in Brooklyn, in 1904. He took an early interest in Physics, and, having to earn his living, set up a radio repair and installation shop in Brooklyn. This enabled him to follow courses at Cooper Union and to obtain his B.Sc. there in 1926. He then went to Cornell University where he graduated with an M.Sc. and a Ph.D. degree under C. C. Murdock. Having obtained from Cooper Union the Schweinburg Fellowship, he spent on W. L. Bragg's invitation a year in the laboratory in Manchester where he applied the new methods of Patterson synthesis and Beevers & Lipson strips to the determination of the structures of sodium- and silver-uranyl acetates. An extension of the fellowship enabled him to work from 1936 to 1938 at the Crystallographic Laboratory in Cambridge, which was then directed by J. D. Bernal. Here Fankuchen was

involved in the continuation of the work which led to the production of the first systematic list of cell dimensions of crystalline sterols and was published by Bernal, Fankuchen & Crowfoot in the *Transactions of the Royal Society*. He arrived in Cambridge in time to participate in the first work on the crystalline virus of tobacco mosaic. Here, the problem was to produce sufficiently intense monochromatic radiation for low-angle diffraction. Fankuchen devised a very ingenious monochromator, obtained by cutting a pentaerythritol crystal at a small angle to the basal plane, so that X-rays were incident on a large area and emerged, concentrated, from a small one. With this he participated in the work on the first stage of the virus investigation, namely those concerned with the relative positions of the particles, which was fundamental to the understanding of long-range forces in liquids. The discussion of higher-angle diffraction gave the intra-particle structure and resulted in the now classical paper on the tobacco mosaic virus. When Bernal left for London, Fankuchen accompanied him and stayed over during the first months of the war.

Back in the U.S.A., after short periods of teaching at M.I.T. and at the Anderson Institute of Biology in Red Wing, Minnesota, Fankuchen came in 1942 to the Polytechnic Institute of Brooklyn, where he remained until his death. Together with H. Mark and others he worked on the ice-float wartime project. It was largely through his efforts that a very strong school of Solid State Research by X-ray Diffraction was established at Poly. Fankuchen's enthusiasm as a teacher to young and old knew no bounds and was truly catching. By the number and variety of pupils he had at the Institute proper and in the yearly 'summer clinics', and among those he addressed in the many talks and short courses he gave in other academic or industrial connections, Fan might well go into history as the Apostle of X-ray Diffraction. His propaganda for X-ray methods was aggressive in the best sense and resulted in converting doctors, journalists, industrial managers, as well as selected high-school students, into active, hard-working crystallographers for the duration of the summer clinics. Fan was proud of many of these pupils whom he liked to speak of as his fourteen-day-wonders.

Before World War II only a few types of X-ray tube, standardized to the needs of the medical profession, were commercially available in the U.S.A., and a similar scarcity of U.S.A.-produced camera types made the importation of European equipment a necessity for any serious research. It was on Fankuchen's instigation, and with his help, that the North American Philips Company began offering special equipment for X-ray diffraction work and to develop this line by appropriate research. At present a number of large and small firms are offering highly specialized equipment.

Whatever research Fan took up, his approach was an original one and in developing the method he was led by his own experience. This holds for the small-angle scattering in the virus and sterol investigation which he later applied to the determination of the fibre diameter in chrysotile, measuring periods of the order of 200 Å; it also holds for his low-temperature work on substances that are normally gaseous, where, by a clever counter-flow and heating arrangement, he prevented unwanted ice formation and allowed for the controlled re-melting of polycrystalline condensations so as to obtain single crystals. His last, highly promising but unfinished investigation is on an anomalous diffraction accompanying the total reflection of X-rays by thin flat films (*Phys. Rev.* 1963, **132**, 1544).

A Enumeration of Fan's 95 published papers would convey but an imperfect picture of his great influence on the general level of X-ray work in the U.S.A., and, through his many pupils from abroad, in many other countries. By his often quite outspoken but never hostile and usually well-founded criticism he raised the standard of presentation of papers at meetings and stimulated the authors to further research. He was a successful consultant to a number of firms and convinced them of the value of having their own X-ray departments. He had an unsurpassed eye for detecting faults even in the bleak tables of the lines of powder diagrams, and his invariable comments on the early ASTM collection of powder diagrams led to a significant improvement of their quality.

Fankuchen took a keen interest in the organizational problems connected with crystallography. He belonged to the group of American crystallographers who, as the forerunner of a National Committee, discussed in London, 1946, the desirability of establishing an International Union of Crystallography, which would become a member of the International Council of Scientific Unions (ICSU). Just prior to the formation of the Union in 1948, the two U.S. societies that

took the greatest interest in diffraction methods, namely the American Crystallographic Society and the Society for X-ray and Electron Diffraction, amalgamated in the American Crystallographic Association (ACA) and Fankuchen was made its first President. He also belonged for many years to the U.S. National Committee for Crystallography, and, at the time of his death, was its Chairman.

At the London meeting of 1946 it was decided to create an international journal of crystallography that should be owned by the Union, and Fan was proclaimed its American Co-editor. As such, Fan has rendered a very important and strenuous service to the progress of crystallography. In the 16 years of *Acta Crystallographica*'s present existence more than 1500 manuscripts went through his hands, and unknown but numerous are the authors who owe to his watchfulness the elimination of slips and of grave errors from their manuscripts before they went to print.

Unselfishness and unstinted help to others were characteristic of Fan's warm personality. An unbendable sense of justice and great personal courage accompanied this. Intellectually, Fan was one of the quickest to perceive a new idea, and also to detect the flaws in a reasoning. The blending of all these qualities made him a great editor and teacher. He was sincere and true in his friendship and will be deeply missed by the many who received so much from him.

His memory will be kept alive by a Fankuchen Memorial Scholarship which is to be established at the Polytechnic Institute of Brooklyn, the scene of his devoted activity.

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