

Felix Frolow (1947–2014)

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On 28 August 2014, the crystallographic community lost one of its most energetic, influential and beloved members with the passing of Felix Frolow.

He was 67 years old. All who knew him throughout the years, either in person or through communicating with him, felt the pain of the loss.

Felix Frolow was educated as a physicist, completing his Bachelor and MSc studies at the Gorky State University in the USSR. He immigrated to Israel in 1972 and a few months later he began his PhD studies in crystallography with Professor Dov Rabinovich in the department of Structural Chemistry at the Weizmann Institute of Science, Rehovot, Israel. Almost immediately, his studies were interrupted by the outbreak of the 1973 Yom Kippur War and his call to reserve duty. But later, after completion of his thesis on porphyrin structures, Felix was made the Head Scientist of the X-ray Crystallography laboratory of the Weizmann Institute, a position he held for 17 years.

As head of the crystallography laboratory Felix continued to work on small-molecule organic and organometallic structures. He contributed to seminal X-ray and neutron studies on reduction of symmetry, crystallography of Langmuir films, biomineralization and natural products. During that time, Felix worked together with Professor Håkon Hope in pioneering the budding field of cryocrystallography and flash freezing, a method that essentially changed protein crystallography. They experimented with viscous oils and any odd material they could think of, such as the resin component of epoxy glue, and with glass spatulas optimized for crystal size glued to a glass fibre.

Oded first met Felix in 1985 at the Weizmann Institute while doing graduate studies in protein crystallography. Felix guided Oded in the X-ray laboratory taking precession and Weissenberg photos as well as data collection on a four-circle diffractometer.

Although he was primarily a small-molecule crystallographer it was around this time that Felix first began to work on proteins, with the crystal structure of acetylcholine esterase. Together with Drs Christian Oefner and Michal Harel, Felix made an immense contribution to the phasing process that led to traceable electron-density maps and ultimately to this groundbreaking structure from the Sussman group. Through his work on this structure, his interest in protein crystallography dramatically increased – he was hooked! He made the transition from small-molecule to protein crystallography. He worked with a large number of collaborators and made significant contributions to nearly every X-ray structure solved at the Weizmann Institute. These included such diverse projects as bacterioferritin, halophilic ferredoxin, conconavalin A in complex with metals and sugars, DNA structures, garlic alliinase, alcohol dehydrogenases and cellulosomal modules such as cohesin and CBM's – the list goes on and on.

In 1998 he moved to Tel Aviv University, where he received his professorship and established his own research laboratory. He introduced the field of protein crystallography to Tel Aviv University where he founded the first macromolecular X-ray laboratory and protein crystallization facilities. Moreover, through his efforts, teaching and research, structural biology at Tel Aviv took root and began to flourish. His unique capabilities and insight paved the way for new collaborations as well as the recruitment of a younger generation of structural biologists and the expansion of the field at Tel Aviv University.

Felix had a deep understanding of the nuts and bolts, the essence, of crystallography. He had a special interest in high-resolution protein structures and the challenges associated with collecting very high resolution data.

He formed collaborations within the University, promoting numerous projects, such as biological nanotechnology and in particular, cellulose active systems. One of the high profile projects was that of photosystem-I complexed with four light

harvesting molecules (in collaboration with Nathan Nelson) where Felix played a pivotal role in promoting the project, with his unique understanding that the phasing power of the intrinsic FeS clusters could be combined with derivative phasing to solve the structure that was ultimately published in *Nature*. At the time of his passing, Felix was actively working (with Professor Abdussalam Azem) on a challenging project where he solved the structure of the human mitochondrial chaperonin football complex.

Felix loved his work, which gave him so much joy and fulfillment. He was a fearless and tireless experimentalist with deep understanding of what he was doing. He enjoyed the process of structure solution and analysis. He regarded synchrotron trips (mainly to the ESRF) as pure fun, and it was our privilege to share these trips with him. He cared about the facility and since 1998 shortly after the Israel–ESRF collaboration was established, he made many data collection sessions, personally guiding students and remaining a fiercely 'hands-on' scientist. He valued and cherished the technical and scientific evolution and improvements, so notable from one trip to the next. He formed special relations with many of the staff members at the ESRF who appreciated his vast experience and valued his opinion and suggestions.

Many will know him or of him through his work as a Co-editor for *Acta Cryst. D* and then *Acta Cryst. F*. He was extremely proud of this position and the opportunity it gave him to contribute to the crystallographic community. He made the field of crystallography, and Israeli crystallography in particular, visibly better and he will be deeply missed.

Above all, Felix was a true and honest friend and colleague who could always be trusted and relied upon. Beneath a sometimes-gruff demeanor he had a huge heart, was generous to a fault, and compassionate in helping so many. He was a wonderful family man; a caring and loving husband, father and grandfather.