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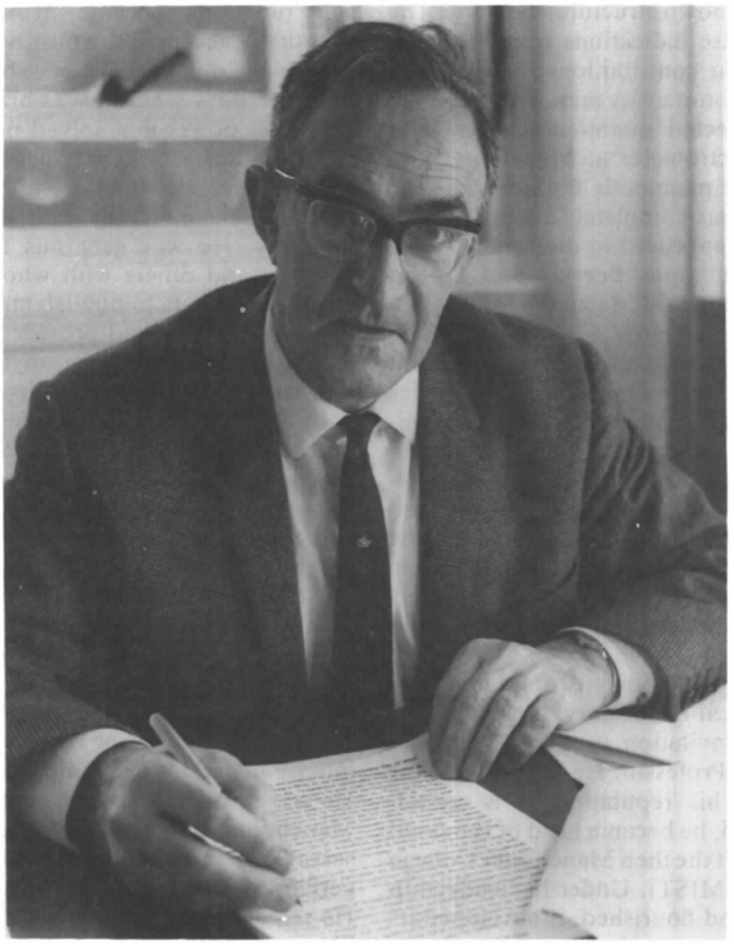
Obituary

Arthur Taylor



Henry Lipson
1910–1991

On 26 April 1991 crystallography lost a distinguished pioneer when Henry Lipson died suddenly and unexpectly. He was not a founder of the subject - that distinction belongs to the generation of Von Laue, W. L. Bragg and Ewald - but he was one of the key individuals who converted structural crystallography from an art into a science.

Lipson, the son of a steel worker, was educated at Howarden County Grammar School and went on to obtain a first-class degree in physics at Liverpool. He began as a research student in Liverpool in 1930, sharing a research supervisor with Arnold Beevers who was one year ahead of him. Their supervisor suggested that they might see what they could do in the field of crystal structure determination. The two young men, after reading all they could find on the subject, went to Manchester to consult Sir Lawrence Bragg who, with W. H. Taylor, gave them great help and encouragement. After solving a couple of simple highly symmetric structures by the trial-and-error method, Beevers and Lipson decided to make a quantum leap in difficulty and attempt to solve copper sulfate pentahydrate. This was a formidable task for that time; the number of parameters was large and the symmetry was minimal - space group $P\bar{1}$. The data, collected on their primitive equipment at Liverpool which included a home-made X-ray tube, characterized intensities in crude categories such as

very weak, weak, medium, medium-strong *etc.* but from this they were able to locate the dominant scatterers, copper and sulfur, by an exhaustive trial-and-error procedure. Beevers then suggested that, to find the oxygen atoms, they should try the Fourier method, which W. L. Bragg had demonstrated in 1929 with a projection of a known structure, diopside. The idea was to accept phase indications from the combined copper and sulfur contributions (0 or π) and then calculate an electron-density map with observed amplitudes. They collected quantitative data with Bragg's ionization spectrometer at Manchester and then went through the mammoth Fourier-synthesis calculation. The idea was completely successful and all nine oxygen atoms appeared in their map.

In doing these calculations Beevers and Lipson discovered that they could factorize the two-dimensional calculation into a pair of one-dimensional calculations, which was a great help, but even so they spent wearisome days writing out entries from sine and cosine tables multiplied by an amplitude factor. Eventually they realized that they could save some of the written-down rows of numbers on paper strips to use again and from this there evolved the idea of the Beevers-Lipson strips which became the workhorse of crystallographic calculations for the next twenty years or so. Many older crystallographers will remember those strips with a strange combination of aversion and affection.

In 1938, after short appointments at Manchester and the National Physical Laboratory, Lipson moved to Cambridge at the invitation of Bragg who had become the Cavendish Professor. He stayed there for seven years, building his reputation as a crystallographer, until, in 1945, he became head of the small department of physics at the then Manchester College of Technology (now UMIST). Under his leadership the department grew and flourished; it developed its own physics degree courses and became an important centre for crystallographic research in the UK - although now its main research activities are in other areas.

Optics was always one of his main interests and many physicists will know the popular optics textbook he wrote with his son Steven. In 1948, inspired by a suggestion of W. L. Bragg, he began work on an optical method for crystal structure solution, exploiting the analogy between optical and X-ray diffraction. He and Charles Taylor developed the SADI (small-angle diffraction instrument) and by studying the relationship between objects and their Fourier transforms they obtained important insights into the fundamentals of X-ray diffraction and structure solution. For his many contributions to crystallography Lipson was elected a Fellow of the Royal Society in 1957.

The advent of the computer as a tool for scientific research ended the application of some of Lipson's main contributions to crystallography. Fourier syntheses could be done in minutes rather than days and new powerful methods of structure solution based on mathematics or complicated manipulations of Patterson functions became available. Henry Lipson eventually accepted the positive role of the computer in the development of science but he always hankered after the days when it was brain power rather than computer power that solved problems.

His enthusiasm as a teacher will be vouched for by his research students, all of whom had to be thoroughly conversant with all aspects of crystallography. He was generous in providing ideas to students and others with whom he worked and he encouraged them to publish material under their own names even if he had provided the original idea; he would not take credit for anything to which he had not made a major contribution.

In his later years Lipson became interested in the problem of evolution. From the way in which function was related to the complexity of biological molecules he became convinced that Darwinism could not explain what now exists and that sudden changes - acts of creation - were necessary for the development of living systems. He was never afraid to think independently, to be controversial and to argue a case strongly; his articles on this topic always stimulated much correspondence - some supportive and some not so.

Lipson's life was one dedicated to service; even his intense interest in teaching can be seen in that light. He served his city by two terms as President of the Manchester Literary and Philosophical Society. He served his fellow human beings as a visitor at the geriatric ward of the local hospital for fifteen years. He served his co-religionists as an active member of his synagogue and as Chairman of the Academic Committee for Soviet Jewry and he served crystallography as a Co-editor of *Acta Crystallographica* for many years. The award of a CBE in 1976 was a just recognition of this life of service.

Henry Lipson's warmth and friendliness was reflected in his family life. He was happily married to Jane (*neé* Rosenthal and known to all as Jennie) for 53 years and he was passionately devoted to, and proud of, his son, two daughers and seven grandchildren. The death of Judith, his youngest child, who predeceased him by five months, affected him greatly and visibly. However, his last day was a happy one, spent with his family near the Sea of Galilee by whose shore he is now at rest.

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