

B. T. M. (Terry) Willis (1927–2018)

Gerry Lander^{a*} and Colin Carlile^b

^aInstitut Laue-Langevin, 71 avenue des Martyrs CS 20156, 38042 Grenoble Cedex 9, France, and ^bEuropean Spallation Source ESS AB, Box 176, Lund, 38042, Sweden. *Correspondence e-mail: lander@ill.fr

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Terry Willis left us on 18 January 2018 after a long and active life. Terry obtained an honours degree from Cambridge in 1948, and a PhD from Royal Holloway, University of London, in 1951 with Bernal and Tolansky as his supervisors. After working with X-rays for three years at the GE Research Laboratories, he was recruited by George Bacon to come to Harwell, where he arrived in 1954. Within two years the new reactors DIDO and PLUTO were operating, and Terry set about building a four-circle diffractometer to measure data from single crystals. He and Ulrich Arndt (then at the Royal Institution) persuaded Ferranti to construct such a machine, and it was operating with punched paper tape by 1960. In 1966, Terry and Arndt published a book, *Single Crystal Diffractometry*, which was reprinted in paperback in 2009.



Exploiting the ability of neutrons to detect light atoms in the presence of heavy ones, Terry fastened on to the idea of using neutrons to examine uranium dioxide, which had by then become the nuclear fuel of choice, and single crystals were available at Harwell. This led to a number of pioneering experiments, including the first publication (in *Nature*, in 1963) of the structural changes when UO_2 takes up additional oxygen. Terry continued his love affair with the many forms of uranium oxides for the rest of his life, working more recently with the high-resolution powder diffractometers at ISIS. He proposed the so-called ‘Willis clusters’, and these are still the subject of research today (see ‘Willis – a tribute’ under the heading ‘History of neutrons at Harwell’ at <http://neutronsources.org/about/history/literature.html>).

Terry and Peter Egelstaff (1925–2015) became the primary exponents of opening the Harwell neutron-scattering facilities to university researchers. They introduced many to Harwell who went on to become leaders in their fields. Probably the most famous were Dorothy Hodgkin (1910–1994), who won the 1964 Nobel Prize for Chemistry for X-ray work on vitamin B_{12} , and Maurice Wilkins, who shared the 1962 Nobel Prize for Physiology or Medicine for the structure of DNA. Terry encouraged many of Hodgkin’s students and co-workers to come to Harwell and use neutrons. A number of important publications resulted, but Terry’s role was to stimulate the use of neutrons and act as an enabler, not to try to convert himself from a crystallographer into a biologist.

Terry’s ongoing research from the 1960s on a variety of systems led to another book, *Thermal Vibrations in Crystallography*, together with Arthur Pryor, published in 1975.

Many scientists visited Terry at Harwell. Hugo Rietveld (Petten) was a frequent summer visitor and he and Terry discussed the profile-fitting method. Alberto Albinati came from Milan, and Noriaki Kato from Japan. Terry himself was a visitor to Denmark, India, Switzerland, Pakistan and Japan.

In 1965 Harwell decided that, with its many external users, the time was ripe for a Summer School in neutron scattering, and Mick Lomer (1926–2013), then head of the Materials Physics Division, asked Terry to organize this. The world's first 'Summer School on Neutron Scattering' took place at Harwell in 1966 with Gordon Squires giving the theory lectures, which he later turned into one of the best introductory texts on neutron scattering. Fifty years later these schools, now moved to Oxford, still take place every other year (<http://www.oxfordneutronschool.org/history.htm>). In re-starting the schools at Oxford in 1979, Terry joined forces with Colin Carlile; together they produced yet another important book: *Experimental Neutron Scattering* (2009, Oxford University Press). From the many school photographs we estimate that the schools have instructed almost a thousand students. The tribute to Terry at <http://neutronsources.org/about/history/literature.html> gives details of the celebration of the school in 2009, and the special poem written by Alan Leadbetter to honour Terry.

Terry left Harwell in 1984 and became a Professor in Chemical Crystallography in the Chemistry Department at Oxford University, where he continued neutron experiments right up to and beyond his retirement in 1997. He was a member of the IUCr's Commission on Neutron Diffraction from 1973 to 1978 and again from 1981 to 1984, and Chair of the commission from 1987 to 1990. He was also a Co-editor for *Acta Crystallographica* from 1980 to 1990, and an *ex officio* member of the IUCr's Commissions on Crystallographic Studies at Controlled Pressures and Temperatures, on *International Tables* and on Crystallographic Nomenclature.

Terry's first wife, Nanette, died early, but with his second wife, Margaret, Terry was always in attendance at the schools and together they entertained the students with 'Tea and Croquet' on the Saturday afternoon at their home on the river in Oxford. They were certainly memorable events for all concerned, and many students were introduced to the unfathomable complexity of croquet and punting for the first time!

Terry's enthusiasm never left him; all neutrons were good neutrons. He was a good friend and mentor in his personal life and a rigorous and talented scientist in all his professional dealings. We shall greatly miss him.