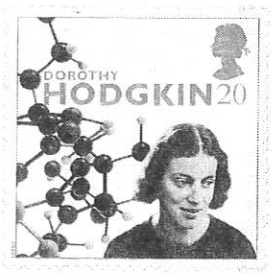
Dorothy Hodgkin – A Life. Georgina Ferry. Granta Books, 2–3 Hanover Yard, London N18 BE, UK. 1998. Price: 20 £. 423 pages.

On the one hand, to write a biography of a much-loved scientist who remains in the near-memory of her colleagues cannot be an easy task. On the other hand, a more intriguing subject for biography than Dorothy Hodgkin – one of the most important crystallographer-chemists of the 20 century – would perhaps be hard to come by. Georgina Ferry's biography written four years after Dorothy's death in 1994 overcomes the former and rejoices in the latter resulting in a scientific biography that is a pleasure to read.

The book starts by describing the early years (1910–1928) with the children of Molly and John Crowfoot (Dorothy being the eldest) being shuttled between Africa and England; war and a colonial lifestyle ensuring that from the age of four onwards, Dorothy and her parents never truly lived under the same roof. Despite this rather shaky start, one cannot lose sight of the fact that for England in the 1920s and 1930s Dorothy had a rather privileged childhood and certainly her entry into Somerville, Oxford to pursue a university education was not at all seen as out of the ordinary. Her interest in science was kindled at an early age, starting with a fascination for the chemical analysis of minerals – the story of 'Uncle Joseph' and the analysis of ilmenite is familiar. This interest was nurtured in the Sir John Leman School, where Dorothy was permitted to attend the chemistry lab. Encouraging of her scholastic turn, her mother also seems to have instilled a strong sense of responsibility in Dorothy.

From the chapter describing the period 1928–1932, we gather that Somerville was not successful in quenching Dorothy's having 'got to know' and this was the period when her interest in crystallography reached fruition. Interestingly, she does not seem to have been mentored in this interest, although she was exposed to the mineralogists Barker and Porter, the latter having taught her in Somerville. In 1929, she read a special issue of *Transactions of the Faraday Society* on the determination of crystal structures by the use of X-rays and this seems to have decided her future career. For a 19-year-old to browse the literature and be inspired to follow a certain career path is clearly quite out of the ordinary and given the time, perhaps reminiscent of a young S. Chandrasekhar in Madras. Combining her quest for an education with the somewhat onerous task of taking care of her sisters (her parents now somewhere in the Middle East) seemed to come naturally, auguring well for a career that would call for being able to do a number of things at once. This is narrated quite poignantly. By the time she reached her honors year in Oxford, she was ready to start her work with H. M. Powell in the Mineralogy Department, on the crystal structures of dialkyl thallium halides. These compounds were cleverly chosen as a bridge between the then uncharted territory of organic structures and the structures of already well-known salts.

Her real break as described in the third chapter (1932–1934) came when she spent two years with Bernal in Cambridge, establishing herself as a very competent crystallographer, working on the structure of sterols – a problem of great relevance in Bangalore in the way that sterols relate to liquid crystals. We see that Dorothy was by no means a lone woman in crystallography. Kathleen Lonsdale had already performed pioneering work on benzene in the lab of Bragg *fils* in the Royal Institution and Helen Megaw, a co-worker of Bernal in Cambridge, had started her incredibly productive career correlating properties of inorganic materials to their crystal structures. Ferry emphasizes throughout Dorothy's own assertion that gender was never an impediment to her career, nor to the manner in which she was treated by her colleagues. This viewpoint should by no means be taken as universal. Crystallography (particularly, British crystallography) had been associated with distinguished women from the very beginning. The reason was that Bragg *père et fils* in their respective labs recognized women to be perfectly capable of doing science. This tradition was continued by people like Bernal. The importance of such a tradition receives unfortunately little mention in the book.



In 1934, Oxford won back Dorothy with a fellowship. In setting up a lab, she wrote out a list of what she needed and Robert Robinson passed this on to Imperial Chemical Industries, which obliged with the royal sum of £ 600. In return, Robinson expected to be helped out with the X-ray analysis of compounds prepared in his vast lab, but in this he seems to have more than redeemed himself when he gave Dorothy her first insulin samples. The 1934–1937 chapter also describes Dorothy's near-affair with a separated Conrad Waddington, her affair with a married Bernal and her meeting and marrying Thomas Hodgkin – the man with whom she would share nearly as much of her life as she did with the structure of insulin. In all this, I should emphasize that Ferry provides just the right amount of detail and this must be no mean task. Certainly, one *does* wish to hear about the vicar interspersing the marriage service of Dorothy and Thomas with quotations from Marx.

The chapter describing the years 1938 and 1939 includes the birth of her first child and her first serious attack of rheumatoid arthritis (the condition of her hands later immortalized by Henry Moore). Amidst all this she continued to pioneer the crystallography of proteins – out of the seven proteins examined by X-rays at that time, four were her work.

The war years (1939–1945) were enormously productive for Dorothy. With her student Harry Carlisle, she determined the complete three-dimensional structure (more precisely, a mirror image thereof) of cholesteryl iodide. At that time, no complete structure of any molecule of that size had been attempted. It was certainly the first molecule of any biochemical significance to have its complete crystal structure revealed. The first of many Rockefeller grants started pouring in and the Oxford scientists Florey and Chain sensitized her to an important molecule called penicillin. Her letters to her husband at this time seamlessly go from describing the weight of her second child to her efforts to crystallize penicillin. We also learn that she pioneered the

use of computers (starting with a Hollerith calculator) not only in crystallography, but also in Oxford. Through all this, we find Oxford treating her rather shabbily and she in turn being sublimely uncaring of what she was owed. Only in 1960 did she come into a professorship to the discomfort of some of the Oxford establishments.

The later chapters record her life post FRS (1947, at the age of 37), the structure of penicillin and the birth of her third child (losing one in between). There are small vignettes of fascinating people such as the Sayres – David of the tangent formula (and later to co-author FORTRAN) and Anne, the biographer of Rosalind Franklin. Government funding (a post-war phenomenon) also became available. In 1948, she started examining samples of vitamin B_{12}. It was this work that led to her (perhaps much-belated) Nobel Prize in 1964. The B_{12} story includes a description of the rather dirty doings of Lord Todd, the synthetic organic chemist, which provoked Dorothy into sending her students wherever Todd spoke on B_{12}, asking them to ensure that the contributions of crystallography were not overlooked. The 1946–1960 chapter reports a crucial conversation between her and David Sayre where she voices her (perhaps only recorded) regret that she did not stick to protein crystallography after having inaugurated the field. This omission (as she regarded it) on her part resulted in people like Perutz and Kendrew receiving the Nobel Prize before she did. That she *did* expect to receive the prize is made clear from her letters to her husband.

I shall not discuss in any detail, the rest of the book. Her humanity, including her involvement with Rotblat in Pugwash (of which she was president) and her many collaborations with groups worldwide, including Bangalore crystallographers such as M. Vijayan, are well documented. It was with Vijayan (and many others) that she finally published the crystal structure of insulin in 1969, 34 years after she recorded the first diffraction from it. The original contributions of Ramaseshan and Venkatesan to the very important phase problem and to anomalous scattering (fully exploited by Bijvoet in his study of sodium rubidium tartarate) also find brief mention. I shall instead focus on the picture that emerges of Dorothy as a person and as a scientist. Her warmth, generosity and the absence of self in dealings with colleagues and family, speak firstly of a very unusual person. More importantly, they provide an alternate view to how successful science can be done. No doubt very secure and rooted in her family, she seems to have given little though to career. Her primary motivation seems to have come from the desire to unravel problems that she set herself. The best example of this is insulin, her last paper (the structure at 1.5 Å resolution) on which was published in 1988, 53 years after she acquired the first photographs. She remained active in issues within science and outside and from all accounts her stature never interfered with her being a warm friend, mother and grandmother. She also seems to have been an amazingly devoted wife to someone who did not quite reciprocate in full. In fact, so complete was her life that it is not only technical people who will be rewarded by reading this book.

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MEETINGS/SYMPOSIA/SEMINARS

VII CME in Haematology and Haemato-Oncology

Date: 18–22 April 2001
Place: Mumbai

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National Conference on Telemedicine

Date: 23–27 April 2001
Place: Lucknow

The scientific program will include Plenary lecture, symposia, scientific sessions (Telemedicne: Evolution and global scenario; Telemedicine: Technological issues; Telemedicine application; Future prospects of telemedicine; Ethical and legal aspects of telemedicine)

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