A passion for physics

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Date : June 23, 1993

Tim Sherratt, ‘A passion for physics: Joan Freeman’, *Australasian Science*, vol. 2, no. 2, Winter 1993, p. 64.

Funnily, much of what we call ‘big science’ is concerned with observing very small entities. Large, expensive machines are built to harness the unimaginable forces necessary to open the sub-atomic world to scrutiny.

In this fascinating, perhaps frightening, area of research, one Australian woman found an outlet for her curiosity, and made an important contribution to nuclear physics. Joan Freeman was born in Perth in 1918. When she was four, her family moved to Sydney where Joan was educated at the Sydney Church of England Girls’ Grammar School and the University of Sydney. Throughout her childhood she was interested in finding out how things worked, often roping in her friends to help her perform simple scientific experiments. However, it was the news, in 1932, that Cockroft and Walton had succeeded in ‘splitting the atom’ that particularly inspired her to consider a career in scientific research.

First though, she had to face the fact that her school offered neither physics nor chemistry at Leaving Certificate level. How was she to prepare herself for a university science course? Showing some of the determination that served her well throughout her career, she attended evening classes at the Sydney Technical College. ‘Sydney Tech’ was intended to educate apprentices and engineers, not schoolgirls – Joan’s attendance was never formally authorized and on one occasion she had to hide behind some shelves while an inspector visited the class!

At university Joan found herself drawn more and more towards physics, even though she was warned that employment prospects were not good for women. She completed her honours degree in physics, undertaking research in ultra-high frequency electrical discharges in gases. By this time the Second World War had begun, and Joan’s research provided her with the perfect background to join a ‘Top Secret’ project that had just been established within the University.

This was the Council for Scientific and Industrial Research’s Radiophysics Laboratory, where a team of physicists were working on the development of radar systems for use in Australia. Joan joined the laboratory and was set to work on the production of a 10cm microwave radar set. At the war’s end, Joan was awarded a Senior Studentship by the CSIR to undertake higher-degree research overseas, and so, in 1946, she sailed for England.

Joan had decided to pursue nuclear physics in the footsteps of such great scientists as J.J. Thomson, Chadwick, Cockroft, Oliphant and, of course, Rutherford, at the Cavendish Laboratory in Cambridge. Here she obtained her PhD through research into short-range alpha-particles, but instead of returning to Australia, she accepted an appointment to the British Atomic Energy Research Establishment at Harwell. Joan remained at Harwell for the remainder of her career, leading a research group using the massive tandem accelerator, built in the late 1950s. In 1976 she became the first woman to be awarded the British Institute of Physics’ prestigious Rutherford Medal.

Joan Freeman tells the story of these remarkable achievements in her autobiography *A Passion for Physics – The Story of a Woman Physicist*. Reading the book, you can’t help but be caught up by her

‘passion’ or enthusiasm for exploring the nature of matter – the world of ‘big science’ becomes much more human.

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