

## Lady Jeffreys 1903 – 1999

Bertha Swirles, Lady Jeffreys, was born in Northampton in 1903 and for the whole of her life she was involved in the educational world. Following the death in 1905 of her father, a leather salesman, her mother, who had trained as a teacher at Stockwell College, opened a small private school. In 1912 Mrs Swirles joined the staff of Stimpson Avenue Elementary School, where her sister (Mercy Blaxley) was Headmistress and her late husband's sister was also a member of staff. Bertha became a pupil at this school before she obtained a scholarship in 1915 to the newly opened Northampton School for Girls. Throughout Bertha's life she maintained an interest in the Northampton schools and in particular in those schools that have evolved from the Girls School. Bertha's educational background was strong with seven of her nine aunts being teachers and her father's mother was on the staff of the Model School at Enniskillen when it was opened in 1867.

While at the Northampton School Bertha was taught Mathematics by three Cambridge mathematicians whose influence, together with the encouragement of her mother and aunts, led her to choose to continue to study Mathematics. She was a talented young lady excelling in many areas: science, languages and music, playing both the piano and cello to a high standard. In 1921 Bertha won a Major Scholarship to Girton College, Cambridge, where she joined ten other first year students reading Mathematics. (Incidentally this number exceeds the annual intake of Mathematics students to Girton during the 1950s and 1960s.) Until coming to Cambridge Bertha had been taught by women in the company of other girls and so the Cambridge lectures, in which women were very much in the minority, must have been a great change for her. However, she was not daunted and obtained first class honours in both Parts I and II of the Mathematical Tripos, but, in common with all women students prior to 1948, she was not awarded her degree by the University of Cambridge.

In 1925 Bertha became a research student of R. H. Fowler who, along with his students (one of whom was Paul Dirac), provided the theoretical background for the experimental work at the Cavendish. The 1920s were some of the most important years for modern Physics: de Broglie's wave theory in 1924, Heisenberg's theory of quantum mechanics in 1925 and Schrödinger's wave mechanics in 1926. Even though, as a woman, Bertha was not allowed to attend physics society meetings where other research students met, she did valuable work on the polarisabilities of atomic cores and the absorption of photons. Following a short period during the winter of 1927–28 in Göttingen, where Bertha worked under Max Born and Werner Heisenberg, she returned to Cambridge completing her PhD in 1929.

Between 1928 and 1938 Bertha held lecturing appointments at the University of Manchester (1928–31, 1933–38), the University of Bristol (1931–32) and Imperial College, London (1932–33) and during that period

she initially did work on the absorption of radiation by electrons in a gas. Later, in collaboration with D. R. Hartree she did further work on quantum theory, mainly concerned with the extensions of the self-consistent field method. For the joint paper obtaining wave functions for oxygen atoms Hartree's father did the numerical calculations using a Brunsviga hand calculating machine. It is interesting to note that at a similar time Keith Bullen and Harold Jeffreys were using a similar machine to compute travel-time tables for seismic waves through the Earth.

In 1938 Bertha returned to Cambridge as a Fellow and Lecturer in Mathematics at Girton College and in 1940 she married Harold Jeffreys. During 1938–49 the Mathematics teaching at Girton was shared between Bertha and Mary Cartwright, who died in 1998 aged 97 years, having been the first woman President of the Mathematical Association. When Mary Cartwright became Mistress of Girton in 1949 Bertha took over as Director of Studies in Mathematics and Mechanical Sciences, a position which she held until her retirement in 1969. Bertha was extremely loyal to Girton, where she fulfilled many roles including Director of Studies in Music, 1939–47 and Vice-Mistress 1966–69. Following her retirement she became a Life Fellow of the College and, until a few months before her death, was present at many of Girton's special occasions.

Her marriage to Harold Jeffreys was a long and happy one and when he was knighted in 1953 she became Lady Jeffreys or Lady J. as she was affectionately known by many of her students. Bertha continued with her research interest in quantum mechanics but naturally involved herself to some extent in Harold's work. Many Cambridge mathematicians will remember *Methods of Mathematical Physics* (or 'J & J') which they wrote together and was first published in 1946. Following numerous editions and revisions it was reprinted again in 1999. Bertha was also involved as an editor in the publication (1971–77) of the *Collected Papers of Sir Harold Jeffreys on Geophysics and other Sciences, Volumes 3 – 6*. As mentioned earlier she was an excellent linguist and in 1963 translated Ye. P. Federov's *Nutation and Forced Motion of the Earth's Pole* from the Russian. Following Sir Harold's death aged 97 in 1989, much of Bertha's time was spent organising his papers ready for safe storage for posterity. In recent years she attended many meetings at which her reminiscences concerning mathematical physics in the 1920s and 1930s were a valuable contribution. Her memory of past events was excellent.

Bertha joined the Mathematical Association in January 1931 and almost immediately participated in the debate at the Annual Conference on the then recently published 'Report on the Teaching of Mechanics in Schools' (*Math. Gaz.*, **15**, pp. 339–46, 1931). In a letter to Dr M. H. Price in 1994 she commented on her boldness in participating in the discussion for she had then only taught Mechanics for seven terms at the University of Manchester! Shortly after this, Bertha was elected to the Council of the Association. During the war Bertha was involved in the preparatory work which led to the publication in 1944 of *The Teaching of Mathematics to Physicists* by the

Institute of Physics (a joint report with the Mathematical Association; *Math. Gaz.*, **80**, pp. 37-38, 1996). As the Association's President in 1969 she endorsed her continued belief '... that the Mathematical Association can play a vital part in the progress of mathematical teaching at all levels.' (M.A. Newsletter 15, December 1969). In retirement Bertha maintained an interest in the work of the Association, but was saddened by the reduced participation of university mathematicians in its work.

Bertha's main contribution to mathematical education was in her role as Director of Studies in Mathematics at Girton and as a consequence her influence has spread worldwide. In recognition of this work she was awarded honorary degrees by the University of Saskatchewan in 1995 and the Open University in 1996. Over 30 years Bertha was involved in the selection, advising and teaching of women mathematicians at Girton, where she was able to communicate her love of mathematics and in particular mathematical physics to others. The discussion of mathematical problems formed the main part of her supervisions but Bertha attached great importance to the precise and correct use of English in the expression of mathematics. Initially Bertha may have seemed formidable to her young students, but she had the kindest heart and frequently on a Sunday evening there was 'open house', with home made goodies to eat, at the Jeffreys home on the Huntingdon Road. Bertha maintained a great interest in the welfare and careers of her former students and they, with their children and even grandchildren, became her extended family. Throughout her long retirement there were numerous visitors at her home and on the occasion of her 90th birthday about 140 former students attended a birthday lunch at Girton College. This was a fitting tribute to a well loved and respected teacher, friend and colleague.

I would like to thank both Dr Ruth Williams and Dr Michael Price for information used in writing this obituary.

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### **David George Crighton 1942 – 2000**

As many readers will know, David Crighton died in April after a lengthy illness. Latterly, he was Professor of Applied Mathematics in the University of Cambridge, and Master of Jesus College. He was a member of the Association and a former president of the Yorkshire Branch. It is impossible to do justice to his huge range of mathematical activities in this short piece. My own small contact with him was through our involvement with the Pop Maths Roadshow.

The Memorial Service was held in in Great St Mary's, Cambridge, on Saturday 3 June and I was pleased to attend and represent the Association.

BILL RICHARDSON