

Appendix 4: Margaret Fishenden

IC Women Standard Biographical Entry Template

Name and post nominals Margaret Fishenden (1889-1977) BSc; MSc; DSc; FInstP

Specialism Air Pollution, Heat Transmission

Career Roles: Lecturer University of Manchester 1910-1915; Director Domestic Heating Research Labs Manchester Corporation 1916-1921; Officer then Scientific Investigator Department of Scientific and Industrial Research 1922-1932; Honorary Lecturer 1932-1944, Senior Lecturer 1945-1946, Assistant Professor 1947-1955 Imperial College London

Career Awards Fellow Institute of Physics

Awards Margaret Fishenden Centenary Memorial Prize Imperial College

Professional affiliations: Institute of Physics; Chemical Society; Institution of Heating and Ventilation Engineers

Lectures

Quote ‘...It is always pleasant to recall the lectures of ‘Ma’ Fishenden. Her information on the theoretical side of heat transfer was always accompanied by [Saunders] experimental data that confirmed the theory.’ⁱ

Born 24th February 1889 Margaret White, Altrincham Cheshire

Family Background: Father Richard William White, Organist; Mother Sarah Elizabeth White (née Broadbent). Siblings 3

Marriage: 1915 Richard Bertie Fishenden OBE (1954) (1880-1956) Divorced 1932. One son, Richard Martin Fishenden (1917-2014) Physicist worked at ARER Harwell; Associate Institute of Physics 1962ⁱⁱ

Schooling; 1890s to 1902 Governess then private school; 1902 Manchester Municipal Secondary School; South Kensington Scholarship; Cheshire County Council Scholarship; First Class Matriculation

University: 1907-1919 University of Manchester

Undergraduate: 1907-1909 Physics

Degree : BSc Physic 1st Class Honours

Undergraduate Awards/scholarships: Higginbottom Scholar

Postgraduate 1909-1919

Degrees: MSc 1910; DSc Physics 1919

Postgraduate Awards/scholarships: 1909 Graduate Scholarship; 1910-1911 Elected Beyer Fellow; 1919 Member of Convocation

Text discussing career and other comments

Margaret Fishenden was something of a phenomenon, a person who kept herself to herself, but who pushed on the world of physics research in meteorology, heat transmission and air pollution.

She was an early 'green' researcher, looking into ways to reduce pollution by finding methods of more efficient heating for homes and reducing pollution from industry.

Very little information is available on her background. It is known that she was born in Altrincham and had 3 siblings, that she married at the age of 26 in 1915 and had one son, born in 1917. She divorced in 1932 and was then a single parent, bringing up her young son, not an easy thing to do in that era. It is not possible to speculate on the circumstances of her divorce, but it is remarkable that despite almost suffering a nervous breakdown following it, she did not falter in her work output.

Margaret's early education was at home with governesses and then at a private school. She had an aptitude for academic work which was shown by the award of scholarships throughout her educational career. The first of these was given by Cheshire County Council in 1902 to attend Manchester Municipal Secondary School. The second was a South Kensington Scholarship and the third a Lancashire County Council Scholarship. Her ability was well recognised and well endowed, and she rewarded her funders by obtaining first class matriculation and then getting an undergraduate award to begin her university studies. She became a Higginbottom scholar and attended the University of Manchester from 1907 and obtained a BSc in Physics in 2 years.

As she began her undergraduate course, the great Physicist and pioneer of nuclear physics, Ernest Rutherfordⁱⁱⁱ was just beginning his tenure as Professor of Physics at Manchester University. Therefore, Margaret was studying in very distinguished company – and not only with Rutherford but with Hans William Geiger^{iv} and Joseph Edward Petavel^v too. The latter was to support her in her later career. At Manchester University since 190, Petavel held various posts in the Physics Department, as Mechanics lecturer then Meteorology, and Margaret would have taken his classes as a student. As she began to undertake research, they published papers together, (in her then name of Margaret White) such as on Meteorology in 1907^{vi}. Petavel became Professor of Engineering and Margaret continued to work in collaboration with him. They both also worked on ventilation in textile mills and weaving sheds with Cecil H Lander^{vii}, with whom Margaret was to become a Colleague at Imperial College. The work she, Petavel and Lander carried out led to the imposing of regulations on working conditions.

Gaining a Graduate Scholarship, Margaret then worked on her MSc and was awarded this in 1910. She was elected to the Beyer Fellowship of the University in 1910-1911 and worked as a lecturer between then and 1915. In 1916, she went to work for Manchester City Corporation (the City Council). This was quite a time for her: changing her marital status and her job in the course of a year. She had met her husband Richard Fishenden^{viii} whilst a student; he was to become renowned in the printing business. (However they were to divorce in 1932.)

Margaret's lectureship had been in atmospheric pollution and she was in charge of these studies in the Meteorological Department. She continued this speciality in the Air Pollution Advisory Board of the Corporation, heading the research into smoke pollution in Manchester. Between 1916 and 1926

she researched into domestic heating and heat transfer. This was extremely important and influential work, even provoking a response from Marie Stopes^{ix}, of welfare and birth control fame. She also investigated atmospheric conditions, continuing work on humidity and ventilation in the textile mills and weaving sheds. Manchester being one of the centres of the textile industry, she lived in the heartland of the industrial revolution, in atmospheric conditions unknown in 21st century Britain – the air she would have known from her birth would have been full of smoke, ash, steam and pollutants from manufacturing and domestic cooking and heating. She was working from personal experience. During this period she gave birth to her son in 1917, and completed her PhD, awarded in 1919. Margaret was truly multi-tasking, working at her job, family life and at her academic research qualification. Her work for the Corporation was funded by the Department of Scientific and Industrial Research (DSIR), which led her to move to London to work for the DSIR in 1922.

Things then began to happen for Margaret: Petavel proposed her for a Fellowship of the Institute of Physics, to which she was duly elected in 1922^x. Margaret's work on In 1923 at the Fuel Research Division of the DSIR she continued what was to be a career long collaboration with Cecil H. Lander and a new colleague, Owen Alfred Saunders^{xi}.

They quickly established themselves as a powerful research team, even moving to Imperial College together, when Lander was appointed to the Chair of Mechanical Engineering in 1932. Between then and 1945, Margaret was Honorary Lecturer in the Department of Mechanical and Motive Power, in charge of the Heat Transmission Research Laboratories. She was promoted to Senior Lecturer in Heat Transmission in 1945, when she also gave lectures to electrical engineering students in Machines, Thermodynamics and Heat Transfer. Another promotion followed in 1947 to Assistant Professor and Reader in Applied Heat in the Mechanical Engineering Department. Including a greater amount of theory in their courses, they altered the methods of mechanical engineering teaching for the better, reducing the divide between science and engineering. The work Margaret and Saunders undertook and their 1932 text book *The Calculation of Heat Transmission for Engineers* was a vital to industry and research and was hugely influential. They produced two other books^{xii} and several articles. During World War II they worked on contracts for the Ministry of Supply, as did many others at this period. Saunders and Margaret worked so well together that it was apparently difficult to distinguish between them where ideas originated from. They shared an office, but it was Margaret who gave time to solving the students problems and providing tea when they required a consultation. Hugh Ford (later Sir Hugh) was one of their PhD students who later became an eminent engineer. He held the Chair in Mechanical Engineering at Imperial 1965-1978^{xiii}

Margaret was clearly respected for her work and treated as their equal by the men she worked with, and the students saw no gender difference either. It was really a male dominated world at that time at Imperial and it would have been unusual for a woman to be lecturing to classes of mostly male students. But putting gender aside and simply being very good at her work made Margaret's career.

She was again in an unusual position in this period of time, socially. She was a an academic, divorced and a single mother, to be any of those in the 1930s was enough to stigmatise people, but to be all three, particularly divorced and a single mother, required much support, which she had from her colleagues and great mental strength, although she struggled with this.

Besides her lecturing and research she was a stalwart of several national committees relating to heat industries, for two of which she was Chairman, again a bold position for a woman at that period.

On her retirement in 1957, she took the surprising step of eschewing anything related to her academic or industrial work. She disappeared as far as those areas were concerned.

Moving to Goring near Reading, Berkshire, she tended her garden and enjoyed wild flowers (something she had in common with another woman engineer, but a Civil Engineer, Letitia Chitty). Margaret continued collecting in the areas of antiques, watercolours and Persian rugs. She was a skilled bridge player, which might be expected given her engineering and mathematical background, so she had quite a lot of social contact.

She died of pneumonia in 1977, but did not have a Christian ceremony as she had no religious beliefs, and donated her body to medicine.

End Notes

Memorial tributes national Academy of engineering vol 8 p231 1996

<http://www.nap.edu/catalog/5427.htm>

Highly productive research period and new style in teaching, more theoretical and enabled a relationship between science and engineering

Owen Saunders (1903-1993) by N.P.W. Moore Memorial Tributes National Academy of Engineering Vol 8

ⁱ From Imperial College Alumni magazine: 'My student apprenticeship with D. Napier and Son from 1946 to 1949 included study of gas turbine technology and heat transfer at Imperial College, and I still have the textbook on heat transfer that was subsequently published by M. Fishenden and O.A. Saunders. It is pleasant to recall the lectures they gave. She was always called "Ma" Fishenden by the students, perhaps because she was slightly older than Saunders. Her information on the theoretical side of heat transfer was always accompanied by his experimental data that confirmed the theory.' Alan Macdonald (Mechanical Engineering 1948) *Imperial Matters* Issue 31 Winter 2007-2008 p.2

ⁱⁱ Elections to Institute of Physics Membership 2nd October 1962 The Register November 1962 IOP Science <http://iopscience.iop.org/article/10.1088/0031-9112/13/11/022/meta> Accessed 20160626 Richard Martin Fishenden worked at AERE Harwell

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- iii Ernest Rutherford (1871- 1937) 1st Baron Rutherford of Nelson OM,FRS
https://en.wikipedia.org/wiki/Ernest_Rutherford (Accessed 20160627)
- iv Hans William Geiger (1882-1945) Discovered atomic nucleus, co-inventor the Geiger counter
https://en.wikipedia.org/wiki/Hans_Geiger (Accessed 20160627)
- v Sir Joseph Edward Petavel KBE; FRS (1873-1936) <http://www.mace.manchester.ac.uk/about-us/hall-of-fame/aerospace-engineering/sir-joseph-ernest-petavel/> Accessed 20160627
- vi Quarterly Journal Royal Meteorological Society v.34 1908 Miss M. White, T. V. P. Pino, and J. E. Petavel, F.B.S.— *Discussion of the Meteorological Observations at the British Kite Stations, 1906-1907*
- vii Cecil Howard Lander (1881-1949)
- viii Richard Bertram Penrose (1880-1956) Graphic Artist/Printer Editor of the Penrose Annual Graphic Arts Review 1934-1956
- ix Nature, Volume 117, Issue 2949, pp. 658 (1926)
- x The Institute of Physics is a leading scientific society. We are a charitable organisation with a worldwide membership of more than 50,000, working together to advance physics education, research and application. We engage with policymakers and the general public to develop awareness and understanding of the value of physics and, through IOP Publishing, we are world leaders in professional scientific communications. <http://www.iop.org/about/index.html> Accessed 20160626
- xi Sir Owen Alfred Saunders (1903-1993)
Owen Saunders was educated at Birkbeck College and Trinity College Cambridge, obtaining degrees in both Mathematics and Sciences. He worked at the Fuel Research Station East Greenwich, between 1926 and 1932, where he met two lifelong colleagues, Margaret Fishenden and Cecil Lander who also became staff members at Imperial, Saunders joined Imperial as Lecturer in the Mechanical Engineering Department in 1932. He was appointed the first Clothworkers Reader in Applied Physics in 1937. His interest in aircraft piston engines and then jet engines led to his being seconded to the Ministry of Aircraft Production in 1942 where he was responsible for turbine engine research and worked with Sir Frank Whittle and Sir Harold Roxbee Cox. He returned to Imperial as Professor and Head of the Mechanical Engineering Department in 1946, succeeding Lander. Besides researching engines, Saunders worked with Margaret Fishenden on heat transmission, they jointly produced a book on it in 1932, which was the standard text for many years. Saunders was the Dean of the City and Guilds College and Pro-Rector between 1964-1966. On the sudden death of Sir Patrick Linstead in 1966, he was acting Rector until, in 1967, he became Vice Chancellor of the University of London.
<http://www.imperial.ac.uk/centenary/timeline/1960.shtml> Accessed 20160626
- xixii An Introduction to Heat Transfer. M. Fishenden and O.A. Saunders Clarendon press 1950
Simplified heat Transfer Data for Design Calculations G. Brown, M. Fishenden, O.A. Saunders (Part 2 by J.E. Bacon, M. Fishenden and O.A. Saunders) 1948, 1950 British Shipbuilding Research Association Report No 17, No 54
Margaret also published alone on fuel and domestic heating from 1920 -1929
- xixiii Sir Hugh Ford (1913-2010) Research project: British Iron and Steel Corporation for the study of heat transfer and fluid flow in Cowper Stoves <http://www.imperial.ac.uk/centenary/memories/ford.shtml> Accessed 20160626

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