

Making Telecommunications in the First World War, Oxford, 24 January 2014.
Elizabeth Alexander by Mary Harris

Elizabeth went up to Cambridge in 1928 to read physics in the glory days of all those big names at the Cavendish. One of the not-big names was New Zealander PhD student Norman Alexander whom she was to marry. They were my parents and I am the middle one of their three children. We were all caught up in the fall of Singapore in 1942 where E was working in RDF at the Naval Base, formally as an Intelligence Officer with the rank of Captain. During our time as refugees in New Zealand while Norman was interned, E kept a diary of our lives, including hers as Head of Operational Research in NZ's radar research unit. That is my first, previously unpublished MS and it's my reason for deciding to write her biography. My second original source is the very recently de-classified NZ Radar Narrative. The recency explains why NZ does not feature in the standard histories of WWII radar.

Half way through her Cambridge first degree E changed her main interest to geology, the subject of her PhD, but maintained her interest in physics. For me, writing about research developments in two parallel but separate sciences in her life, proved impossible until I decided to handle the physics aspects of it through the history of the electromagnetic wave, what it is, what it does and what it can be made to do. This allows me to bring in some of E's antecedents like several-greats Aunt Mary Somerville who was a buddy of Michael Faraday, and two uncles at Trinity College Dublin at the time when Fitzgerald was explaining what Hertz was doing and various other interesting uncles, and what E did with it in her radar research in NZ.

To go back to Cambridge in 1928, all of those big names had been involved in some form of physics research in WWI, even if they were not then at the Cavendish, and as we know, WWI was not only a time of unprecedented content of, but also speed in wireless research, and a time of unprecedented working together by all sorts of people involved in all aspect of wireless and its uses. So E's tutors had all been involved in some way at the crucial time when valves and continuous waves and directional aerials and RDF were appearing, she and her fellow students were playing around with short waves recently liberated to amateurs, and of course listening to the wireless. I like collapsing dates here by saying that E and Frau Hertz were in Cambridge at the same time and could both listen to the same BBC concert.

So, among people who were to have major influence in E's life, who had been active in research in WWI were

- Rutherford and William Bragg, acoustic submarine detection and much else
- Chadwick, PoW in Germany and Geiger now the enemy, Norman's supervisor
- RN Cadet Patrick Blackett*, to Cambridge post war
- 2nd Lt Lawrence Bragg (brother Robert died at Gallipoli) and Major E Marsden, sound ranging. Marsden was E's boss in NZ.
- Signals Officer Appleton, who liberated some valves and took them to Cambridge to unpick; later ubiquitous and self promoting in all matters ionospheric
- CTR Wilson - as a child I thought his name really was 'Cloudchamber'
- Experimental Equipment Officer at Martlesham Heath, Henry Tizard*
- Experimental Officer RNAS Major Harry Wimperis*, aeronautical engineer and instrument maker
- RN electrical apprentice Jimmy Rowe*, to Imperial College post war

* all radar people.

In digging around for the antecedents of radar, I had long realised the importance for wireless history of WWI and periods before it, and was in danger of growing a crush on Henry Jackson, but it was not until I began researching the unique and extraordinary 1935 Imperial Airways, Short's Empire Flying Boat, on which we flew in luxury from Singapore to NZ for leave in 1940 and on which we escaped in less luxury and under fire from Singapore two years later, that I began to realise that every single part of that aircraft, constructional and operational and all interdependent, depended on research carried out during WWI, and that many of the people who did it were still around. Just one significant factor for its monocoque construction, was research in aluminium alloys by Oswald Short himself. Some of this research is summarised in reports of the Advisory Committee on Aeronautics, the Radio Research Board, the brand new RAF, the National Physical Laboratories, Farnborough, Cranwell, Blandford and the Imperial College Centenary Website and more. There are mountains of it but it is all over the place (researcher's lament).

From my own research in the equally messy literatures on the fall of Singapore it seems that E was ordered out by the Navy to take us children to Norman's family in NZ and return with radars being made in NZ and Australia. But we were overtaken by events and it was because she knew all those people from the Cavendish who were then working in radar in Australia and New Zealand, and no doubt because of her credentials in RDF in the Royal Navy, that she was asked to set up and run operational research, the job on which she reared her children as a single mother, for nearly 4 years. It was while she was doing this job that, in passing, she made the interpretation of an anomalous radio signal that was the beginning of radio-astronomy in Australia. At the end of the war, with Norman restored to her but not to health, she returned to Singapore with him and to numerous jobs including that of government geologist to survey the island for sources of granite for reconstruction. During this research she made her second paradigm shift in two separate sciences in 4 years.

So my emphasis today is not only on thanking you for bringing to light, and publication please, the breadth and depth and importance of wireless research in WWI, but in looking at what it started in the progress of my old friend the electromagnetic wave, because without that body of research that happened when it did under the circumstances in which it did, the history of where it went next, would have been rather different. One of the many things that happened was another paradigm shift in science, the shift from generating, observing and operating e-m waves, to their controlled use as research tools for unpicking the ionosphere. E was also involved peripherally in that and she died in Nigeria in 1958, where Norman's department had become a US tracking stations for the first satellite launch (which was Russian), during the International Geophysical Year. Interestingly enough, one of the consistent threads of her life was Appleton, who as self-appointed Emperor of the Ionosphere, was still publishing on it after she died, just before her 50th birthday and still putting his name in front of the person who actually did the research.