

Grafton's Dr Elizabeth Essex-Cohen blazed a trail in space science and for women

Fitting tribute to true pioneer

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ANOTHER piece in the extraordinary legacy of Grafton-born pioneering physicist Elizabeth Essex-Cohen has found its way back to the school that set her on course to become a leader in the field of space science.

A rotating antenna used by Dr Essex-Cohen while working at La Trobe University in Melbourne now stands tall in the Grafton High School's quadrangle garden, the recent and timely removal of an unhealthy palm tree lending itself to prime positioning.

Young Elizabeth Essex attended the high school from 1952-56, two plaques already bearing her name acknowledging her attendance and honouring her achievements in groundbreaking research.

Delivering the amazing relic was the late doctor's husband, Dr Harvey Cohen, who said his wife had always been "most grateful to the excellent teaching of advanced maths and physics she experienced at Grafton High".

"At the time these classes were not even available to girls attending single-sex high schools of Sydney."

He said he wondered what he should do to acknowledge her 50th anniversary at La Trobe and when the uni gave Dr Cohen permission to remove the damaged antenna from its field station – which Dr Essex-Cohen and her students were using to monitor the ionosphere when she passed away – "the idea just gelled".

Dr Cohen described his late wife as a unique person. "Not only was she the fourth woman in Australia to gain a PhD in Physics, far more inspiring to me was that she was the very first of those women to have a lifelong career**."

Dr Essex-Cohen was an academic and international researcher in physics, focussing on space physics.

This was reiterated in her 2004 obituary where it was

mentioned she "was the only one to be both a lifelong researcher and lead a full life as wife and mother".

Apart from her remarkable mind, Dr Essex-Cohen broke through social barriers, quietly but confidently navigating the entrenched sexism that was rampant in many male-dominated fields in Australia as she set about carving out a career in science.

While Dr Cohen was reluctant to go into too much detail, he did imply there were issues in this country.

"Let's just say she had no trouble in the international sphere. One of the things I still resent was that she was never made a professor."

Dr Cohen said he met his wife "somewhere in between the physics building (at La Trobe) and a conference at Adelaide Uni".

Attracted to her brain – "among other things" –

✦ ***Elizabeth was a member of the Essex family who resided in the Lower Clarence since about 1860. Her mother, Majorie Munday, taught at Lawrence Primary School, which Elizabeth also attended, but was forced to retire when she married Charles Essex, a farmer upstream from Lawrence.**

****Women were forced to retire upon marriage. The very first female radio astronomer, Ruby Payne Scott, was co-incidentally also born at Grafton, and educated in Sydney. Despite the extreme magnitude of her pioneering discoveries, she was forced to retire from CSIRO and research when it was discovered she had married.**

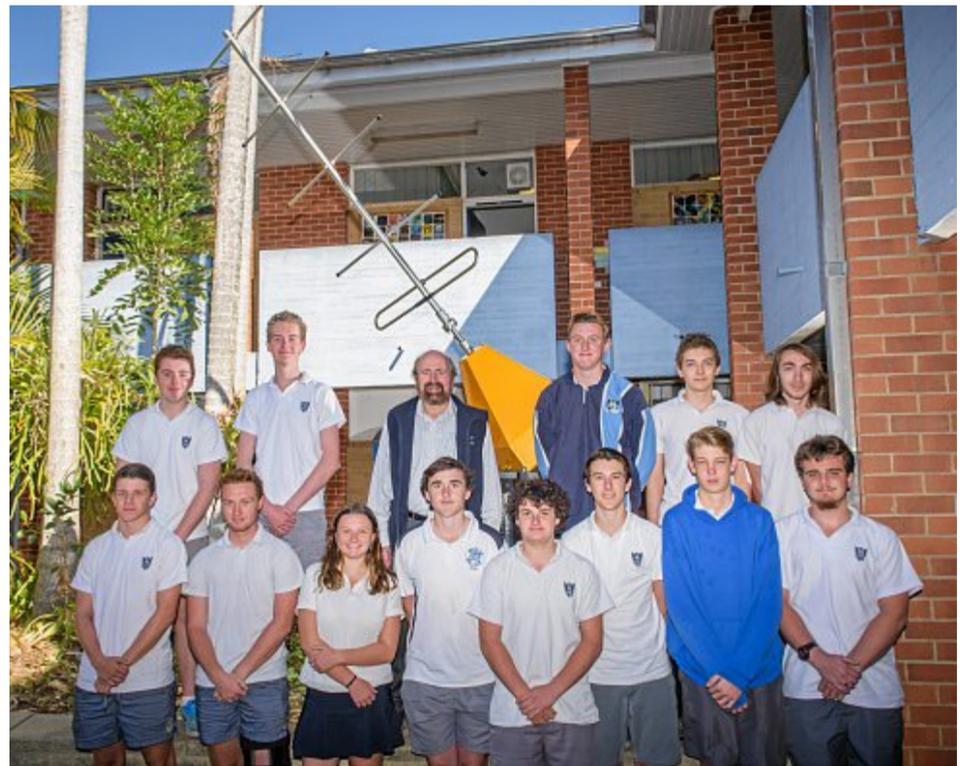
Dr Cohen said despite getting married too late to have "a big family", they still managed to have three sons and a daughter.

"Maternity leave didn't exist in that era. Elizabeth continued working while having and raising the kids. There was child minding on campus and she would go and feed them and go back to lecture.

"I have to concede she was a superwoman."



Dr Cohen rescues the broken antenna from outside Melbourne, which is now repaired and standing at Grafton High as testament to his wife's lifelong work.



FUTURE SCIENTISTS: Dr Harvey Cohen with Year 11 physics students in front of the aerial installed at Grafton High this week. It was used by his late wife and scientist Dr Elizabeth Essex-Cohen, a former student of the school.
PHOTO: ADAM HOURIGAN

School honours physicist's role

PHYSICS students at Grafton High welcomed the arrival of an important part of Dr Elizabeth Essex-Cohen's working life on Wednesday when Dr Harvey Cohen arrived with the special delivery that made the road trip from Melbourne in the back of his RAV4 in pieces.

After its erection Dr Cohen, who specialises in theoretical physics, spoke with the students about his wife and her contributions to science.

Grafton High physics

teacher Ian O'Loughlin said the timing of the visit was uncanny.

"It was strange that the class curriculum meant students just happened to be studying GPS as part of their course in the lead up and bang on the same time as the antenna was set to arrive," Mr O'Loughlin said.

He said they did joke with the students about how it was going to be the new wi-fi tower and pick up alien life but of course it isn't operational, it's there representing an interesting

part of Grafton High's past.

It was interesting to note that despite all the advances in women in science since Dr Essex-Cohen paved the way, Grafton High has one female student "who is excelling" in their physics class of around 13 students.

Brodie Gough is well aware of Dr Essex-Cohen's achievements, a plaque mounted in same class the scientist once studied all those decades ago to honour her.

"Yes, no pressure," Brodie laughed.

Ionospheric scientist helped shape GPS

DOCTOR Elizabeth Essex-Cohen's life ended suddenly in March 2004, when she was aged 64, just after the second Australian scientific satellite FedSat was launched.

The doctor was in charge of Global Positioning System-related research, a testament to her involvement with the development of GPS, which began in 1974 with the US Air Force Geophysical Research Laboratory near Boston. Here she evaluated the impact of ionospheric plasma on radio signals from satellites powering the proposed satellite navigation system, then called NAVSTAR. Dr Essex, as she was initially known, had in 1969 pioneered the first use, in Australia, of so-called beacon satellites to probe the ionosphere.

The first Australian scientific satellite, WRESAT, was launched from the (Australian) Weapons Research Station at Woomera, South Australia, in 1967. The second Australian scientific satellite, which Dr Essex-Cohen was overseeing when she fell ill, the micro-satellite FedSat, was launched December 14, 2002.

In her early years while carrying out PhD research at the University of New England at Armidale, she made a

study of ionospheric irregularities, by bouncing radio waves of different frequencies off the underside of the ionosphere. After her PhD, Dr Essex-Cohen spent two years teaching at the University of the West Indies, and then was appointed as a lecturer in Space Physics at La Trobe University in 1968.

Shortly after her arrival at La Trobe, she set out to capitalise on opportunities for ionospheric research by monitoring radio beam from ATS-1 using an antenna pointed at the satellite but steadily rotating. By that means, the plane of polarisation of the received signal could be determined, which gives a direct measure of the Total Electron Content along the path. The fact that La Trobe Physics at that time had a fully equipped workshop was vital to her project.

As early as 1971, Dr Essex-Cohen collaborated with a worldwide group of ionospheric physicists to give a whole-Earth description of a huge ionospheric storm of that year. This collaboration, and participation with other space scientists, led her to spend eight months at the US Air Force Geophysical Research



Dr Essex-Cohen in 1968 and, above right, at home in Melbourne attending to a Yagi antenna in 1975.

Laboratory, just outside Boston. At the AFGRL, she made a study of the bending of radio waves from orbiting satellites, essential knowledge to check out the possibility of Satellite Navigation, then called SatNav but later on called GPS. Her AFGRL supervisor, Jack Klobuchar went on to develop a model (the Klobuchar Model) still in use that is used to make corrections to GPS due to ionospheric effects and without which GPS accuracy would be limited to tens of metres.

1974 was the "Year that Made Me" for Dr Essex-Cohen. Not only did she contribute as the only Australian Ionospheric



Scientist to guide GPS design, and was the only woman to do so, but her relationship with a researcher at the MIT Artificial Intelligence Laboratory, Dr Harvey Cohen, deepened and she returned to La Trobe as Dr Elizabeth Essex-Cohen.

Dr Essex-Cohen continued as Lecturer/Senior Lecturer at La Trobe, teaching undergraduates and research students, continuing to explore ways to observe the ionosphere using the tools of the space age.

She attended a meeting with the government, leading to Commonwealth funding (amounting to \$26 million) to the FedSat Scientific Research satellite. For FedSat, she was in charge of

GPS-related research. When FedSat was launched, on Saturday, December 14, she was able to respond to phone calls from the press but could not take part in TV interviews. She suddenly became ill and was in hospital by Christmas. She was ultimately diagnosed with mesothelioma. She had a brief remission period and with her husband attended an international conference on Wireless Science in January 2004, but her condition suddenly deteriorated and she died in March 2004.

She received many professional tributes, including a Special Session of the (International) Beacon Satellite Group. Touching is this tribute from Heather McCreadie, who gained a PhD at La Trobe: "Elizabeth was a role model for me. She was quiet and gentle, yet very determined. She helped me to become strong and stick by decisions. She showed me that being a scientist didn't mean I had to stop being a woman. Her example and leadership helped to forge my career. It is from her that I got my strength to continue to follow the path of science in the face of much adversity."

Information supplied by Dr Harvey Cohen.



Dr Harvey Cohen in front of the aerial installed at Grafton High School used by his late wife.