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I've Missed Something

Writing about history is always fraught with difficulty, as the writer is confronted with a range of known and unknown material. This is what occurred with me when I wrote the February 2022 column [1] in which I described how some scientific areas were made possible by developments in radar and its associated technology that, in later years, resulted in IEEE Milestones. I became aware of three related items soon after publication.

First, my attention was drawn to the continued legacy of amateur radio related to moon bounce. Second, a detailed historical account of early air intercept radar is presented in [2]. Finally, in radio astronomy, another important event was the measurement and discovery of solar radiation at radio frequencies (RFs). Indeed, one of the first female radio astronomers was a little-known scientist named Elizabeth Alexander [3]. Her important contribution has been detailed by Orchiston [4].

THE MISSED CONTRIBUTIONS FROM THE EARLIER COLUMN

Returning first to moon bounce, I received an encouraging email message from Joe Sanroma (K1DXJ), a radio amateur, telling me that, even up to 1958, radio amateur Sam Harris (W1BU) communicated via moon bounce at 1,296 MHz with another amateur (KH6UK). Harris used a makeshift wooden parabola located in Medfield, Massachusetts, which is about 50 km southwest from Boston. Apparently, remnants of this parabola still exist in the woods near where the historical transmissions were made.

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The topic of air intercept radar and, especially, its early history are inseparable from the choice of frequency and size of the antenna that could fit on the available aircraft. The first operating system in 1937 was fitted to an Avro Anson K6260 for flight trials from Martlesham Heath, a village near Ipswich, United Kingdom, to track shipping off the Suffolk coast. The frequency was 150 MHz, which made the then-available antennas relatively large. In this case, tuned half-wave dipoles or unipoles were used. This first radar set gave a range of 3.2–4.8 km from Western Electric Type 316 A "Giant Acorn" valves that could generate a few hundred watts at the RF from the transmitter. From this humble beginning, the present air intercept systems evolved. This development is provided in delightful detail by White [2].

Finally, on solar radiation, several people were conducting RF observations related to radar in 1945. This included the Council for Scientific and Industrial Research Division of Radiophysics in Sydney, Australia, which was mentioned in the earlier article [1], but also by Bruce Slee in late 1945 using a radar station near Darwin (Figure 1). At the time, Slee was a radar technician and operator who also verified the performance of the equipment [5]. He noticed that the noise level increased in the hour leading up to sunset. He contacted the division, and, although collaboration was planned, it never happened. However, perhaps as a result of this contact, Slee later joined Radiophysics after first gaining his Ph.D. degree. He was one of the original discoverers of the first discrete radio sources and took part in one of the first meter-wave sky surveys for radio sources.

Farther to the east, in the middle of the Tasman Sea, a "very striking" increase in "radio noise" was noticed earlier, on 27 March and 1 April 1945, by the officer in charge of the Royal New Zealand Air Force 200-MHz radar unit located on Norfolk Island (Figure 1). Its remoteness made it an ideal location for a convict settlement in the late 18th and

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19th centuries. As an aside, from the 1860s, Norfolk Island became the home of the descendants of some mutineers from the *Bounty*.

Moving on, Elizabeth Alexander and her children had been repatriated from Singapore in 1942, and she was then relocated to Wellington, New Zealand (Figure 1). She was assigned to investigate the so-called "Norfolk Island effect." Alexander had completed a Ph.D. degree in geology from Cambridge University prior to the war. From 1940 to 1941, she held the rank of captain in the Naval Intelligence Service, working on radio direction finding in Singapore. In New Zealand, she was head of the Operations Research Section of the Radio Development Laboratory [3]. With Alexander involved, further monitoring took place later in April, where several other radar stations located on New Zealand also detected the same effect. She authored a detailed report on the Norfolk Island effect [6] and later corresponded on it with J.L. Pawsey, the lead investigator of radio astronomy at the Division of Radiophysics, on the other side of the Tasman Sea [5].

I wanted to acknowledge the many early radar technicians and operators who later contributed to extending our field of antenna engineering as well as scientific knowledge.

As recorded by Orchiston [4], the observations of solar radiation effects recorded by the Division of Radiophysics and Alexander did not receive the recognition that was due at the time, as their papers to *Nature* were inexplicably delayed, giving the priority of publication to British researchers [4], [5], [7]. It goes without saying that skullduggery in science is not a modern phenomenon but went on in the 1940s as well as in ancient times. For instance, the Babylonians actually knew Pythagoras's formula a millennium before, but Pythagoras or someone in his mathematical school may have been the first to prove it. More recent misappropriation as well as duplicate submissions is one of the reasons for a rigorous and independent review process, such as that used by our journals.

The main point of these remarks is to further emphasize the importance of radar technology and early radar stations in creating new science areas. In addition, I wanted to acknowledge the many early radar technicians and operators who later contributed to extending our field of antenna engineering as well as scientific knowledge.

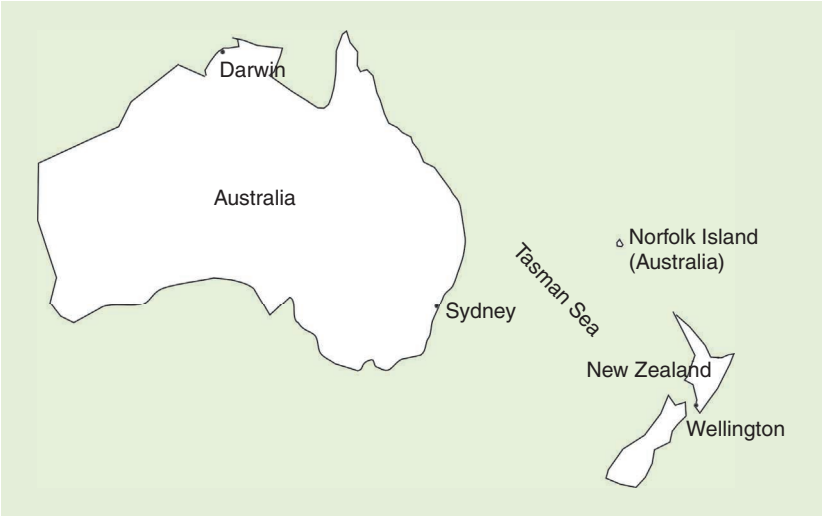

FIGURE 1. A map showing the sites related to identifying radar solar noise in 1945.

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