

# ALAN MAXWELL AND THE MONITORING OF 100 MHz SOLAR EMISSION IN 1947–1948: TOWARDS THE WORLD'S FIRST KNOWN MSc THESIS ON RADIO ASTRONOMY

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**ABSTRACT:** Alan Maxwell was a pioneer of New Zealand radio astronomy. Born in Auckland in 1926, he was an accomplished organist, but also was enthralled with radio science. After completing an MSc in Physics at Auckland University College in 1948 Maxwell went to Manchester University for a PhD. He was then appointed by Harvard University to develop radio astronomy, and founded the Fort Davis field station in Texas, where he built an international reputation in solar radio astronomy.

In this poster we discuss Maxwell's MSc thesis, which we believe was one of the first—if not the first—Masters thesis on radio astronomy anywhere in the world.

## 1. INTRODUCTION



Alan Maxwell was born in Auckland on 21 October 1926. An only child, he showed musical talent at a young age, and at 16 gave his first organ recital at the Auckland Town Hall.

After completing his Auckland MSc, Maxwell went to Manchester University, graduating in 1953 (photo, left) with a thesis on “A Radio Astronomical Investigation of the Upper Atmosphere” He then taught in the Physics Department for two years before joining Harvard University. In 1956 he founded the Fort Davis Radio Astronomy Field Station in Texas (see below), where he and colleagues researched solar radio emission.



Auckland, 2011



Maxwell retired in 1983 but maintained an office at Harvard University. Never marrying nor putting down roots, he loved to travel (photo, left). Eventually COVID put a stop to this, and he died peacefully in San Diego on 22 August 2021, where he had spent the past 15 months.

## 2. MAXWELL'S MSc RESEARCH

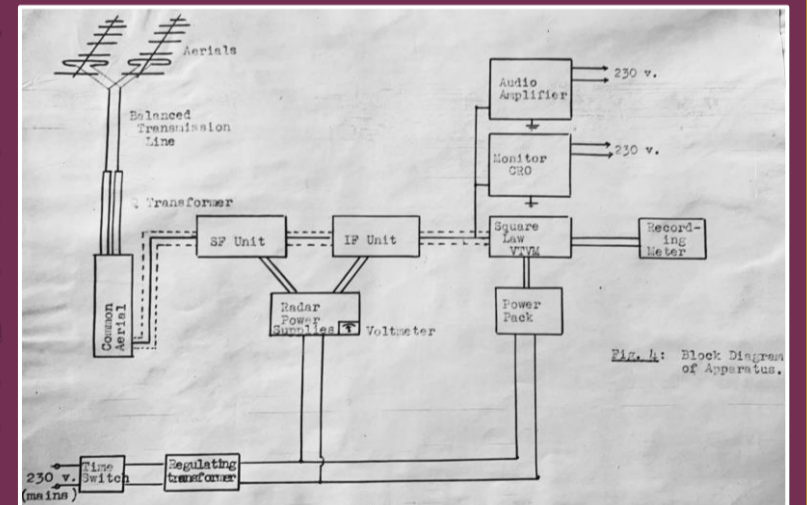
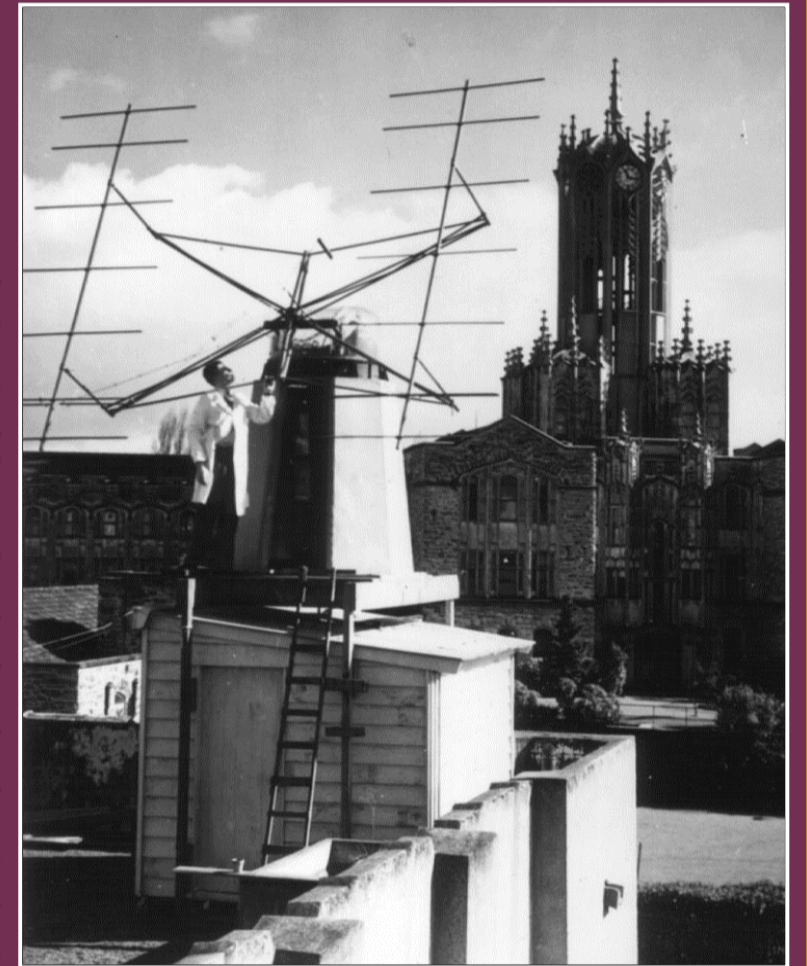
### 2.1 Introduction

In 1947 Maxwell began an MSc in the Physics Department at Auckland University College, with a thesis on “Enhanced Solar Radiation at 3-metre Wavelength.” His supervisor was Dr Karl S. Kreielsheimer from the Physics Department. His thesis investigation built on the pioneering research in solar radio astronomy carried out in New Zealand in 1945 by Dr Elizabeth Alexander (which is the subject of another poster at this conference). It also allowed Maxwell to monitor the Sun for months on end, after he had gained hands-on experience in designing and building a radio telescope. His 1948 thesis may have been the first on radio astronomy completed anywhere in the world. It was certainly a ‘first’ for New Zealand.

### 2.2 Instrumentation

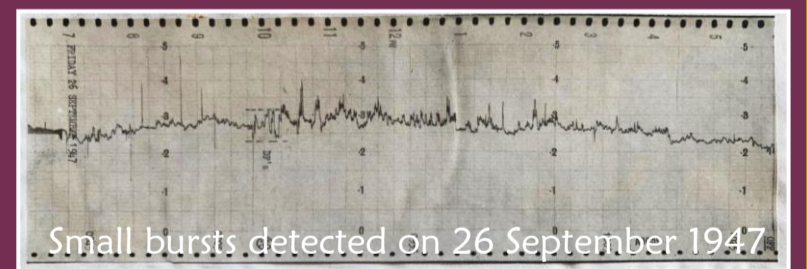
Maxwell used an LRAW Type 1 ex-WWII radar equipped with a pair of equatorially mounted Yagi antennas that could track the Sun. These (see right) were mounted on a small shed atop the 3-storey Biology Building at the University.

The small shed housed the 100 MHz superheterodyne receiver, with Signal Frequency (S.F.) and Intermediate Frequency (I.F.) units (see the block diagram below). The S.F. unit had two stages of amplification, using CV66 grounded grid triodes followed by a 953 diode mixer with a 6J5GT-G local oscillator. The I.F. unit comprised nine 6AC7 tubes. The output was charted on a Siemens milliammeter and on a CRO, while an audio amplifier announced the presence of solar bursts. 230V mains power was used.



### 2.3 Solar Observations

Maxwell's objective was to investigate solar bursts. The radio telescope was operational from July 1947, and on 5 and 8 August he detected his first solar bursts. Others followed on 25–27 September 1947 (see right), and 12–15 May, 3 June, 1 July, 5–9 August and 17–19 October 1948. Sadly, Maxwell never had time to publish his MSc research.



## 3. FURTHER READING

Maxwell, A., 1948. *Enhanced Solar Radiation at 3-metre Wavelength*. MSc Thesis, Physics Department, Auckland University College.

Orchiston, W., 2017. The early development of New Zealand radio astronomy. In Nakamura, T., and Orchiston, W. (eds.), *The Emergence of Astrophysics in Asia: Opening a New Window on the Universe*. Cham (Switzerland), Springer. Pp. 675–702.

Skinner, S.M., Orchiston, W., and Parkins, S., 2022. Alan Maxwell (1926–2021): pioneering New Zealand radio astronomer. *Southern Stars*, 61(3), 11–17.

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