

New Zealand and the Beginnings of Radio Astronomy –
A Process of Discovery
Orewa: 30 January – 1 February 2013

A brief history of New Zealand astronomy including an analysis of what went wrong and what we did right!

John Hearnshaw
University of Canterbury
Christchurch



Astropolitics

Astropolitics: The art of convincing politicians to fund telescopes and other astronomical facilities, even though they have no idea or understanding of the scientific uses to which they will be put.

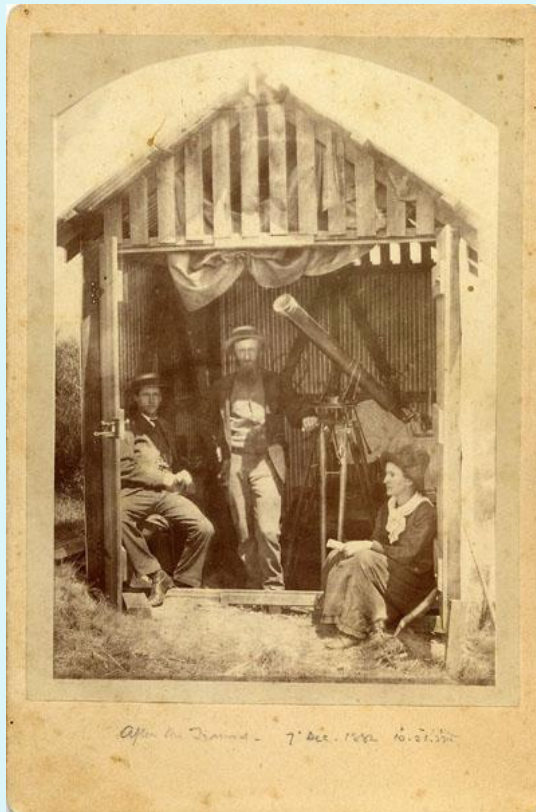
A nation with an astronomical birth!

- In 1769, a nation founded on astronomy.
- James Cook and Charles Green view transit of Mercury from Mercury Bay, Coromandel.
- Astronomers' Point in Dusky Sound was Cook's observatory in 1773.
- It was a propitious astronomical birth which few countries can claim to emulate.



The story continues ...

Transits of Venus expeditions were sent to NZ for the transits of December 1874 and December 1882.



Observers in Nelson, Dec 1882



American transit expedition, Queenstown, Dec 1874

The next step forwards: the first professional observatory

- 1863: first observatory established in Wellington to provide a time service. Archdeacon Arthur Stock in charge (cf Sydney Observ. 1858; Melbourne Observatory 1862).
- 1868: Named Colonial Time-service Observatory; NZST adopted
- 1907 Colonial Observatory resited in Kelburn, Wellington; known as Hector Observatory, then in 1926 as Dominion Observatory
- Finally taken over by IRL Standards Lab in 1992

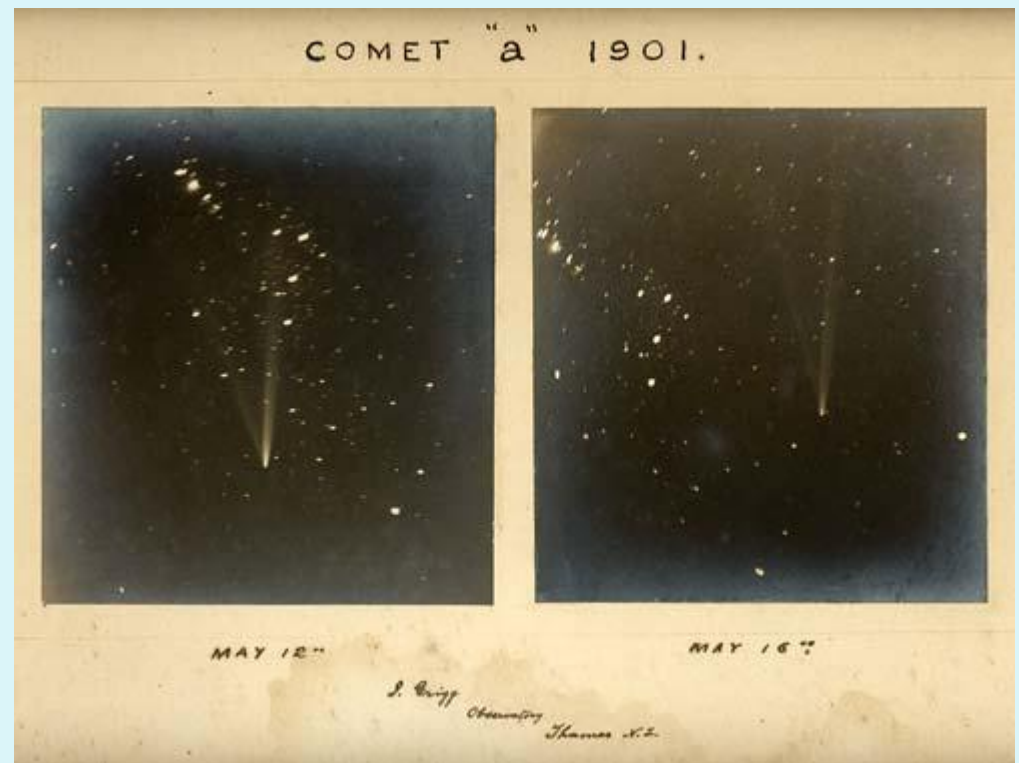


Left: Time ball of Colonial Observatory
Above: 1907 building of Hector/Dominion
Observatory

We also had some enterprising amateurs in the early years

- John Grigg established his observatory in Thames. Comet-hunter who discovered three comets in the early 20th C
- Joseph Ward was an amateur astronomer and optician/telescope maker – Ward observatory, Wanganui, 52-cm newtonian telescope.
- And many others ...

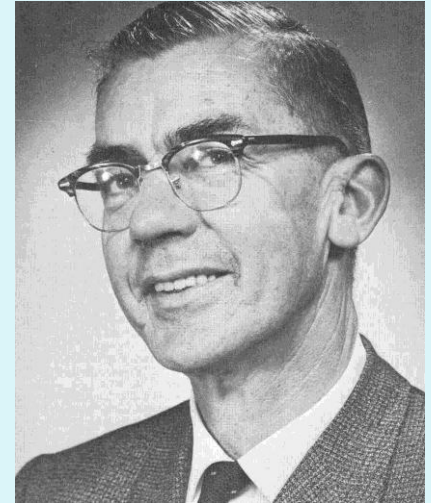
Right: Grigg photograph of his comet of 1901.



The amateur tradition in optical astronomy continued right through the 20th century

Some NZ amateurs have had considerable international reputations for their research work, such as:

- Ronald McIntosh (1904-77) – meteors (active in 1930s)
- Frank Bateson (1909-2007) – variable stars. Founder Mt John Observatory, and RASNZ Variable Star Section.
- Albert Jones (b 1920) – naked eye variable star observer with over half a million observations.



Above right: Frank Bateson
Below right: Albert Jones

Optical observatories were established in several places by schools, colleges and for the public

Examples:

- Townsend Observatory, Canterbury University College 1897: 6-inch Cooke refractor from 1864.
- Ward Observatory, Wanganui: 9.5-inch refractor, 1901.
- Gifford Observatory : 5-inch Zeiss refractor, Wellington College, 1912.



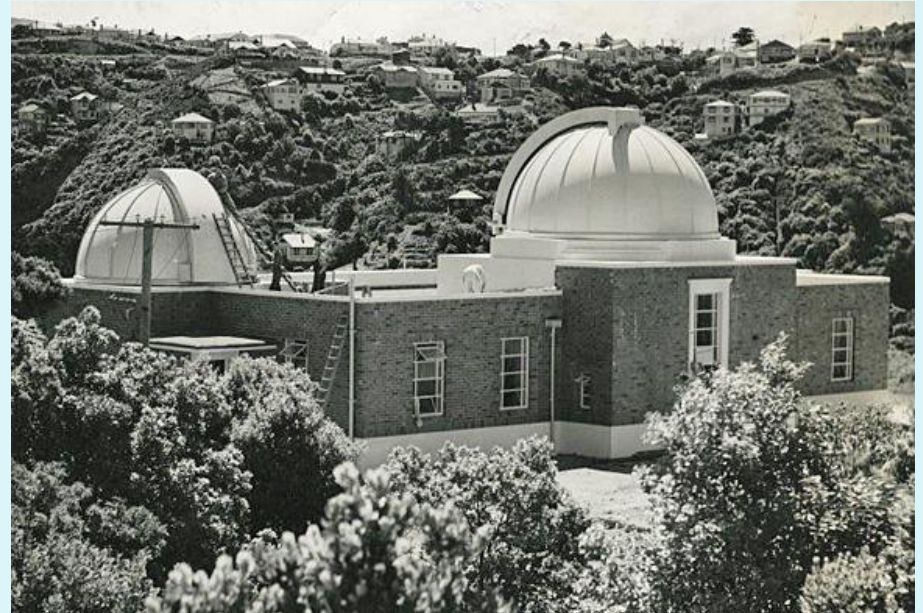
Townsend Observatory, Christchurch



Gifford Observatory, Wellington – opening 1924

Carter Observatory, Wellington

- Founded in 1941 with a role for public education and research
- Equipped with 9¾-in Cooke refractor; later 16-in B&C reflector
- Funded through direct grant from MORST, plus Wellington City Council, until 2008
- Director from 1973-81 was Dr Murray Lewis, an Australian radio-astronomer; ill-fated attempt to establish an optical observing outstation in South Island, but with inadequate funding.
- The Black Birch outstation was closed about 1990.
- A planetarium was installed at Carter in 1991.



Carter Observatory, Wellington

Carter Observatory, Wellington

- Carter was given the status of NZ National Observatory in 1977, but no additional funding to support this role.
- Prof Mike Bessell (ANU) commissioned to report on future of Carter and its national observatory status in 2005.
- He recommended 'National Observatory' title be transferred from Carter to Mt John.
- In the event, Carter lost this status, and its MORST funding, and NZ now has no national observatory.
- The lesson learnt: (a) fund astronomy properly or not at all; (b) carefully define function and purpose of an observatory; (c) a radio-astronomer as director was a missed chance to develop radio-astronomy.



Carter Observatory Cooke refractor

Mt John Observatory, University of Canterbury

- Established in 1965 in central S Island as a joint project of Univ. of Pennsylvania and Univ. of Canterbury. (Pennsylvania involvement ceased after 1975).
- Early project was Canterbury Sky Atlas (1972).
- Research especially on variable and binary stars, using two 60-cm telescopes, plus 1-m McLellan reflector from 1986.
- Spectroscopy undertaken from 1976, and high resolution échelle spectrograph from 1977.
- High resolution fibre-fed vacuum échelle HERCULES on 1-m telescope 2001 used for high resn. spectroscopy and precise radial velocities.



1.8-m MOA and 60-cm domes at Mt John

Mt John Observatory, University of Canterbury

- Collaboration with Nagoya Univ. Japan from 1995 in MOA microlensing project for extrasolar planets.
- 2004 Nagoya installs 1.8-m MOA wide field survey telescope on Mt John for microlensing.



1.8-m MOA dome and telescope at Mt John



Mt John Observatory, University of Canterbury

- Mt John has been NZ's only successful research facility in optical astronomy, and will soon see its sesqui-centenary (in 2015).
- Funding has been adequate but not munificent, and is largely through university grants.
- Weather for optical astronomy in 'the Land of the Long White Cloud' is not the greatest (25% photometric; 25% partly cloudy; 50% unusable), but adequate for many projects.
- Typical staffing:
 - 2-4 technical staff,
 - 2-4 optical PhD level astronomers,
 - 6-10 graduate students.



1-m dome and telescope

Radio Development Laboratory, DSIR

- Established in 1937. RDL's Operational Research Section led by Elizabeth Alexander.
- Supported radar work in WW II, and 5 radar sites (4 in Northland, 1 on Norfolk Island)
- Disbanded with shocking lack of vision in 1946 by Sir Ernest Marsden, Director-General of DSIR.



Above: war-time radar station at Whangaroa in N Island. Right: Elizabeth Alexander



Radio Development Laboratory, DSIR

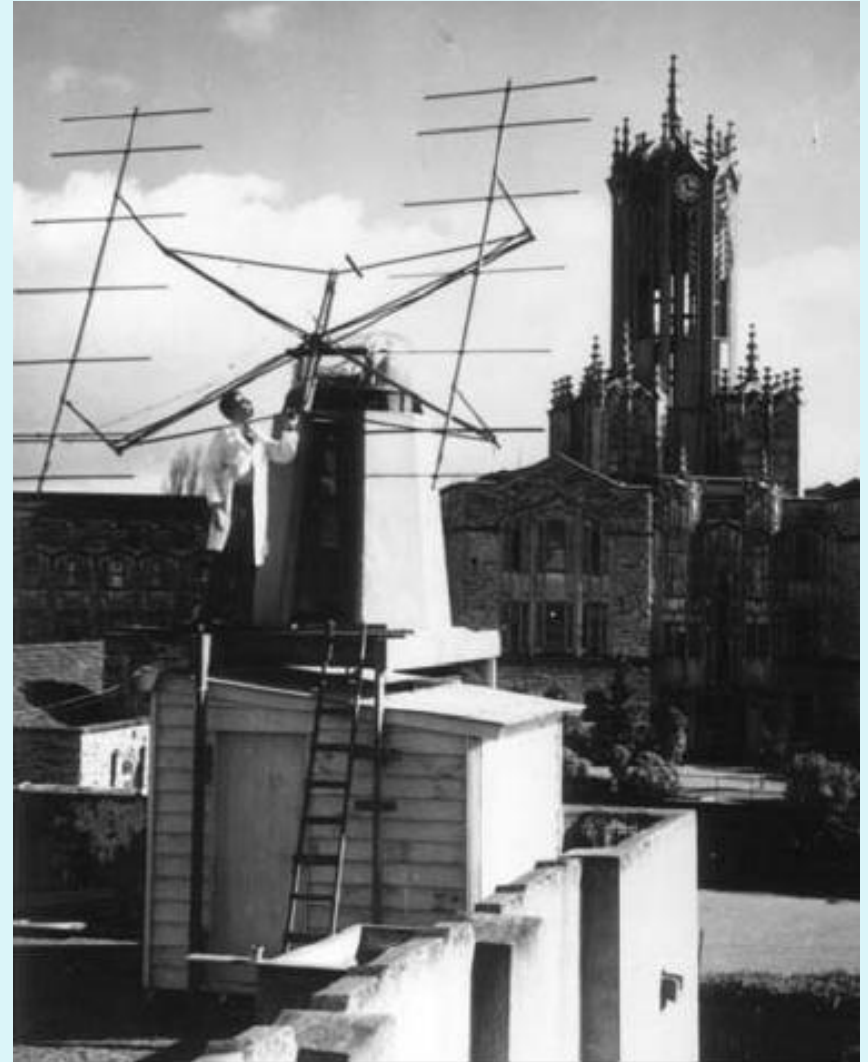
- Compare the fate of RDL in NZ with CSIRO's Division of Radiophysics (established 1940), which was kept going and expanded after the war, and became the home for Australia's expansion into radio-astronomy
- CSIRO's Dover Heights facility began active research in radio-astronomy from 1946.
- This was thanks to the vision of Sir Frederick White, Director-General of CSIRO (a New Zealander, formerly head of Physics at the University of Canterbury!)
- The demise of RDL in New Zealand meant NZ lost its first chance to establish research in radio-astronomy.

Solar radio astronomy in Auckland

- 1947-48: Alan Maxwell does an MSc thesis in solar radio astronomy at Auckland University College (now University of Auckland).
- One of the first graduate theses ever in radio-astronomy, but it remained unpublished.
- He used twin Yagi aerials to detect solar radiation at 100 MHz, and studied correlation with sunspots.
- Maxwell left NZ thereafter, to do a PhD in radio-astronomy at the University of Manchester.
- His departure led to the loss of the embryonic research in radio-astronomy in Auckland – New Zealand’s second missed opportunity in this new scientific field.

Solar radio astronomy in Auckland

Alan Maxwell adjusting the 100 MHz twin Yagi antenna set up on the roof of the Biology Building at Auckland University College in 1947. The small hut below that antenna and mounting housed the receiver



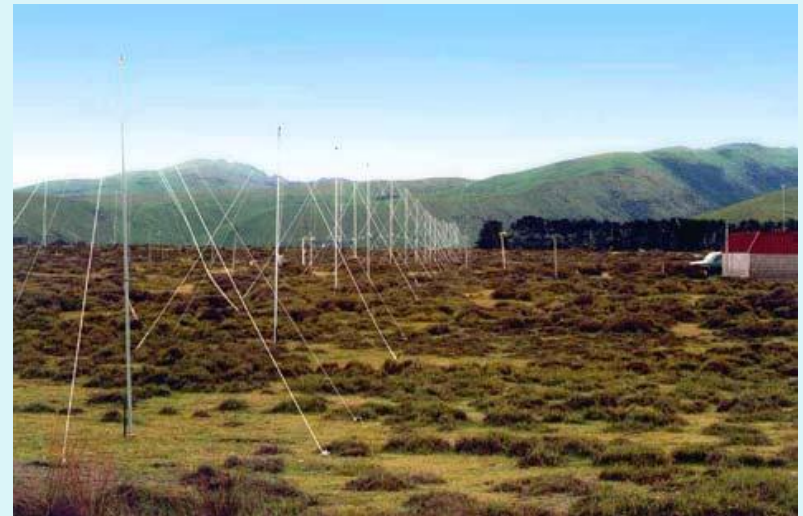
University of Canterbury: meteor and atmospheric radar



- A research group was established at Canterbury from early 1950s led by Clif Ellyett, with Colin Keay, John Gregory and graduate students Grahame Fraser, Dick Manchester, Bob Bennett and others for meteor and atmospheric radar.
- Ellyett trained at Jodrell Bank under Lovell, so his expertise was a significant fraction of NZ's know-how in radio-astronomy at that time.
- Ellyett and Keay left UC in 1964-65 for Univ. Newcastle in Australia, Gregory left for a position in Canada, leaving a large hole in NZ's radio-astronomical expertise. The third disaster for radio-astronomy in New Zealand!

Birdlings Flat Atmospheric and Meteor Radar Field Station University of Canterbury

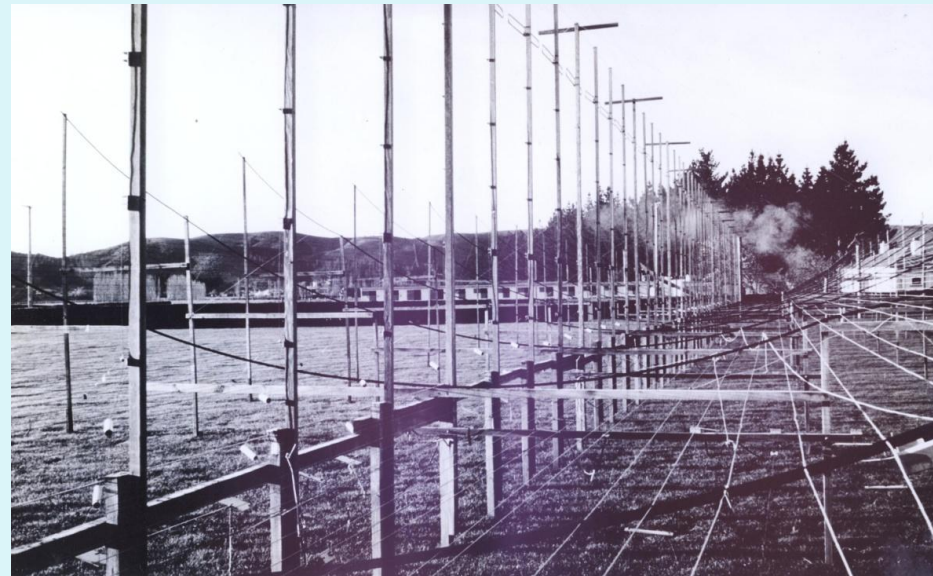
- Although radar research continued at UC under Fraser, Baggaley, Bennett and von Biel, the mass exodus “put the nail in the coffin of radio astronomy in NZ at the time. It perhaps cleared the way for the development of professional visual astronomy, which has dominated ever since, as the same year saw the opening of Mt John Observatory.” (Marilyn Head, Southern Stars, 2010).



Right: Meteor radar at Birdlings Flat field station

Invermay Radio Observatory, University of Otago, Dunedin

- Dick Dowden from 1965 and Paul Edwards from 1968 (both from Australia) established radiophysics research groups at Univ. of Otago for magnetosphere and radio-astronomy.
- Edwards set up a phased array of dipoles at Invermay on Taieri plains, NZ's first radio telescope!
- Research in radio emission from flare stars at 120 MHz was a major goal, with graduate students Robert Hurst and Malcolm McQueen.



Right: Invermay radio telescope near Dunedin

Invermay Radio Observatory, University of Otago, Dunedin

- Edwards left in the mid-1980s, returning to Australia, and radio-astronomy at Otago also terminated then (though Dowden's group doing ionospheric research continued).
- This was the fourth misfortune for NZ radio-astronomy.



Professor Paul Edwards

AUT and Warkworth radio astronomy

- AUT's move into radio-astronomy under Sergei Gulyaev is actually New Zealand's fifth chance to establish a viable research facility in radio-astronomy!
- Hopefully this time it will flourish and be supported!



Left: Warkworth
30-m radio dish.
Right: 12-m radio
telescope.



What went wrong?

- New Zealand governments have never had the vision to invest in research for its own sake. They always looked for economic advantage, and were unable to foresee the benefits of astronomy. (In the case of SKA, it was the prizes of broad-band internet and super-computing that sparked some interest, not astronomy *per se*.)
- Personal disputes and infighting did great damage to NZ astronomy (at Canterbury, Otago universities and Carter Observatory). Our best people went overseas, usually to Australia (White, Ellyett, Keay, Manchester, Edwards) or elsewhere (Maxwell, Lewis, Gregory, Gilmore).

What went right?


- Successful developments in research astronomy in NZ have mainly come by efforts from individual university departments, without much national co-ordination. (e.g. Mt John, University of Canterbury; Warkworth radio observatory, AUT).
- Collaboration with Americans and Japanese (in case of Mt John) and with Australians (in case of Warkworth) has been hugely beneficial, and will probably be essential for future developments of NZ research in astronomy.

Optical astronomy by default

- New Zealand developed optical astronomy more or less by default, first at Carter and then at Canterbury (Mt John).
- This was heavily influenced by the thriving tradition of amateur optical astronomy in the country.
- And also by the fact that a viable but small research facility in optical astronomy is probably less expensive than one in radio-astronomy.
- If we were starting to develop astronomical research from scratch again in the 'Land of the long white cloud' one wonders if a radio-astronomy observatory might have been the more strategic and viable option in 1965. (This is, of course, with the benefit of hindsight!)

Postscript: In the land of the Long White Cloud, the sky is nevertheless sometimes clear. This is the Church of the Good Shepherd at Lake Tekapo, near Mt John Observatory. (Photo: Fraser Gunn).



A silhouette of a barn roof is centered in the lower half of the frame, set against a dark night sky filled with stars and the Milky Way galaxy. The text "The End Thank you!" is overlaid on the barn silhouette in a yellow, cursive font.

*The End
Thank you!*