

1. **Auckland to the Cavendish to Sydney University A career in Radio Astronomy**
New Zealand and the Beginnings of Radio Astronomy A Process of Discovery Bruce McAdam
2. **Where did the 80 years go?** Education in New Zealand – 23 years 6 months
 - ◆ Army & Dominion Physical Laboratory – 6 months
 - ◆ Cavendish Laboratory, UK – 3 years 2 months
 - ◆ Naval Research Laboratory, NZ – 2 years 3 months
 - ◆ Sydney University Physics Dept. – 32 years 3 months
 - ◆ Cosmology Distinction Course – 16 years
 - ◆ Retirement – 3 years
3. **Triggers for a science career 49 valve**, a gift in mid 1944 in Cadet signals Ham radio license 1946 **ZL1IA**
5valve radio, Built from kitset in 1946; Bought war surplus ZC1 transceiver 1947 **ZC1**
4. For many years from 1946 I subscribed to the monthly journal **Wireless World**
In a series from 1947 to 1950 WW published 6 articles on a Design for a High-quality Amplifier which were reprinted in this supplement. I built a Williamson Amplifier in 1951. The *double T* high pass filter was a crucial part of my Ph D equipment for the 3C Survey
5. 1951 to 1954 oceanographic field trips: Parua Bay (Endeavour) and Mayor Island (Isa Lei).
6. MSc thesis: The Radioactivity of Natural Bismuth 1952-54
23 channel pulse analyser; 8ppm (1% loss) 1.5-6.6 MeV alpha pulses (250 keV resolution)
Ionization Chamber and gas filling line Argon 4 atmos; 10 µsec pulses
7. **The half life of ²⁰⁹Bi** Reported in 2003 $T_{1/2} = 1.9 \times 10^{19}$ yr Detected 128 decays in 5 days
8. **1955 Finished M Sc. Joined Defence Scientific Corps Seconded to Dominion Physical Laboratory**
PHOTO AUC Physics Staff & MSc students 1957
9. **RMS Rangitane** - 1955 from Wellington, 27 August via Panama to Southampton, 26 September
344 passengers, including Roy Kerr, Grahame Fraser & Mark Barber and to Cambridge
10. **September 1955 to November 1958 Cavendish Laboratory, Cambridge Mullard Laboratory**
Ionosphere Group: J.A. Ratcliffe + 8 staff, 16 students
Radio Astronomy Group: staff Martin Ryle, Tony Hewish, Graham Smith,
with Bruce Elsmore, Peter Scheuer, Robin Conway, John Baldwin, John Shakeshaft;
students:- 1954 George Whitfield, John Thomson;
1955 David Edge, Carmen Costain, Jan Högbom, Bruce McAdam
1956 Paul Scott, Pat Leslie, Harriet Tunmer, Simon Archer, John Haseler
11. **The Cambridge 3C interferometer** 308 EW & 27.2 NS wavelengths
12. **3C observations with a bandpass filter**
The filter was tuned to the interferometer period of about 16 mHz with a bandwidth of 0.8 mHz.
The filter reduces both noise and confusion from sources at other declinations
13. **The 3C lower culmination survey 52 -70 declination**
14. **3C Survey positions** The 3C aerials were 6° off true EW so that upper and lower culmination beams crossed at 12° This helped avoid lobe position errors for the overlap in northern sky.

15. Surveys of Stars or Sources?

The covers of 2C, 3C and 3CR all state "RADIO STARS" but the title pages use "RADIO SOURCES"

16. RNZAF flight home at Entebbe; 5 November 1958

Dave Byers, Grahame Fraser, Tony Lewis, Sister Pope, Garry Cuff, Eddie Eide

17. The Naval Research Laboratory Devonport, Auckland The NZ Army, Navy and Air force Seconded many of their Defence Scientific Corps Officers to this Laboratory for the remaining years of active service.

18. Sydney University Astrophysics Group

In 1961

by 1970 add

Bernard Mills

Michael Large

Alec Little

Tony Turtle

Arthur Watkinson

Hugh Murdoch

Bruce McAdam

Dave Crawford

Terry Butcher

Alan Le Marne

Mick White

Jack Howes

John Horne

19. From the grant application to NSF in 1961. Note Pat O'Brien's name

20. The Electrical Engineers designed much of the receiver system. These were the folk in 1961; Bob Frater joined as full-time research fellow when the NSF funding was approved.

21. The Molonglo Cross as seen from the West.

22. Cornell – Sydney University Astronomy Center linked the Arecibo and Molonglo research groups

23. Construction of feeds took until 1964 for EW and September 1967 for the complex NS arm
Don Campbell in 1962

24. Multi phasing gave 3 EW fan beams and 33 pencil beams Output was on digital tape Control desk with on-line monitoring of 11 pencil beams, total power and immediate contour plot of the zone

25. In 1965 The EW arm was ready It was used as a fan beam 1964-'67; Cross '67-'78; MOST '81-2001 Terry Butcher on the cantilever ribs

26. The NS arm observed as the Cross, Sept 1967 to Aug 1978. Since 25 August 1978 this arm has not been used

27. Production of a contour map for extended source 1333-33, using three dec zones Fax plot of D 485 Computer map from the digital data of D 486 Hand drawn contours using all 3 zones of computer output.

28. Structure of Extended Sources two major projects
116 sources 408 MHz Richard Schilizzi 1975 383 sources 843 MHz Paul Jones 1992

29. Individual source observations: Combining Molonglo with Fleurs and VLA gave better results

30. Seeking a gamma ray source 1706-44 with the Durham Cosmic Ray Group, Feb 1993

31. The Centre of the Cross Now, in 2013, the EW arm is the SKAMP – the SKA Molonglo prototype

32. A Career in Summary

1936 Hillcrest Primary School 1944 Hamilton High School; introduction to electronics; gift of a 49 valve

◆1949 Auckland University College 1950 assistant to E H Sagar; underwater acoustics

◆1953 Temporary Part-time Junior Lecturer

◆1955 NZ Defence Scientific Corps move to the Cavendish; Martin Ryle, Tony Hewish, Graham Smith

◆1958 return to Naval Research Laboratory, Auckland 1961 Sydney University: join Bernie Mills

◆1993 Chair, Cosmology Distinction Course 2009-11 Distinction Courses closed; retirement!

33. The End – in memory of Bernie Mills 1920 – 2011