

Chapter 1, An Inheritance of Intangibles, 1890s

Joe Pawsey and the Founding of Radio Astronomy in Australia, Early Discoveries from the Sun to the Cosmos

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ESM_1.1.pdf: Additional Details about Primary Sources

The source material for this book consists of a number of elements.

Archive resources that were gathered earlier for three published books were relevant: (1) *Under the Radar- The First Woman in Radio Astronomy: Ruby Payne-Scott*, by Goss and McGee, 2009, (2) *Making Waves- The Story of Ruby-Scott: Australian Pioneer Radio Astronomy*, by Goss in 2013 and (3) *Four Pillars of Radio Astronomy: Mills, Christiansen, Wild, Bracewell*, by Frater, Goss and Wendt, 2017.

Archives

We drew material from the following institutional repositories:

The Australian Academy of Science archives

National Library in Canberra

The Churchill College Archives Centre, University of Cambridge,

NRAO archives

CSIRO archives in Canberra

The useful material identified in these archives by archivist Rob Birtles in 2010 included C. Boris Schedvin's unpublished draft of the history of CSIRO from 1949 to 1983. Details of this text are presented in NRAO ONLINE.³ Schedvin, CSIRO History 1983. This text is about half of the intended second volume of Schedvin's two volume series on the history of CSIR and CSIRO. A number of insightful comments about Pawsey and Bowen are summarised in the NRAO ONLINE text.

We provide a longer description of our use of the following three archives:

1. National Archives of Australia records

The National Archives of Australia (NAA) in Chester Hill, Sydney, New South Wales, Australian provided resources in the years 2008 to 2020. Goss visited the NAA in 2008, 2009, 2011 (twice), 2014, 2015 and 2016. Most visits consisted of two to three days working at the site in Chester Hill; the original archive material was photographed. A number of files were classified as NYE-“Not Yet Examined”. For these items, permission was granted by CSIRO to examine the content.

The main NAA resource for the CSIRO Division of Radiophysics is series C3830, 1215 files starting in WWII. Other series of much smaller extent contain CSIRO Division of Radiophysics content. The “John Deane” archive of April 2011 is described below as well as the policy of “culling” (selective removal of items) files.

In October 2013, Rob Birtles of the CSIRO archives (CSIRO Records Advisor - Collections and Archives) located a number of files from the “Knuckey System”, connected to RPL. In NRAO ONLINE.¹, we reproduce portions of the series note for NAA Series A10061 “Correspondence Files, Multiple Number Series with Alphabetical Prefix”, dating from January 1929. This text presents the complex history of the “Knuckey System” which started in the CSIRO Division of Plant Industry and was migrated to other parts of CSIRO, including the Division of Radiophysics. This series consisted of an alpha/numeric numbering system that was applied to CSIRO Records from about 1951 to 2016.² The system was created by the CSIRO Records Officer Phillip C.J. Knuckey over many decades. The system was used throughout all CSIRO Divisions with a flexible numbering system which could be used by all Divisions of CSIRO. The purpose of this system was to classify correspondence and records relating to “the establishment, operation and administration of scientific research rather than actual research data. The series also records the functions, aims and research programs of the Division.” Additional details of the Knuckey files are provided in the 1976 account of his retirement from CSIR/CSIRO after 50 years of service. (See below: “Phil Knuckey Retires”, from CoResearch November 1976 issue 210, p 9).

For RPL, the files with prefix KE contained general correspondence and technical discussions between the CSIRO head office and RPL. The category TZ contained information about CSIRO properties (for example the GRT-Parkes telescope-site and finances). Rob Birtles and the NAA in Canberra³ provided 11 KE files and 4 TZ files from NAA and CSIRO archives. These have supplemented source material located in C3830 files at the NAA.

¹ In addition, the SR text contains a CSIRO document provided by Rob Birtles in July 2020. The text is a summary of Knuckey’s presentation in February 1958 at a conference of CSIRO Divisional Clerks as he introduced the Knuckey System. The presentation was entitled “Correspondence Records”.

² Limited use to 2016 by the CSIRO Legal Team; CSIRO Property used this TZ classification until about 2010.

³ Assistance provided by Brendan Fenton of NAA Canberra August 2015 to February 2016.

In August 2020, Birtles provided details of a legacy of the “Knuckey System”, Personal History files for CSIRO staff (PH):

The current PH files are indeed a numbering system related to the Knuckey System. PH (and all Ps) relates to the Personnel subject area. All staff have a Personnel Record (and corresponding Staff ID) that starts with “PH” followed by a “/” and then followed by the first three letters of the staff members surname and then a running 3 digit number ... [The PH system] is the last surviving reminder of the Knuckey System that is still used within CSIRO. It has been modified though to cater to those more common surnames starting with BRO, SMI, WIL etc where 999 has been reached but generally it is very much the same as devised by Phil Knuckey. [For example Pawsey’s file in the NAA A8520 series is PH/PAW/1 , an extensive file from 1933 to 1962.]

In 1991, the Knuckey file system was replaced by a computer system used by the CSIRO, the TRIM system. This was an Electronic Records Management System (EDMS) which created a record number based on the year followed by a running number (e.g. 1991/0001). The implementation was staggered as Divisions introduced the system at various times. An advantage of the Knuckey system was that the user could find all relevant files located physically in the same place. The TRIM system did not have this property since the system was based on consecutive numbers.⁴

Also, on 18 October 2013, Rob Birtles located consignments of RPL files that had not been processed by the NAA. Listings were provided via the TRIM documents. The consignment was designated “C3830/6 “, numerous boxes sent some years earlier from RPL to the NAA. At the NAA, Fiona Burn remembered having seen this consignment earlier and helped us view the files in July 2014.

A number of these categories became significant additions to the content of the present book:

(1) The Z files mainly originated from Bowen (Z1, box 46) and Pawsey (box 45, Z3), based on personal correspondence or related to both planning and experiences during overseas visits. A number of significant letters were located. The Z1 and Z2 files are now present in the NAA C3830 online listings.⁵

(2) Additional files were also transferred at this time. Documents originating from Paul Wild, Brian Robinson, Dick McGee, Don Yabsley and Harry Minnett contain relevant material for RPL activities in the era 1945 to 1962.

⁴ Rob Birtles has provided details of the CSIR/CSIRO systems.

⁵ The Z8 series in the NAA contains documents from J.P. Wild.

One of the more important aspects of the TRIM file discoveries of October 2013 was the discovery of files D5/4 from the publication office of RPL. These included the publications RPP 1 to RPP 2450 from the years 1945 (RPP 1 “Radio Frequency Energy from the Sun” by Pawsey, Payne-Scott and McCready, published in *Nature*) to 1981 (RPP 2450 “The Position Angle of Jupiter’s Polarised Synchrotron Emission and the Jovian Magnetic Field Configuration” by Komesaroff and McCulloch, published in *Monthly Notices of the Royal Astronomical Society*).⁶ These files were located at the NAA with the assistance of Kerrie Jarvis and Fiona Burn of the NAA archive staff. In July 2014, a number of the publication files were copied, providing details of first drafts of journal publications with the accompanying referee reports from the editors of the journals.

1.1 “Phil Knuckey Retires”, from *CoResearch* November 1976 issue 210, p 9:

One of the latest officers to have his file closed is Phil Knuckey who was the Organization’s Registrar. In his fiftieth year of service with CSIRO, Phil was attached to the CLIS [CSIRO Central Information Service at the CSIR Head Office at 314 Albert Street in Melbourne]. He joined the Council way back on 17 January 1927 [the year after the founding of the CSIR on 26 June 1926] at the tender age of 14.

After serving a number of years as Divisional Clerk of Animal Health, Parkville, Phil returned to Albert Street and led the Head Office Correspondence Records Section for many years. Many of the present-day administrators of the Organisation serving around Australia received their early training under his direction.

However, Phil is perhaps better known for the role he played as Registrar assisting most Divisions to organise their Divisional records- administrative and technical- to provide an essential service to research workers. He started this herculean task in 1958⁷, traveling around Australia and becoming one of the best-known officers. He will be long remembered as the installer of the “Knuckey System” of filing which will no doubt remain with the Organisation for many years to come.

He was keenly interested in all sports, having played cricket to the “veteran” stage and was always associated with sporting activities of CSIRO in Melbourne.

Phil was farewelled at a function held in Melbourne, when more than 100 fellow officers and friends from many offices and laboratories paid tribute to his contribution to the Organization and his friendships created during his 50 years with CSIRO.

⁶ The file for RPP 1 (the first publication in the series) is designated C3830 D5/4/1.

⁷ See the original text (CSIRO archive) in NRAO ONLINE.Knuckey System, CSIRO files. Some existing files were given Knuckey System classifications retroactively.

2. Pawsey family personal records

The Pawsey family retains a number of significant records which we have termed the “Joe and Lenore Pawsey Collection”, located mainly at the house of Hastings Pawsey (son of J.L. Pawsey) in Frenchs Forest in Sydney. Some material, mainly photographs, were located at the home of Stuart Pawsey (20 April 1939 - 22 April 2020) in Berkeley, California. A number of confidential letters were located in the Frenchs Forest home archive. A significant discovery was the collection of letters that Pawsey wrote to his mother during his years as a student in Cambridge in the 1930s. A second discovery was a collection of letters that Pawsey’s mother-in-law, Mabel Nicol, sent to her daughter (J.L. Pawsey’s wife) Greta Lenore Nicol. These have now been transcribed by Elizabeth Pawsey, the daughter-in-law of J.L. Pawsey. These letters provided details of Pawsey’s experiences and opinions during key parts of his education and offer insights into his personal and family life after WWII.

3. The Sally Atkinson Archive

Sally Atkinson (13 July 1914 to 13 November 2012) was E.G. “Taffy” Bowen’s personal assistant from the 1940s to his retirement in 1971.⁸ In fig. 0.2.1, we show Atkinson in a photo from 2 November 1989 at Dover Heights, Sydney, a celebration of “Forty Years of Radio Galaxies – Evolution of Ideas and Techniques”. In the latter years of her life, she was looked after by her next-door neighbours, Dan Stevens and his wife, in North Epping, Sydney. After her death in late 2012, Ron Ekers, Jay Ekers and CSIRO communications officer Helen Sim were contacted in May 2013 by Stevens, her executor, concerning a number of documents, books and photographs that remained in Sally Atkinson’s house. In May and August 2013, about five linear metres of files were collected and taken to Ron Ekers’s office at CSIRO in Marsfield (Sydney)

⁸ Atkinson retired from CSIRO in 1979, having joined CSIR in 1940. After retirement, she worked in a paid capacity part-time for a year, organising the vast RPL archives (mainly C3830—now 1215 separate collections). Afterwards, she continued this work on a part-time basis for over 15 years. During this period, a number of the C3830 files were sent to the National Archives, plus some other smaller collections. The finding aid for C3830 (the majority of the RPL files) is described in 2.2.2 below. Her contributions to the history of Australian radio astronomy are monumental. Goss corresponded with her frequently in the years 1997 to 1999, as she helped contact Ruby Payne-Scott’s family and friends. Jim Caswell and Goss visited Atkinson at her home (51 Surrey Street, Epping) on 11 February 1999; she was very cooperative, sharing letters and photos. However, by 2003, Atkinson was reluctant to meet Goss: “I am so sorry but I cannot remember anything from the past.” Goss responded: “Of course, we understand.” This was his last contact with her. She died nine years later.

(fig. 0.2.2). Ekers provided an index to these files. In July 2014, Miller Goss went through all files in detail.

Two unique items were discovered at this time: (1) a collection of Pawsey's **original** work sheets and calculations from 1945-1946 with data from Collaroy and Dover Heights concerning radio observations of the sun and (2) a collection of the correspondence concerning the two publications from Parkes in 1962 about Centaurus A, a controversy involving Ron Bracewell and Taffy Bowen. NRAO ONLINE.2, CenA, 1962, *Nature* publication, provides a summary of the Centaurus publication controversy, which was described by Frater et al in *Four Pillars of Radio Astronomy: Mills, Christiansen, Wild, Bracewell* on page 143.

In the print book, in fig. 12.2, 12.3, 12.4 and 12.5, we show the original data from 1945-1946; Pawsey's handwriting is apparent on each document. Fig. 12.2 is his annotated worksheet for the Collaroy data of October 1946. The additional hand-written data refers to the sunspot area on each day (provided by Cla Allen at Stromlo) and the intensity of the 200 MHz radiation at sunrise and sunset in db (relative to the fiducial value of 10^{-21} watts $\text{m}^{-2} \text{Hz}^{-1}$). Fig. 12.3 is the worksheet called "Probability", the results of the "**ogive**" analysis that is displayed in Fig. 12.4 for the data from both sunrise (dawn) and sunset from Collaroy, October 1945 to March 1946. The ogive plot (Fig. 12.4) is a statistical scheme used to present the cumulative distribution of the observations, then to be used to determine how many data values lie above or below a set reference level.

In Fig. 12.5, we show a plot made by Pawsey that provided a summary of all the 1945 and 1946 data from Collaroy. The main result is the histogram of daily averages. In mid-2020, Harry Wendt provided a reconstruction of the original faint plot at the bottom of the figure. (see Chapter 14, fig. 14.1 and 14.2 for the published data in 1949).

Pawsey had initially published a histogram of daily averages from Collaroy from October 1945 to March 1946 of 200 MHz intensity in *Nature* on 21 November 1946 ("Observations of Million Degree Thermal Radiation from the Sun at a Wavelength of 1.5 Metres", vol 158, p 633). A subsequent summary including a longer time interval was published by Pawsey and Yabsley in 1949 (*Australian J Science Research*, vol 2, p 198, "Solar Radio-Frequency Radiation of Thermal Origin"). Data with improved signal to noise from Dover Heights in 1947 was also included in the 1949 publication in addition to the Collaroy data.

3.1 Paul Wild's role in preserving the Pawsey records from 1945-46

Above, we summarised the circumstances of locating the Pawsey 1945-46 original solar data in the Atkinson archive. The recognition of the importance of these documents occurred in July 2014.

The first page of the Pawsey collection was the following letter from Paul Wild to the Australian Academy of Science librarian, 28 May 1968:

28th May 1968

Mrs. L. Hooper,
Librarian,
Australian Academy of Science,
Gordon Street,
CANBERRA, A. C. T. 2600.

Dear Mrs. Hooper,

I enclose some documents, unearthed the other day, which are in the handwriting of Dr J.L. Pawsey and which I think should be kept in his file in the Adolph Basser Library. They are of considerable historical interest since they are original graphs describing the earliest radio astronomy observations made in Australia. In order to link them with the literature, the following reference should be noted: - L. L. McCready, J.L. Pawsey and Ruby Payne-Scott, *Proc. Roy. Soc. A* 190,357,1947.

Yours sincerely, J.P. Wild [The letter is an original, with original signature]

Apparently, the letter was not posted. In August 2014, after Goss found the letter in the collection, the late Professor Peter G. Hall of the University of Melbourne contacted his colleagues at the Australian Academy of Science. On 15 August 2014, Lisa Conti Phillipps, the Librarian Archivist at Bassar Library and Fenner Archives (Australian Academy of Science) in Canberra, replied to Hall: "I have taken a look at the Pawsey files, but unfortunately it doesn't look like the data ever made it to the Library. It must have not been sent, as suspected ..." A note at a later date was also found in the file from Sally Atkinson for Joan Jones, a colleague at RPL, asking: "Joan, xerox please." The likely date of this notation is 26 July 1977; again there is no record of any communication nine years after the original letter from Paul Wild (likely not posted), intended for the Australian Academy of Science in Canberra.

3.2 The Practice of “Culling” records and the C3830 (RPL) National Archives Finding Aid

The finding aid for the major file series C3830 in the National Archives (“Series notes for series C3830”, a category currently with 1215 items) gives the following history of the collection:

This series was created in order to maintain a record of the research and technical actions of the Division of Radiophysics and to provide a distinction between their functional and administrative records. The Technical correspondence files were maintained by the Secretary of the Chief of the Division of Radiophysics and later by the administration section, and were divided into classifications ranging from A: Research and Development – to Z: Personal Files.

The files date from 27 November 1940 to April 1988, when it was decided that the Secretary of each group leader would maintain a separate series of technical files. Many of the files were transferred into the custody of an honorary archivist [ie, Sally Atkinson] who continued to create files and add documents to existing files up until 1992. In some cases, it is difficult to determine which files were created by the Division registry and which by the honorary archivist. Files in the custody of the archivist were sometimes consolidated and top numbered. Some files are believed to have been **culled** [implying a process of selectively choosing the files to be saved].

This assertion of intentional “culling” of C3830 material is striking. The claim is consistent with annotations on a number of files found in the “John Deane” collection given to Goss in April 2011⁹; this collection was intended to be destroyed but were “rescued” by John Deane and given to Goss some years later. A number of the files in this collection have typed on the cover: “No letters have been culled from this file. - SA” [i.e. Sally Atkinson] An example of “culling” are the two publication files of the famous Parkes Centaurus A controversy described in the NRAO ONLINE.2, CenA, 1962, Nature publication.

⁹ John Deane (1949-2020) found a number of files in a rubbish collection area at the Division of Radiophysics in the 1990s as he departed the Radiophysics Laboratory in the late afternoon. (date unknown) The files had been placed for collection on the side of the road, likely by Sally Atkinson. Apparently, none of these files had been copied for transmission to the National Archives of Australia. John took the files to his home. In 2011, Deane told Goss about this collection. After bringing the massive collection to Goss at Bondi (in Sydney), Goss took them back to Socorro, NM, where they were all copied and scanned. After being returned to Dean, he presented the collection in 2015 to Jessica Chapman at the CSIRO Australian Telescope National Facility for further preservation. A number of items in the “John Deane” collection contain unique material, used by the authors in the preparation of this book.

Unpublished manuscripts, interviews and conversations

Interviews and discussions (aloud and via email) were carried out over many years starting in 1992 (with John Bolton). Most of the interviews occurred in the years 1998 to 2018 with Bernie Mills, Ron Bracewell, “Chris” Christiansen, Paul Wild, Peter Hall, Fiona Hall, Rachel Makinson, Elizabeth Hall, Don Yabsley, Harry Minnett, Sally Atkinson, Campbell Wade, Ken Kellermann, Ellen Bouton, Hastings Pawsey, Stuart Pawsey, Elizabeth Pawsey, Jasper Wall, Tim Robishaw, Robert Hayward, Joe Fletcher, Sir Bernard Lovell, Sir Frances Graham Smith, Professor Rodney Davies, Professor Adriaan Blaauw, Sergei Gulyaev, Grahame Fraser, Paul Vanden Bout, Frank Bash, Frank Drake, David Heesch, David Hogg, Don Mathewson, Don Melrose, Don McLean, Summer Ash, Harry Wendt, Brian Svoboda, Craig Anderson, John Murray, John Brooks, Malcolm Sinclair, Gwen Anne Mansfield and Professor Henk van de Hulst, Margaret Clarke, Rupert Clark, Jet Merkelyn, Letty Bolton, John Whiteoak and Nick Lomb.

Unpublished manuscripts consulted include:

NRAO ONLINE.50 Helen Sim MSc thesis Rainmakers

NRAO ONLINE.49 Jim Roberts Autobiography

NRAO ONLINE.3 Schedvin CSIRO History 1983

Bowen, E.G. (1987) *Radar Days*

Evans, W. F. (1970) *History of the Radiophysics Advisory Board: 1939-1945* (digital version available from the authors)

Evans, W.F. (1973) *History of the Radio Research Board: 1926-1945* (digital version available from the authors)

Pither, A.G. (1946) *An Account of the Development and use of Radar in the Royal Australian Air Force*

NRAO ONLINE Supplementary Resources

(<https://science.nrao.edu/about/publications/pawsey>)

NRAO ONLINE.1 Knuckey system, CSIRO Files

NRAO ONLINE.2 CenA, 1962, Nature publication

NRAO ONLINE.3 Schedvin, CSIRO History 1983

NRAO ONLINE.4 Martyn and lunar radar, 1930

NRAO ONLINE.5 Low level ionosphere, 1936

NRAO ONLINE.6 Martyn trip to UK, 1939

NRAO ONLINE.7 Martyn scandal 1940, breakdown 1954

NRAO ONLINE.8 Mills Cross vs Parkes Dish 1962

NRAO ONLINE.9 Darwin Radar Station 1942

NRAO ONLINE.10 Pither, RAAF History

NRAO ONLINE.11 Moran, threat from Air 1941-1942

NRAO ONLINE.12 Darwin Radar Failure 1942: Epilogue

NRAO ONLINE.13 Oliphant visit to Sydney RPL 1942

NRAO ONLINE.14 High Frequency Radar Group, Melbourne 1942

NRAO ONLINE.15 Madsen Resignation as RAB Chair 1942

NRAO ONLINE.16 White Lecture 1943, Radar in Europe

NRAO ONLINE.17 Tizard visit to Australia 1943

NRAO ONLINE.18 Australian Group Radiation Lab 1944-45

NRAO ONLINE.19 Associated Press Brouhaha 1946

NRAO ONLINE.20 Solar Precipitation, RPL Post-war to 1963, Metre Wave

NRAO ONLINE.21 Eclipse Expedition Failure 1947, RPL and Cavendish

NRAO ONLINE.22 Pawsey Ionosphere Research 1947-1954

NRAO ONLINE.23 Solar Precipitation, RPL Post-war to 1963, Centimetre Wave

NRAO ONLINE.24 Martyn-Pawsey-Bowen Controversy over the Million Degree Corona 1946

NRAO ONLINE.25 Cloud Physics 1947-48

NRAO ONLINE.26 Pawsey and Canada Connection

NRAO ONLINE.27 New Australia Journal Concerns 1948-59

NRAO ONLINE.28 IAU Commission Radio Astronomy 40 Report 1955

NRAO ONLINE.29 Pawsey Flinders Lecture 1957

NRAO ONLINE.30 Payne-Scott and Ryle Conflict, Type III Bursts

NRAO ONLINE.31 Burchell: Black Cloud Hoyle creates Pawsey as Harry Leicester, Australian Scientist

NRAO ONLINE.32 Menon, IAU 1961

NRAO ONLINE.33 Tata Institute, Pawsey and Indian Radio Astronomy

NRAO ONLINE.34 Helen Sim: URSI at 100 Years book, Australian radio astronomy

NRAO ONLINE.35 Pawsey images USSR 1958

NRAO ONLINE.36 Pawsey Post-war Public Policy

NRAO ONLINE.37 Mills 1953 Events--Baade, Prototype Cross and AAAS Boston

NRAO ONLINE.38 GRT 1951-1952

NRAO ONLINE.39 GRT 1953

NRAO ONLINE.40 GRT 1954

NRAO ONLINE.41 GRT 1955

NRAO ONLINE.42 GRT 1956

NRAO ONLINE.43 GRT 1957

NRAO ONLINE.44 GRT 1958

NRAO ONLINE.45 GRT 1959

NRAO ONLINE.46 GRT 1960

NRAO ONLINE.47 GRT 1961-1962

NRAO ONLINE.48 A Tale of Three Peg Events—Locating the Parkes Telescope, 1958-1959

NRAO ONLINE.49 Jim Roberts Autobiography *Have Gen Will Travel*

NRAO ONLINE.50 Helen Sim MSc thesis Rainmakers

NRAO ONLINE.51 Pawsey as Internationalist

NRAO ONLINE.52 Pawsey photos Solar Conference Sac Peak

NRAO ONLINE.53 Pawsey Bracewell textbook 1955

NRAO ONLINE.54 HI timeline

NRAO ONLINE.55 Duguid, Champion of Aboriginal Rights

NRAO ONLINE.56 TV Interview partial transcript, George Baker with Pawsey and G Giovanelli
1960 Nov 11 Horizons, ABC

NRAO ONLINE.57.1 Stromlo 1957 Conference New Galactic Coordinates

NRAO ONLINE.57.2 Groningen Meeting Nov 1957

NRAO ONLINE.57.3 Drake Galactic Centre Image 8 GHz 1959

NRAO ONLINE.57.4 Owendon Critique, New Galactic Coordinates 1959

NRAO ONLINE.58.1 Struve: *Sky and Telescope*

NRAO ONLINE.58.2 Colin Gum Biographical Sketch



Fig. 1.1.1. Sally Atkinson (1914-2012) at the 1989 Dover Heights celebration “Forty Years of Radio Galaxies- Evolution of Ideas and Techniques” in the background are (from left) David Jauncey and the late Robert Duncan (1929-2004). Photo by W.M. Goss.



Fig.1.1.2 Ron Ekers' office at Australia Telescope National Facility (CASS) CSIRO; Atkinson archive- in green, blue, red and yellow notebooks in July 2014. Photo by W.M. Goss.