

INTER-UNION (IAU–URSI) IAU DIVISION B HISTORICAL RADIO ASTRONOMY WORKING GROUP

CHAIR Leonid Gurvits (The Netherlands)
VICE-CHAIR Tim Robishaw (Canada)
EXECUTIVE OFFICERS Past-chair – Richard Schilizzi (UK)
Secretary – Kenneth Kellermann (USA)
Web manager – Ellen Bouton (USA)

TRIENNIAL REPORT 2021–2024

1. Purpose of the WG

The WG was first established in 2003 as an IAU Commission 40 WG, and continued as a Joint Commission B4-C3 WG through 2021. From 2021, it continued within IAU as a functional WG of Comm B with a six-year operational mandate. Since the URSI General Assembly in 2014, the WG has been recognised as a joint WG of the IAU and URSI. The Working Group’s aims are to

- maintain an ongoing bibliography of publications relevant to the history of radio astronomy;
- organise or assist in organising scientific events (meetings, conferences, colloquia) or sessions of events relevant to the history of radio astronomy;
- collect and make publicly accessible materials (e.g., presentation slides) or video/audio records of presentations on the history of radio astronomy;
- document the careers of deceased radio astronomers in biographical memoirs; as of February 2024, the list contains more than 160 names and is accessible at <https://rahist.nrao.edu/HRAWG-bio-memoirs.shtml>;
- document and preserve surviving historically-significant radio telescopes and associated instrumentation.

All the materials above are accessible through the WG web site <https://rahist.nrao.edu> hosted by the National Radio Astronomy Observatory (Fig. 1).

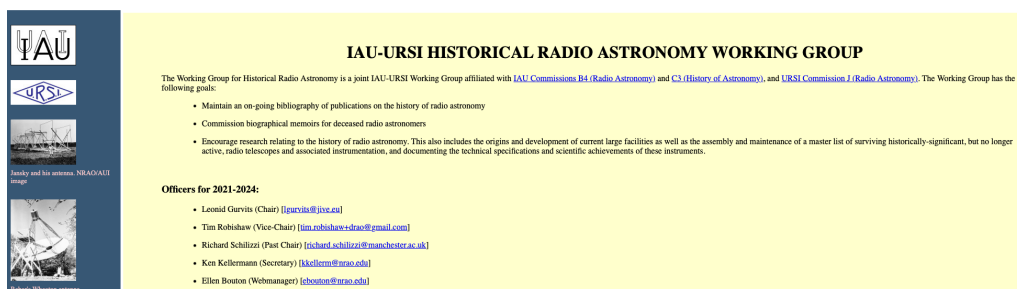


Figure 1. Top page of the WGHRA website

The group's work is conducted by the five members of the Executive committee listed above, 15 members of the WG Organising Committee and 38 WG members, all listed on the WG webpage <https://rahist.nrao.edu>. The WG consists of representatives of 15 countries. Fourteen WG members are "national/regional reporters" responsible for keeping track of developments of relevance to the WG in their respective countries or regions.

2. Events organised by or involving the WG and/or its members

2.1). The WG organised a session "History of Radio Astronomy in Eastern Asia" at the IAU General Assembly in Busan, R. of Korea, on 5 August 2022. Eight talks were given at this session either in person or remotely. These were:

- Radio astronomy developments in Republic of Korea, Se-Hyung Cho, KASI, Seoul, R. of Korea;
- Radio astronomy in Japan: 1950s – 1980s, Masato Ishiguro, NAOJ, Tokyo, Japan;
- Developments of VLBI in Japan, Hideyuki Kobayashi, NAOJ, Tokyo, Japan;
- 25 years of the VSOP/HALCA launch, Hisashi Hirabayashi, ISAS/JAXA, Sagami-hara, Japan;
- History of radio astronomy in Taiwan, Paul Ho, ASIAA, Taipei, China/Taipei;
- History of radio astronomy in China: from early days to SKA and FAST, Bo Peng, NAOC, Beijing, China/Nanjing;
- History of VLBI in China, Zhiqiang Shen, ShAO, Shanghai, China/Nanjing;
- History of mm and sub-mm astronomy in China, Ji Yang, Purple Mountain Astronomical Observatory, Nanjing, China/Nanjing

Video/audio recordings and slides of all eight talks are publicly available at the WG webpage <https://rahist.nrao.edu/HRAWG-meeting-reports.shtml>.

2.2). Several members of the WG participated in preparatory activities of Scientific Organising Committees of the following two conferences with substantial historical contents:

- "The Universe: from the Big Bang to Present Days", dedicated to the 90th birthday of Nikolai Kardashev (1932–2019), Lebedev Physical Institute, Moscow, Russia, 25–26 April 2022;
- "A Multi-facet Universe: Theory and Observations – 2022", dedicated to the 90th birthday of Yuri Pariiskii (1932–2021), Special Astrophysical Observatory, Nizhnii Arkhyz, Russia, 23–27 May 2022.

However, after the Russian military invasion in Ukraine on 24 February 2022, the Working Group as a whole and its non-Russian members suspended their involvement in these two events.

2.3). The WG assisted in organising a general lecture by the WG member Ron Ekers at the URSI General Assembly in Sapporo, Japan, on 23 August 2023. The lecture "History of Radio Astronomy: Celebrating 90 Years of Innovation and Discovery" was dedicated to the 90th anniversary of radio astronomy. The lecture materials are available at the WG webpage <https://rahist.nrao.edu/HRAWG-meeting-reports.shtml>.

2.4). Several members of the WG participated in the 8th IEEE History of Electrotechnology Conference (HISTELCON), Florence, Italy, 7–9 September 2023. One of its sessions, organised by Luigina Feretti (INAF–Istituto di Radioastronomia, Bologna, Italy) and Pietro Bolli (INAF–Osservatorio Astrofisico di Arcetri, Florence, Italy) was entitled "High tech developments in the history of radio astronomy". All seven presentations

at this session listed below are publicly available as audio/video recordings and sets of slides at the WG web site <https://rahist.nrao.edu/HRAWG-meeting-reports.shtml>. The list below indicates time markers of the start and end of the respective presentation in the video/audio file.

- Ron Ekers and Clair Hooker, The Parkes Radio Telescope: how technological developments have driven discoveries in Radio Astronomy, 00:00:00–00:26:03. NB: The recording was slightly late in starting, so the initial slide and first few seconds of audio are missing;
- Yashwant Gupta, Technological Innovations and Historical Impact of the GMRT: an IEEE Milestone Facility, 00:26:05–00:46:43;
- Rustam Dagkesamanskii, Pushchino Radio Astronomy Observatory: briefly about history and instrumentation development, 00:46:44–01:09:35;
- Leonid Gurvits, A Brief History of Space VLBI, 01:10:10–01:33:54;
- Germano Bianchi, Federico Perini and Giancarlo Setti, A brief history of the Northern Cross Radio Telescope, 01:34:27–01:56:47;
- Christopher Salter, The Arecibo 305-m Telescope: 57 Years of Unprecedented Discovery, 01:56:59–02:20:42;
- Ralph Spencer, The Role of Technology in the Development of Very Long Baseline Astronomy 02:20:49–02:45:00.

All listed above presentations are published in the HISTELCON–2023 proceedings in the IEEE *Xplore* depository <https://ieeexplore.ieee.org/xpl/conhome/10365711/proceeding>.

2.5). List of other individual talks on history of radio astronomy given during the reporting triennial period, available at the WG webpage :

- Ron Ekers and John O’Sullivan, The Development of Focal Plane Arrays in Radio Astronomy PAFAR 2022, Sydney, Australia, November 2022;
- Dave Finley, The Very Large Array - Past and Future, 2022 version of talk on radio astronomy and the VLA;
- Miller Goss, J.L.Pawsey: Pioneer Radio Astronomer, Socorro, NM, 16 March 2022;
- Miller Goss, J.L. Pawsey: His 1961-1962 Plans for the Future of NRAO and a Proto-VLA - Would He Have Built the VLA? Socorro, NM, 22 February 2023;
- Ken Kellermann, Karl Jansky and the Beginning of Radio Astronomy, Charlottesville, VA, 27 April 2023;
- Adele Plunkett, The Story of the Story: The ALMA Telescope, Charlottesville, VA, 22 August 2023;
- Tony Remijan, Radio Astronomy and Spectroscopy: Bell Labs to ALMA AAS, June 2022;
- Timothy Robishaw, Gladys A. Harvey: Canada’s First Woman Radio Astronomer / la première Canadienne radioastronome, NRC Symposium: Celebrating the Success of Women in STEM, Virtual Symposium, 11 February 2021;
- Timothy Robishaw, The Foundations of Canadian Radio Astronomy, University of Calgary Physics and Astronomy Colloquium, Calgary, AB, 14 October 2021;
- Timothy Robishaw, A History of Radio Astronomy in Canada, Leading to the Measurement of the Zeeman Effect in Interstellar Matter, NRC Security and Disruptive Technologies Research Centre Seminar, Ottawa, ON, 1 December 2023;
- Ralph Spencer, A Century of Cosmic Rays and Manchester’s Role in Their Study, Schuster Colloquium, 5 October 2021;
- Ralph Spencer, Professor Roger Clifton Jennison, 1922-2006, Jodrell Bank Centre for Astrophysics, June 2022;

- Ralph Spencer, The Jodrell Bank Story, Sandbach Lodge of Installed Masters No. 9433, 19 January 2023;
- Paul Vanden Bout, Space Molecules to Solar Systems: Five Decades of Discoveries (Millimeter Astronomy at NRAO - Some Personal Reminiscences), 2023 Jansky Lecture.

3. Publications on history of radio astronomy

The Master List of Publications in the field of Historical Radio Astronomy can be found on the Working Group's website <https://rahist.nrao.edu> under the heading Resources – History of Radio Astronomy. By the time of this reporting, the Master List is complete through 2022 and includes more than 320 articles published in various journals and conference proceedings. Update of the publications for 2023 is ongoing at the time of this reporting (6 February 2024). A link to the Journal of Astronomical History and Heritage is also provided from this webpage.

Below is the list of books on the history of radio astronomy or containing chapters/papers on the topics relevant to the history of radio astronomy published in 2021 – Feb. 2024. In most cases, these books are authored by active members of the Historical Radio Astronomy WG

- 100 Years of the International Union of Radio Science, 2021. Eds.: Ph. Wilkinson, P.S. Cannon, W.R. Stone. Gent: URSI Press. (Includes chapter on Commission J by Jaap Baars, p. 589);
- Academician A.D. Sakharov: science works, 2021, eds. B.L. Altshuler, M.A. Vasiliev, L.I. Gurvits, I.M. Dremin, V.I. Ritus, V.Ye. Fortov, A.E. Shabad, Moscow, Fizmatlit, (in Russian), contains papers by
 - L.V.E. Koopmans, "Cosmology at the wavelength of 21 cm at high redshift – from SakhArov to the SKA", pp. 264-275;
 - N.S. Kardashev and L.I. Gurvits, "Telescopes greater than Earth for cosmology and microphysics", pp. 387-390;
 - Answers by A.D. Sakharov on the questionnaire on CETI (1971) with commentaries by L.M. Gindilis (2021), pp. 462-466;
- Goss, W.M., Hooker, C., and Ekers, R.D., 2023, Joe Pawsey and the Founding of Australian Radio Astronomy – Early Discoveries, from the Sun to the Cosmos, Springer;
- Gregorini, L., Feretti, L., Giovannini, G., Mantovani, F., Parma, P., and Vettolani, G. Perché non costruisci un radiotelescopio?: quarant'anni di Radioastronomia a Bologna. Why don't you build a radio telescope?: 40 years of Radio Astronomy in Bologna (in Italian), Bologna University Press;
Italian edition: <https://buponline.com/prodotto/perche-non-costruisci-un-radiotelescopio/>
English translation:
<https://info.ira.inaf.it/wp-content/uploads/2021/07/Storia-IRA-EnglishVersion1.pdf>;
- Kellermann, K.I. and Bouton, E.N., 2023, Star Noise: Discovering the Radio Universe, Cambridge University Press;
- Orchiston, W., Robertson, P., and Sullivan, W. T., 2021. The Golden Years of Australian Radio Astronomy: An Illustrated History. Springer;
- Nan, Rendong (ed.), 2021, The Sky Eye: Five-hundred meter Aperture Spherical radio Telescope (FAST), Springer;
- Schilizzi, R.T., Ekers, R.D., Crosby, P., and Dewdney, P.E.D, in press, The Square Kilometre Array: A Science Mega-Project in the Making, 1990–2012, Springer Nature;

- Vanden Bout, P.A., Dickman, R.L., and Plunkett, A.L., 2023, *The ALMA Radio Telescope – The Story of a Science Megaproject*, Cambridge University Press.

4. Radio astronomy archives

The following archives on history of radio astronomy are now accessible through the WG webpages.

4.1). The NRAO/AUI Archives (<https://www.nrao.edu/archives/>) collects and provides access to institutional records of NRAO and to papers of many individual radio astronomers in both digital and traditional formats, provides supplemental electronic materials for books and articles of historic interest (<https://science.nrao.edu/about/publications>), and maintains the Web pages for the IAU/URSI WG on Historical Radio Astronomy (<https://rahist.nrao.edu/>).

4.2). The CSIRO Radio Astronomy Image Archive is a collection of over 15,000 images that relate to the early history of radio astronomy in Australia and is accessible at <https://www.atnf.csiro.au/ImageArchive/index.html>.

4.3). Cornell University resources on Arecibo Observatory:

- An Oral History of the Arecibo Observatory, a collection of oral histories and conversations.
- Arecibo Ionospheric Observatory records in the Division of Rare and Manuscript Collections, Cornell University Library.

5. Preservation of historical radio-astronomical equipment

5.1). The WGHRA was active in the successful effort to preserve the historically important Holmdel horn antenna used by Arno Penzias and Robert Wilson to discover the cosmic microwave background radiation.

5.2). Members of the WG continue participating in the campaign of preserving historical artefacts of the W. Gordon Arecibo 300-m radio telescope of the Arecibo Observatory (Puerto Rico) after its collapse on 1 December 2020.

5.3). Members of the WG continue providing support to securing the digital archive of the observing data and related auxiliary information from the low-frequency Ukrainian T-shaped Radio telescope UTR-2 operated by the Institute of Radio Astronomy of the Ukrainian National Academy of Sciences (RI NANU), Kharkiv, Ukraine. The telescope and its laboratory building with various operational instrumentation were heavily damaged during the occupation of the area by the Russian armed forces in the period February–September 2022. The reconstruction and archiving work began after the liberation of the area in September 2022.