

COMMISSION 40: RADIO ASTRONOMY  
(RADIO ASTRONOMIE)

Report of Meetings, 14, 15, 16, 17, 18, 20, 21 and 22 August 1979

PRESIDENT: H. van der Laan

SECRETARY: R.G. Strom

JOINT DISCUSSIONS

On 20 August Commission 40 cosponsored a Joint Discussion with Commissions 28, 44, 47 and 48 on Extragalactic High-Energy Astrophysics.

On 21 August Commissions 28, 33, 34 and 40 held a Joint Discussion on the Nuclei of Normal Galaxies.

The transactions of these meetings will be published in "Highlights of Astronomy".

JOINT MEETINGS

A Joint Meeting of Commissions 44, 16 + 17 and 40 on the Search for Life in Space was held on 15 August.

Commissions 35, 40 and 48 were the sponsors of a Joint Meeting on Pulsars which took place on 17 August.

A Joint Meeting on Close Binaries and Stellar Activity held on 18 August was cosponsored by Commissions 42, 10, 27, 40, 44 and 48.

These activities are outlined in one of the reports of the cosponsoring Commissions.

14 August 1979

With the President, H. van der Laan, in the chair the following business was transacted.

I. REPORT OF THE PRESIDENT

In a brief summary the President reported on Commission activities since the Grenoble General Assembly. Much of this involved preparations for the World Administrative Radio Conference (WARC) to be held this year, which was also an important discussion topic later in this business meeting. During the last three years Commission 40 (co)sponsored IAU Symposia 86 and 87, and Colloquium 49.

II. REPORTS ON ASTRONOMY

The composition and content of the latest triennial Commission Report were sketched. As had been agreed in Grenoble, purely astronomical developments are now reported on by the Commission responsible for that area of astronomy, and the membership voted to continue this format. This year's report, published in volume XVII A of the Transactions, was also issued as a Leiden astronomy preprint and distributed to all Commission members. A vote of thanks to those responsible for the report was adopted by acclamation.

III. COMMISSION ACTIVITIES IN MONTREAL

The President reviewed the joint sessions which have been organized for this General Assembly. Those which still had room for short contributions were indicated,

and it was announced that an extra scientific session would be organized if there was sufficient demand. This, together with a session devoted to new developments at radio observatories, was held on 22 August.

#### IV. IUCAF NEWS

Westerhout summarized the work carried out by IUCAF in preparation for the WARC. This will concern the radio spectrum from 2.5 MHz to 275 GHz, and IUCAF's job has been to coordinate and communicate the radio astronomy and space science position to participating national delegations. This has been achieved by preparing a position paper, after several iterations with IUCAF correspondents, containing the reasoned wishes of the radio science community. It has generally been possible, for example, to include all spectral lines discussed in the preliminary deliberations. IUCAF has tried to identify those delegation members sufficiently knowledgeable to be able to explain the positions adopted, and will man an office at WARC. Additional comments were made by Wielebinski, who stressed the intensity of competition for radio frequencies, and Burke, who pointed out that the positions delegations adopt are most likely to be influenced by their own nationals.

Robinson reported on the activities of the working group set up by Commission 40 to decide which are the astrophysically most important spectral lines. In 1976 a questionnaire was distributed to astronomers active in radio spectroscopy asking their opinions and, because of concern that the situation might have changed, this exercise was repeated at the beginning of 1979. As Table 1, summarizing these two surveys, shows, the results are very similar. With one or two exceptions, the changes were described as "well within the noise".

After some discussion, the President suggested that Westerhout and Robinson organize an informal discussion before the second business meeting to consider some of the points raised regarding the IUCAF position paper.

#### V. NOMINATIONS OF OFFICERS AND ORGANIZING COMMITTEE

The slate suggested by the outgoing Organizing Committee consisted of:

President: G. Swarup

Vice President: K.I. Kellermann

Organizing Committee: Ables, Booth, Broten, Dulk, Fanti, Höglund, Kardashev, Moffet, Morimoto, Okoye, van der Laan, Weliachew.

Other nominations could be made before the second business meeting, when elections would be held.

#### VI. NEW MEMBERS

It was decided that the Organizing Committee would review the qualifications of the eighty-odd applicants. A list would be made available to Commission members before the holding of elections at the second business meeting.

#### VII. RESOLUTIONS

Commission 40 would propose one resolution for adoption by the IAU, relating to frequency protection and WARC-'79. This was to be considered at the second business meeting after the IAU resolutions committee had approved the text.

#### VIII. MISCELLANEOUS

Morimoto announced that Tanaka has asked for suggestions and comments on Commission J activities during the next URSI General Assembly in 1981.

16 August 1979

Joint meetings were held by Commissions 40 and 28 in the morning, and 40 and 48 in the afternoon of 16 August.

TABLE 1. ASTROPHYSICAL IMPORTANCE OF LINES

Line (1976 Survey)	Frequency (GHz)	Line (1979 Survey)	Frequency (GHz)
Hydrogen	1.420	Hydrogen	1.420
CO (J = 1→0)	115.271	CO (J = 1→0)	115.271
Hydroxyl	1.665	Hydroxyl	1.665
	1.667		1.667
$^{13}\text{C}^{16}\text{O}$ (J = 1→0)	110.201	Formaldehyde	4.829
Hydroxyl	1.612	$^{13}\text{C}^{16}\text{O}$ (J = 1→0)	110.201
Formaldehyde	4.829	Water vapour	22.235
Water vapour	22.235	Hydroxyl	1.612
			1.720
Hydroxyl	1.720	Hydrogen cyanide	88.631
Hydrogen cyanide	88.631	Formyl ion	89.189
CO (J = 2→1)	230.538	$^{12}\text{C}^{18}\text{O}$ (J = 1→0)	109.782
$^{12}\text{C}^{18}\text{O}$ (J = 1→0)	109.782	Silicon monoxide	86.243
Formyl ion	89.189	Ammonia	23.694
			23.723
			23.870
Carbon monosulphide	97.981	Silicon monoxide	42.820
			43.122
Ammonia	23.694	CH	3.263
	23.723		3.335
	23.870		3.349
Silicon monoxide	42.820	CO (J = 2→1)	230.538
	43.122		
Formaldehyde	14.468	$^{13}\text{C}^{16}\text{O}$ (J = 2→1)	220.399
$^{13}\text{C}^{16}\text{O}$ (J = 2→1)	220.399	Formaldehyde	140.839
Formaldehyde	140.839	Carbon monosulphide	97.981
CH	3.263	Deuterium	0.327
	3.335		
	3.349		
Carbon monosulphide	48.991	$\text{HC}_3\text{N}$	36.392*
	146.9		
Deuterium	0.327	Formaldehyde	150.498
		$^{12}\text{C}^{18}\text{O}$ (J = 2→1)	219.560
		Nitric oxide	150.74
		Carbon monosulphide	48.991
		$\text{N}_2\text{H}^+$	93.17

\*Not included in IUCAF 277

## I. RADIO STUDIES OF NEARBY GALAXIES

This meeting, which lasted one session, was chaired by Elly Berkhuijsen. The following papers were presented:

Nearby galaxies in continuum and the hydrogen line (P.C. van der Kruit).  
 Radio spectral index and polarised emission of M31 and M33 (E.M. Berkhuijsen).  
 Progress report on the Westerbork M31 study (H. van der Laan).  
 Radio halos of galaxies (R. Wielebinski).  
 HI in the elliptical galaxy NGC 4278 (E. Raimond).  
 CO emission from nearby galaxies (L.J. Rickard).  
 Integrated properties of 100 Sbc galaxies (R.D. Davies).

## II. RADIO STUDIES OF RADIO GALAXIES AND QUASARS

The talks given at this session whose chairman was A.H. Bridle were:

Radio galaxies - a review (D.E. Harris)  
 High frequency observations of large radio galaxies (R. Wielebinski).  
 Magnetic fields in radio jets (E.B. Fomalont).  
 A radio jet in a quasar (J.F.C. Wardle).  
 The radio variability of BL Lac objects (K.W. Weiler).  
 Fleurs maps of radio sources (A. Bosma).  
 BL Lac objects (D. Stannard).  
 Rotation axes of radio galaxies (P.A.G. Scheuer).  
 VLA map of a double quasar (B. Burke).

## III. VARIABILITY OF FLUX DENSITY, POLARIZATION AND STRUCTURE IN RADIO SOURCES

Centimeter wavelength variability in compact radio sources (W.A. Dent).  
 Millimeter wavelength variability in compact radio sources (E.E. Epstein).  
 Low frequency variability in compact radio sources (R. Fanti).  
 Variability of polarization in compact radio sources (H. Aller).  
 Search for variable radio sources in the galactic plane (P.C. Gregory).  
 Superluminal motions in compact radio sources (M.H. Cohen).  
 Slowly varying radio sources (D. Shaffer).  
 Morphology and alignment in compact radio sources (T.J. Pearson).  
 Search for relativistic Doppler shifts in the continuum spectra of double radio sources (Yu. N. Parijskij).  
 X-ray variability in compact radio sources (D. Warrell).  
 Energetics and dynamics in relativistically expanding radio sources (M. Salvati).  
 Intrinsic and extrinsic models for fast variations and superluminal motions (P.A.G. Scheuer).

22 August 1979

The second business meeting was chaired by the president. After approval of the agenda, the business transacted was as follows.

## I. PREPARATIONS FOR WARC 1979

Westerhout, in introducing this discussion, said that since the first Commission business meeting there had been a number of consultations and a three hour meeting of those interested. He pointed out that IUCAF represents the interests of both radio astronomy and space science and in its position paper, IUCAF 277, it proposes a table of bands to be protected for both services. IUCAF's advisory role at WARC was emphasized. A major suggestion would streamline the use of footnotes in the Radio Regulations (Article 5). The present series of footnotes scattered throughout the table would be replaced by four to cover: (a) Primary exclusive continuum bands; (b) Continuum bands shared with other services; (c) Spectral lines; (d) Regional protection (special cases).

Commenting on this proposal, Swarup suggested that only spectral lines should

have a blanket footnote. Wielebinski said that one reason for the reform was a threat from European countries to abolish footnotes altogether, although he agreed with Swarup insofar as spectral lines are the main problem. As Robinson was absent, Westerhout led a discussion of spectral line priorities (see the table in the summary of the first business meeting). After due consideration, the Commission unanimously adopted a motion which would make the latest list the official viewpoint of the radio astronomy community.

Howard then presented a resolution relating to frequency protection to be adopted by the IAU as a whole. (For the text, see Resolution No. 2.) After some discussion it was unanimously adopted.

This section of the meeting then closed after the chairman had listed those members of the radio astronomy and space science community who will be present in Geneva during WARC. Problems with coordination and communication were mentioned, and after a final summary of the IUCAF role by Westerhout, Howard noted with regret that while the viewpoint of radio science as a whole has been represented, no one has put forward the case for radio astronomy uncluttered by the needs of other services.

## II. REPRESENTATION IN IUCAF AND CCIR

The Commission chose Westerhout and Schilizzi as IUCAF representatives. Doherty and Robinson will be the new CCIR representatives. The terms of office for both IUCAF and CCIR begin after WARC, in 1980.

## III. GERT PROPOSAL

The General Assembly had before it a proposal asking ICSU to urge appropriate bodies to support the Giant Equatorial Radio Telescope project (GERT). The IAU executive was now requesting Commission 40 endorsement of the proposal. Swarup outlined the astronomical justification for the project, which would build an Ooty-type cylindrical reflector 2 km long and 50 m wide. It would be used at 327 and 38 MHz for both lunar occultation and synthesis mapping. Okoye said that the site being considered is in Kenya, 300 km north of Nairobi, and emphasized the value of such a project to developing countries. After discussion, the meeting unanimously backed the proposal.

## IV. ELECTIONS OF OFFICERS AND ORGANIZING COMMITTEE

There had been no additional nominations after the first business meeting. The slate of candidates originally proposed (see section V of the report of that meeting) was then carried without dissent.

## V. FUTURE SYMPOSIA AND COLLOQUIA

Mention was made of international conferences planned for the coming three years of interest to Commission members. These include IAU Symposium 95 on Pulsars (26-31 August 1980), a symposium on millimeter astronomy (20-25 August 1980) and IAU Symposium 97 on Extragalactic Radio Sources being held in conjunction with the opening of the VLA (August 1981).

## VI. MEMBERSHIP

Changes to the membership list proposed by the Organizing Committee, with several additions, were approved by the membership.

The meeting closed with a vote of thanks to all those responsible for organizing Commission activities in Montréal.

Scientific Sessions.

Commission 40 held both morning and afternoon scientific sessions on 22 August.

Status and prospects of radio observatories. At this session, chaired by G. Swarup, the following papers were presented:

- Multi-telescope radio-linked interferometer at Jodrell Bank (B. Anderson).
- New Arecibo interferometer (K.C. Turner).
- Cosmic 10 m radio telescope in space (N.S. Kardashev).
- The Very Large Array (D.E. Hogg).
- European VLBI System (K.I. Kellermann).
- The Westerbork Synthesis Radio Telescope (R.G. Strom).
- The Cambridge 150 MHz radio telescope (A. Hewish).
- From Molongolo Cross to M.O.S.T. (B.Y. Mills).
- Ooty Synthesis radio telescope (G. Swarup).
- Effelsberg 100 m telescope (R. Wielebinski).
- The present and future of Rattan 600 (Yu.N. Parijskij).
- French-German mm-wave facilities - IRAM (D. Downes).
- Japanese Radio Telescope (M. Morimoto).
- The Onsala 20 m telescope (A. Hjalmarson).
- U.S. Naval Observatory: The 35 km interferometer at Green Bank as an astrometry instrument (G. Westerhout).
- Hartebeesthoek Radio Observatory (G.D. Nicolson).
- Culgoora Synthesis telescope (D.J. McLean).
- Siberian solar radio telescope (G. Smolkov).
- Penticton Observatory (J. Galt).
- Algonquin Radio Observatory (N.W. Broten).
- Clark Lake array (M.R. Kundu).
- Gauri Bidanaur 34 MHz T-antenna (C.V. Sastry).
- University of Massachusetts 14 m millimeter-wave telescope (W.M. Irvine).

Short contributed papers. K.I. Kellermann was the chairman of this session and the following talks were given:

- Solar observations with the WSRT and the VLA (M.R. Kundu).
- Jovian polarimetry with the WSRT at  $\lambda 50$ , 21 and 6 cm (I. de Pater).
- Observations with the Bonn 100 m Telescope at 7 mm (D. Downes).
- Sensitive large area surveys at 2.3 GHz (E.E. Baart).
- Recombination line survey made with the Bonn 100 m Telescope (T.L. Wilson).
- The new 1720 MHz OH outburst in V 1057 Cyg (T.A. Pauls).
- Radio flares in Cir X-1 (G.D. Nicolson).
- Broad HI shells on the peripheries of extended HII regions (R.S. Roger).
- Synthesis observations of HI clouds (C.H. Costain).
- Possible HI detection of nearby protogalaxies (R.D. Davies).
- Radio observations at 408 MHz of a sample of spiral galaxies (I.M. Gioia).
- The double quasar - a gravitational lens ? (D. Walsh).
- Multiwavelength polarimetry of 3C 310 and 3C 465 (W. van Breugel).
- MTRLI and VLBI of 3C 380 (P.N. Wilkinson).
- Quasars with resolved radio components (T. Kiang).
- Radio jet in Cen A and the precessing beam model of radio sources (R.D. Ekers).
- Summary of searches for short duration radio bursts from M87 (J.A. Roberts).
- Plasma turbulence models of QSOs (J. Colvin).
- Magnetic dipole model for cosmic radio sources (H.D. Greyber).