# Program

## Historical Radio Astronomy Working Group

### IAU General Assembly

### Beijing, China

### Room 408

### August 27, 2012

# Working Group on Historical Radio Astronomy

## August 27

### Session I: 0830-1000
### Business Meeting and Contributed Papers

### Business Meeting

### Contributed Presentations

Richard Wielebinski: *Albrecht Unsöld - A pioneer in the interpretation of the origin of the cosmic radio emission*

*Abstract:* Albrecht Unsöld was born 20th April 1905 in Bohlheim (Württenberg) and died in 1995 in Kiel. He was appointed in 1932 at the age of only 26 to the Chair of Astronomy and Theoretical Physics at the University of Kiel. This appointment initiated a very successful development of the studies of stellar atmospheres in Kiel under his life-long direction. Unsöld developed an active cooperation with astronomers in the USA. During a Rockefeller Foundation fellowship he used the Mount Wilson 100" telescope for spectral work. A major book published by him (Unsöld, 1938) "*Physik der Sternatmosphären (mit besonderer Berücksichtigung der Sonne)"* dealt with stellar atmospheres and became a classic in this research area. Prof. Unsöld kept the good contacts to colleagues in the USA having a visiting professor appointment in Chicago in 1939. At the Yerkes Observatory, working with Otto Struve (1888-1956), he became familiar with the observations of Karl Jansky (1905-1950) and Grote Reber (1911-2002). He immediately realised the close connection between the observed radio waves and the stellar atmospheres research.

The origin of the radio emission observed by Jansky and Reber at first eluded interpretation. The major conclusion in the early days was that 'the black-body radiation theory failed to account for Jansky's observations by a factor of $10^4$ in the most favourable case'. Unsöld started his investigations based on the data available to him in 1940, at first trying to bring the free-free emission to explain the radio observations. Unsöld from that time on began to use the Effective Temperature definition as obtained from the Rayleigh-Jeans approximation. This was a great step forward, going away from the intensity definitions (mVolts/m) used by radio engineers up to that time. A paper submitted in 1944 to the German journal 'Die Naturwissenschaften' was published only in 1946. In this paper the conclusion is drawn that only electron temperatures of some 100,000°K must be present in the interstellar space to account for a free-free emission of the radio waves.

In 1947 Unsöld examined the results of the radio observations of the Milky Way, the Sun and the Moon. Cleary the thermal component of Solar emission was identified. However the then published results about much higher effective temperatures during Solar eruptions lead to a conclusion that 'Ultrastahlung' (ultra-radiation) in addition to thermal free-free emission must be present. This 'ultra-strahlung' was in fact synchrotron radiation, bremsstrahlung of energetic electrons in magnetic fields. . We think that the radio emission was interpreted by Alfvén or Kiepenheuer. The contributions of Unsöld to this important aspect of radio astronomy is somewhat forgotten.

Richard G. Strom: *The Dutch effort to observe the HI line: some little-known details*

*Abstract:* Van de Hulst's 1944 suggestion that 21 cm HI from the Milky Way might be observable, Ewen and Purcell's 1951 detection and the subsequent Kootwijk confirmation by Muller constitute the basic facts of the HI line discovery. I will discuss some less well-known aspects of the prediction and detection. There is concrete evidence as to when Oort first became aware that radio emission had been detected from the Galaxy, and what his reaction was. In the post-war Dutch effort, the Leiden physicist Gorter and the theoretician Casimir played minor roles. I will discuss how both were involved in the physics of hyperfine structure before 1940, and their contributions after 1945.

Ishiguro, M., Orchiston, W., and Stewart, R., *The IAU Early Japanese Radio Astronomy Project: A Progress Report*

*Abstract:* Japan was one of those nations that make an early start in radio astronomy, when solar observations began at both the Tokyo Astronomical Observatory (TAO) and at Osaka University in 1949. The research at the TAO accelerated during the 1950s and 1960s under the capable direction of Professor Hatanaka, while an equally-vibrant program was developed independently at Toyokawa by Professor Tanaka from Nagoya University.

In this paper, after briefly describing the Osaka University initiative we will outline the instruments developed at Toyokawa and Mitaka, review the research programs carried out with them and introduce the scientific staff who played so important a role in the early development of Japanese radio astronomy.

Following the success of the WG's Early French Radio Astronomy Project (seven papers were published), an ambitious IAU project to systematically document early developments in Japanese radio astronomy and publish the results in a series of research papers in the *Journal of Astronomical History and Heritage* was launched in December 2010. Further research visits to Tokyo were made by the second author in 2011 and 2012, and two papers have now been completed and a start made on a third.

## Session III: 1400-1530

## Session in Memory of Recently Deceased Radio Astronomers

**Don Backer, John Baldwin, Tom Carr, Robin Conway, Dave DeYoung, Bill Ellis, Shinzo Enome, Istvan Fejes, Andrej Finkelstein, Vitali Ginzburg, Bill Gordon, Stan Gorgoleski, Albert Greve, Dave Heeschen, Yuri Ilyasov, Naum Kaidanovsky, Kinaki Kawabata, Mukul Kundu, Norm Labrum, Tom Legg, Jack Locke, Frank Low, Bernie Mills, Masaki Morimoto, Ernst Raimond, Radhakrishnan, Steve Rawlings, Bob Rood, Vagharshak Sanamian, Kevin Sheridan, Natalia Soboleva, Titus Spoelstra, Jaap Tinbergen, Atsushi Tsuchiya, I. V. Tuominen.**

## Session IV 1600-1800

## Radio Source Counts and Cosmic Evolution

### David Jauncey: *Early Radio Source Counts: Differentiating the Data and Integrating the Implications*

*Abstract:* There are a number of essentials needed to produce statistically reliable source counts; A complete and reliable survey with accurate flux density measurements, and a statistically correct analysis of the resulting source counts. I will discuss how difficulties with the above, individually and/or collectively, affected analyses of the early source counts.

### Ron Ekers: *How Fred Hoyle reconciled radio source counts and the Steady State Cosmology*

*Abstract:* In 1969 Fred Hoyle invited me to his Institute of Theoretical Astronomy (IOTA) in Cambridge to work with him on the interpretation of the radio source counts. This was a period of extreme tension with Ryle just across the road using the steep slope of the radio source counts to argue that the radio source population was evolving and Hoyle maintaining that the counts were consistent with the steady state cosmology. Both of these great men had made some correct deductions but they had also both made mistakes. The universe was evolving, but the source counts alone could tell us very little about cosmology. I will try to give some indication of the atmosphere and the issues at the time and look at what we can learn from this saga. I will conclude by briefly summarising the exponential growth of the size of the radio source counts since the early days and ask whether our understanding has grown at the same rate.

### Jasper Wall: *Eddington, Ryle and Hoyle: How a major 20th century discovery was lost in confusion and noise*

*Abstract:* The Steady-State vs Big-Bang controversy of the 1960s, also known as the source-count controversy, was almost unparalleled in bitterness and rancour. Vestiges linger to this day. The very personal struggle between Ryle and Hoyle changed the course of the lives of both men. It resulted essentially in the loss from the record of a major cosmological discovery which astronomers and cosmologists finally recognized and revisited far too late.