

CURRICULUM VITAE (Andrzej Kus, Torun Centre for Astronomy)

- **Name** : Andrzej Jan KUS,
- **Present address**: Torun Centre for Astronomy, Radio Astronomy Department, Nicolaus Copernicus University, PL-87100 Torun, Gagarina 11, Poland.
- **Home** : Nalkowskiej 12, PL-87-100 Torun, Poland.
- **Date of birth** : 21st June 1944 in Cracow Poland
- **Marital status** : Married since 1968, with two grownup children
- **Secondary qualification** : In 1962 a degree from the High School.
- **Undergraduate Education** : Study at the NCU (Nicolaus Copernicus University) Torun at Institute of Astronomy - Physics Faculty, for master degree in Astronomy 1962- 1967. Supervision from Prof. W.Iwanowska and Prof. S.Gorgolewski, Master thesis in Radio Astronomy, Graduated from the University in 1967 with the best mark.
- **Academic qualifications** : Mgr. (Master of Science) in astronomy from the Nicolaus Copernicus University (NCU), Torun Poland in 1967. Ph.D. in Physics at the Nicolaus Copernicus University received in 1975 a habilitation degree (Dr. hab.) 1989 and Docent position at the Nicolaus Copernicus University since May 1990.
- **Professor** position and the Chair of Radio Astronomy from April of 1991.
- **Director** of Torun Radio Astronomy Observatory, Nicholas Copernicus University 1992-1996.
- **Head** of the Radio Astronomy Department of the Torun Centre for Astronomy, Faculty of Physics and Astronomy, Copernicus University, 1997-2005.
- **Director Torun Centre for Astronomy** from January 1st 2001.
- **Professor title** received (nominated by the President of Poland) in June 2003.

Postgraduate education :

In 1967 employed at the NCU as a research assistant (with teaching duties and the aim to work on Ph.D.). During the time of 1967-1973 I worked on the following projects:

- Solar radio observations at 127 and 327 MHz, data analysis and modernizations of receivers and antennas,
- Antenna's design for the meter wavelength solar radio telescope,
- Development of aperture synthesis techniques at Torun Observatory,
- My entirely own project - the design and construction of a 43 MHz radio telescope for super-synthesis observation of the North Polar Region. Observations and data reduction were completed, however due to limited computing power available at that time and the chance to study at Cambridge UK, this project (an initial subject for Ph.D. thesis) wasn't ever satisfactorily finished,
- Participation in the project study of the 5 x 25m parabolic antennas - the planned aperture synthesis instrument for Torun.

In 1973 I received a special Copernicus Grant from the British Council to study Radio Astronomy at Cambridge University. In 1973-1974 I worked at the Mullard Radio Astronomy Observatory, Cavendish Laboratory Cambridge as a research student under the direct supervision from Professor Sir Martin Ryle. During that time I learnt the radio interferometry techniques and the aperture synthesis methods. As the result I completed observations with the One Mile Radio Telescope - the 5C7 deep survey of radio sources. I also worked on development of local oscillator and phase rotator units for the new 151 MHz synthesis radio telescope for the Mullard Radio Observatory (under Dr. J.Boldwin supervision)..

The scholarship at Cambridge was the important opportunity to study radio astronomy in the world leading research centre. It resulted in good knowledge of Cambridge research

programs, their instrumentation and directions of development. At that time, a very profitable collaboration has started with Dr.T.J.Pearson and Dr. A.C.S.Readhead (now at the California Institute of Technology - Owens Valley Radio Observatory in Pasadena USA) both well known world wide for VLBI work.

In 1975 I received the Ph.D. degree in Physics from the NCU Torun. The thesis - "The 5C7 Deep Survey of Radio Sources" - is based on results obtained during the study at Cambridge University.

Research Fellowships and long term visits:

Research fellowship has been obtained from the Nicolaus Copernicus University Torun in a period of 1975-1990. The main research line until 1979 centred on : the development of an instrumentation for 15m Torun microwave radio telescope, i.e.: feeds, low noise receivers, back-ends and Mark IIc terminal for the VLBI observation.

In 1979 I received one year research fellowship from the Manchester University, Nuffield Radio Astronomy Laboratories Jodrell Bank in England. There I worked with VLBI data and MERLIN observations. The subject of the work concerned the parsec scale structure of steep spectrum quasars and the OH maser lines of the IR/OH stellar sources. There I have gained the experience in VLBI techniques, in the image processing and in the OH spectroscopy. The close collaboration with Dr R.S.Booth, Dr P.N.Wilkinson, Dr R.Norris, Dr P.Diamond has proven to be very successful and continued over many years after.

Since return to Torun Radio Astronomy Observatory (TRAO) in 1980 my main efforts were directed towards connecting the Torun telescope into the European VLBI Network. In 1981 we had first successful experiment at 5 GHz - first VLBI fringes on baseline Torun - Effelsberg. My technical achievements comprised the building of the low noise receivers for operation at 92, 50, 21 and 18 cm, which since then were used for VLBI experiments, the building and testing the VLBI IF converter and MkIIc terminal. I have significantly contributed to the construction and testing of all Torun's scientific instrumentation as well as into the management of VLBI and other research work at TRAO.

In 1987-1989 I worked as a visiting scientist at Onsala Space Observatory Chalmers Technical University in Sweden. In close collaboration with Professor Roy Booth and Dr. Lars Baath I worked on VLBI at 3 and 1 mm wavelength, on VLBI studies of Compact Steep Spectrum Quasars and on the mm wave study of the Southern Sky radio sources using SEST. The further extension and continuation of the work at the OSO was possible in 1991/1992 thanks to support received from the OSO and the Swedish Institute.

At present my scientific work concentrates on continuation of steep spectrum QSOs studies and in particular on the most luminous objects such as 3c286 and 3c309.1 and 3c380. This program was undertaken as international co-operation with Prof. R.S.Booth from Onsala Space Observatory - Sweden, Prof. A.C.Readhead from CALTECH - the USA, Dr. P.N.Wilkinson from Jodrell Bank - England, Dr.T.J. Pearson from CALTECH. My contribution into the joint work comes through the observations, data reduction and theoretical interpretation. I am particularly interested in the physical processes of the bipolar outflow observed in form of twin radio jets in cores of quasars and active galaxies. The most important results were: (i) the discovery of SLM in 3C309.1, (ii) a new canonical model of CSS luminous quasars and (iii) the model of helical flow and back flow (now incorporated into AIPS package) observed in AGNs.

The development of new methods in VLBI image reconstruction technique is one of the additional interest. A collaborative work on this subject was undertaken with Prof. J.Pfleiderer of Innsbruck University, Austria.

From 1990 the new 32m. telescope affairs absorbed very much most of my time. Now as the

telescope is fully operational the chance for more research opens up again. We have started several local projects like pulsar timing programme, studies of OH maser emission, flux monitoring of AGNs and VLBI. Except the pulsar research I fully direct those projects.

Several longer visits at the Max-Planck-Institut für Radioastronomie in Bonn (1986, 1992, 1994) has led to a new collaboration with Prof. R. Wielebinski and his group - the study of Inter Stellar Matter (ISM) by means of complex VLBI observations of galactic and extra-galactic sources seen through the plane of the Galaxy. This novel approach has yet undiscovered potentials to measure properties of small scale interstellar plasma clouds and the galactic magnetic field.

Recent activities are connected with EVN development and in particular e-EVN and network operation. This includes continuous upgrade and modernization of Torun 32m telescope and building of modern infrastructure around it.

Important part of recent activities concentrates on FARADAY programme. One of the products of the activity is OCRA receiver (One Centimetre Receiver Array) installed as a prototype on 32m Torun radio telescope. The project aims towards massive studies of weak sources which can be seen above 30 GHz. The project is interesting for studies of young AGNs and CMB anisotropy.

Invited visits of short duration:

- In 1975 for one month at Cavendish Laboratory in Cambridge to continue work on 5C6 and 5C7 surveys of radio sources.
- In 1978 for two weeks at Max-Planck-Institut für Radioastronomie Bonn.
- In 1979 for two weeks in Radiosterrenwacht Dwingeloo in Holland to work on low noise front-ends lent from the NFRA to the Torun Observatory.
- In 1979 for one month in CALTECH USA to collaborate on 3C309.1 VLBI data and then for two weeks at Jodrell Bank England for the same reason.
- In 1984 for two weeks and then for three month at MPIfR Bonn to work with the VLBI data and to analyze results from 100m telescope on clusters of galaxies.
- In 1985 for three month at Onsala Space Observatory to continue work on VLBI projects and to prepare new observational program.
- In 1986 for three weeks in CALTECH USA to work on new observational results from recent 5 GHz global VLBI experiment on SSC QSO 3C309.1.
- In 1990 one month at ESO La Silla Chile for mm VLBI observation of compact radio galaxies and quasars, also one month visit at Onsala Space Observatory to continue collaboration on mm VLBI, studies of CSS QSOs and continuum flux measurements at mm band for southern hemisphere sources.
- June 1991 one week stay at Institute of Astronomy Innsbruck University, Austria. A short visit to start collaboration on new methods for analysis of VLBI data.
- October 1992 - a month visit to Max-Planck-Institut für Radioastronomie, Bonn.
- 1992-1999 a monthly visits to OSO, JIVE

Attended conferences :

- 1971 YERAC in Bologna, paper: 43 MHz super synthesis observations of the North Polar Region,
- 1974 YERAC in Gothenburg,
- 1976 YERAC in Torun, paper : Corrections to the N(S) Relation,

- 1975 YERAC in Paris, paper : Possible Clustering of 4C Sources,
- 1977 YERAC in Havelte Holland, paper : Optical Identifications and galaxies in 5C6 and 5C7 areas,
- 1976 IAU Symposium No.74, Cambridge UK, paper : 5C6 and 5C7 Surveys of Radio Sources,
- 1977 IAU Symposium No.79, Tallin the USSR, 1978 VLBI Symposium, Heidelberg W.Germany, paper : The 15m microwave radio telescope for Torun,
- 1982 IAU General Meeting, Patras Greece, presented report : Recent Development at TRAO,
- 1982 VLBI Conference, Toulouse France, paper : Present Status and Future Plans for VLBI at Torun,
- 1983 IAU Symposium No.110, Bologna Italy,
- 1986 Workshop on Superluminal Sources, Big Bear Lake, CALTECH California the USA.
- 1987 IAU Symposium No.129, Cambridge Ma., paper : VLBI Structure of the QSO 3C286.
- 1989 Workshop on Kilo-parsec Scale Radio Jets, Socorro, NRAO, USA, paper : Superluminal Motion in 3c309.1.
- 1990 Workshop on Steep Spectrum and GHP sources, Dwingeloo, Holland, paper : Cores of 3C286 and 3C309.1 quasars.
- 1992 Symposium on Sub Arcseconds Radio Astronomy, Manchester University, three papers presented.
- 1992 II-nd European Astronomical Society Meeting, Torun Copernicus University, paper presented on CSS luminous quasars.
- 1993 I-st EVN Symposium, Jodrell Bank, paper presented 1994 II-nd EVN Symposium, Torun
- 1995 Large Telescope Working Group and Workshop on Spherical Radio Telescopes, Guizhou, China, paper presented on the future global VLBI telescope as the solution for 1 km² radio telescope.
- 1996 III-rd EVN Symposium, Alcala de Henares, Spain.
- 1998 IV-th EVN Symposium, Dwingeloo, The Netherlands
- EMC Conference Warsaw 2000, invited lecture
- 2001 The role of VLBI in Astrophysics, Astrometry and Geodesy, NATO School, two lectures delivered.
- Workshops and conferences on FARADAY, PHAROS 2002/2005
- KKRRiT Cracow, Invited opening lecture, 2005
- Conference on Organic Chemistry, Torun 2005, Invited opening lecture.

Experience in fields of:

Radio astronomy techniques - especially in interferometry, VLBI, mm VLBI, aperture synthesis, low noise receivers, antennas, extra galactic radio astronomy - physics of radio galaxies and quasars, spectroscopy of OH masers.

Teaching experience :

Lectures for undergraduates on : Extra Galactic Astronomy, Extra Galactic Radio Astronomy, Radio Astronomy, Astronomy and Astrophysics, tutorials in radio astronomy. Supervision of Ph.D. students.

Administrating and managing experience :

Director of Torun Radio Astronomy Observatory (staff of 33 astronomical and technical support personnel) since 1992. Supervision of the 32m. telescope investment project - the second largest investment for the science in Poland. Defining and completion of specialized instrumentation for the telescope. Supervision of telescope operation and the research programmes. Organization of international conferences : II EAS Meeting in Torun in 1992, II EVN Symposium in 1994, and several workshops and EVN meetings.

Member of :

- IAU since 1975, URSI 1975, EAS 1992.
- Member of the EVN Consortium from 1992.
- The Royal Astronomical Society Associate from 1995.
- Member of the Polish National Astronomical Committee.
- Member of Physics and Astronomy Faculty
- Member of the University Senat
- Member of Astronomical Council of the State Committee for Scientific Research in period of 1992-1996 and 1998-1999.

Last update 2005.09.20

LIST OF PUBLICATIONS

Refereed papers and original articles :

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- Hanasz J., Gorgolewski S., **KUS A.**, Turlo Z., *Daily flux values and distinctive events at 127 MHz observed at Torun*, 1969-1972 monthly reports, Quarterly Bulletin on Solar Activity, Vol. 15, 16, 17, No. 165-180.
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- **KUS A.**, Gorgolewski S., Kepa A., Mazurek J., Pazderski E., *Receivers for the 15 m TRAO Radio Telescope*, 1984, Post.Astr., 32, 303 (in Polish).
- Borkowski K.M., **KUS A.**, *Review of VLBI - Part I*, 1983, Post.Astr., 31, 99 (in Polish).
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- Matveenko L., Pauliny-Toth I., Sherwood B., Baath L., **KUS A.**, *Study of the 3C345 Quasar Structure at Decimeter Wavelength*, 1986, Pisma v Astron.Zurhnal, 2, 156 (in Russian).
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- **KUS A.**, *Radio Investigations of 3C309.1 QSO*, The Nicolaus Copernicus University Press, 1985, Habilitation, Torun (in Polish).
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- M.Szymczak, G.Hrynek, **A.J.KUS**, *Observations of OH 4767 MHz maser Emission from Star-forming Region*, 1999, *MNRAS*,
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