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Andrea Richichi

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Personal data

Born on January 22, 1962 in Rome (Italy). Italian citizen.

Education

1980 – 1982 Physics, University of Cagliari (I)
1982 – 1985 Physics, University of Florence (I)
Degree in Physics *summa cum laude,* July 1985.

1986 – 1989 Ph.D. Program, University of Florence (I)
Ph.D. in Astronomy, October 1989, with a thesis on "*Lunar Occultations for high angular resolution in the near infrared*".

Professional experience

1985-1986	fellowship, Arcetri Astrophysical Observatory (I)
1986-1988	studentship, European Southern Observatory
1989-1991	post-doc, Steward Observatory (USA)
1992-1995	post-doc, Max-Planck-Institut für Astronomie (D)
1994-2001	staff member, Arcetri Astrophysical Observatory (I)
2000-2001	paid associate, ESO
2001-current	staff member, ESO (VLTI Instrument Scientist)

Research interests and experience

High angular resolution techniques, such as lunar occultations, speckle interferometry, long-baseline interferometry; mainly in the near infrared. Binary stars on the main sequence and in star forming regions. Angular diameters and effective temperatures of cool stars. Dust and circumstellar matter in AGB stars, carbon stars, infrared objects, young stars.

Observing experience at many observatories in the world, including visual and infrared imaging, spectroscopy, photometry, high angular resolution techniques. Experience with data analysis packages, with programming, and in general with all major software tools and operating systems relevant for modern astronomical work (MIDAS, IRAF, IDL, Unix, Windows, C, Fortran, etc.)

Work in the VLT Interferometer Group at ESO since February 2000 (Instrument Scientist of AMBER and MIDI).

Publications

About 140 refereed and non-refereed publications.

Awards

Chretien Grant of the American Astronomical Society, awarded in September 1995 for a project on "*World Wide Network on Lunar Occultation Research*".

UNESCO recognition among "Youth Scientific Projects" awarded to M. Khristoforova for her work at ESO under A. Richichi's supervision (2003).

Languages

Mother tongue: Italian. Good knowledge of English. Working knowledge of German and Spanish. Some knowledge of Russian, Japanese, others.

Andrea Richichi, June 2003

Curriculum Vitæ

July 1985: Degree in Physics *summa cum laude* at the University of Florence. Thesis on the technique of lunar occultations as a method to achieve high angular resolution, with special concern for the near-infrared domain, under the supervision of Prof. P. Salinari. This work resulted in the creation of a working group on lunar occultations at the Arcetri Astrophysical Observatory, as well as the devolpment of a specialized instrument for the TIRGO telescope (Mt. Gornergrat, Switzerland). The aim was mainly the measurement of stellar angular diameters of late-type stars. This in turn represents the only direct way to determine the effective temperature, a fundamental parameter which is not very well known yet for such stars.

December 1985: Fellowship at the Arcetri Observatory, for the duration of one year. In this period, the lunar occultations program grew considerably and observations were extended to very embedded infrared sources. A new approach to data analysis was required, and I developed a novel model-independent analysis method which was successfully used to reconstruct the brightness profiles of sources having a complex geometry, such as circumstellar shells. This method has been used and referenced in many publications relevant to lunar occultations.

December 1986-September 1988: Fellowship at the European Southern Observatory (ESO), in Garching (Germany). I began to learn other techniques for high angular resolution, such as speckle interferometry, and I worked on algorithms for phase reconstruction and image sharpening. I began to coordinate lunar occultations and speckle interferometry observations to obtain measurements that span several orders of magnitude in angular resolution on sources with circumstellar shells in the near-infrared. Also, under Dr. J. Wampler's supervision, I worked on optical spectroscopy of SN1987A. This work, based on medium-resolution echelle spectra of the supernova obtained systematically at ESO in the first year after the explosion, allowed us to study the expansion process of the stellar material and the interaction of the shock front with the circumstellar medium. I also developed practical experience in the field of image analysis and astronomical data treatment. In particular, I took part in a working group for the upgrade of the astronomical software package MIDAS.

March 1987-September 1989: Ph.D. studies in Astronomy at the University of Florence. The first part of this period was spent at ESO, the second one in Florence. The subject of my thesis was again the technique of lunar occultations, with deeper investigations of the mathematics of data treatment and error estimation, and making use of a wider archive of observations (about one hundred at that time). I also began a collaboration with Prof. Leinert from the Max-Planck Institute for Astronomy in Heidelberg (Germany), with whom we started coordinated observations by speckle and lunar occultations of binary stars, both on the main sequence and among young stars. This research, continued for several years, led to several results in particular for what concerns the frequency of binary systems in the early stages of stellar evolution.

October 1989-November 1991: Post-doctoral fellowship at the University of California in Los Angeles, with Dr. M. Malkan. In this period, my work was carried out mostly at the Steward Observatory in Tucson (Arizona), where I worked in a group led by Dr. K. Hege. The main subject of my research was the investigation of active galactic nuclei (AGN) at high angular resolution by means of differential speckle interferometry in the optical domain. In particular, my contribution consisted mainly in the development of software for the bispectral analysis of photon-counting as well as analog speckle data. This software allows the user to choose arbitrarily the number of bispectrum subplanes, and it also corrects a number of instrumental artefacts. For this reason, it is of a general use and has been employed also in the reduction of near-IR speckle data.

November 1991-June 1992: After returning to Italy, I pursued further studies in Mathematics at the University of Florence, continuing at the same time my collaboration with the Arcetri Observatory.

July 1992-August 1992: I was a visiting scientist in the research group "Dust in the circumstellar medium" of the Max-Planck Society in Jena (Germany), in collaboration with Prof. T. Henning and Dr. B. Stecklum. In this period, in addition to work on previously acquired data, we also discussed the project of an IR portable fast photometer, which was later developed into the FIRPO instrument described below.

September 1992-March 1995: Post-doctoral fellowship at the Max-Planck Institute for Astronomy in Heidelberg (Germany). Here, I began to be involved in instrumentation development, as the initiator and leader of a joint effort between Heidelberg, Jena and Arcetri for the construction of a portable fast IR photometer. This has been used primarily at the 1.2m and 2.2m telescopes of the Calar Alto Observatory in Spain, but also at the 6m telescope of the Special Astrophysical Observatory in Russia; and parts have been lent to the National Observatory of Mexico. To date, two such photometers are in use. In addition to lunar occultations, the results include standard photometry as well as fast photometry of special events, as was the case for the impact of comet SL9 on Jupiter. In parallel, I have taken part in an effort that has led to the first use of an infrared array to record lunar occultations at high speed on a subwindow of the detector. Also, I have intensively continued my efforts with other techniques, such as speckle interferometry, speckle holography, and adaptive optics (observations at the Starfire Optical Range in New Mexico).

October 1994: Staff position at the Arcetri Astrophysical Observatory and, after a few more months in Heidelberg, subsequent return to Florence. In Arcetri, I have led a group funded with a special grant from the National Research Council, for studies in the field of high angular resolution. During this time, observations have been carried out by means of several techniques at a number of telescopes in the world, and results have been obtained in diverse areas of stellar astronomy: brown dwarfs, binaries and circumstellar matter around young stars, binaries among main sequence stars, effective temperatures of the coolest stars, dust around AGB stars.

1995- 2000: In addition to my continuing interest in the scientific areas described above, I intesified my participation in the development and implementation of modern techniques for high angular resolution at the new telescopes in which Italy was a partner. For instance, I took part in the panel for adaptive optics at the new national telescope in the Canary Islands. I collaborated with ESO, as a member of a steering committee for the VLT interferometer (ISAC).

1997-2000: I started a collaboration with german and french partners for the construction of the first near-infrared focal plane instrument for the VLTI, dubbed AMBER. I led a team of 5 staff and postdocs, working in Arcetri on the development of the spectrograph for AMBER. In parallel, I chaired the AMBER scientific group which included about a dozen researchers from various european countries. I was also involved in similar efforts for the Large Binocular Telescope project (LBT), in particular regarding a proposal for a visual/near-IR interferometric beam combiner based on double-layer adaptive optics correctors (Oneiric), and a project for the development of software tools for the simulation and analysis of interferometric images (Airy).

2000- 2001: I joined the VLT Interferometer Group at the European Southern Observatory, where I worked in several aspects related to the scientific use of the VLTI, expecially with respect to the operation of the so-called VINCI instrument. In particular, I have collaborated to the definition of initial observing programs and source catalogs, to the procurement of required software tools, and in general to several aspects at the interface between instrumental and observational aspects of the VLTI. I started a project of collecting sources for the calibration of VLTI measurements, which resulted in the so-called CHARM catalogue, which is by now widely used in the interferometric community.

2001- current: I resigned from my staff position at the Arcetri Observatory and took up the offer of a staff position at ESO, working as Instrument Scientist in charge of the AMBER and MIDI

instruments built by european consortia. I am responsible for the supervision of the construction of MIDI and AMBER according to ESO standards, and all related aspects such as documentation, shipment, etc. MIDI obtained first fringes in December 2002, while AMBER is expected to achieve this goal by early 2004. I am actively involved on scientific aspects related to the VLTI, including preparation and execution of observations, data analysis, and development of tools to be later provided to the community. Following the temporary appointment of F. Paresce as division head, I have helped him with his work as VLTI Project Scientist, in particular for what concerns the so-called Science Demonstration Team. I have been involved with the Genie precursor experiment for the Darwin mission (an ESA instrument for nulling interferometry at the VLTI). I am the ESO member of the Genie Science Team.

Observational and Technical Experience

My experience includes observations and data analysis in the fields of photometry, fast photometry, speckle interferometry, speckle holography, differential interferometry and spectroscopy, both in the optical and near-infrared domains. I have carried out observations at a number of telescopes of medium to large size around the world, including: most of the italian telescopes; La Silla and Paranal (Chile); Kitt Peak, Mt. Hopkins (MMT, IOTA interferometer), Wyoming/WIRO, Starfire Optical Range (USA, adaptive optics); San Pedro Martir (Mexico); Special Observatory 6m tel. (Russia); Mt. Abu (India); Calar Alto (Spain). I have been a co-investigator on the Hubble Space Telescope. I have experience in the use and programming (Fortran and C) of computers under different operating systems (including Unix, VMS, DOS/Windows), and in the use of astronomical data reduction packages such as MIDAS and IRAF. I have also developed specialized software for specific applications of data reduction.

I have experience laboratory experience concerning instruments and cryogenics, and I have led an effort that has led to the construction of a fast IR photometer. I have coordinated the initial efforts for the spectrograph of the AMBER instrument, when I was still staff at the Arcetri Observatory.

Recently, my observation time has been spent mainly at the ESO observatory on Paranal, in particular with several observing runs for the VLTI commissioning with the VINCI instrument, and for the commissioning of the MIDI instrument.

Teaching, Committees, Working groups

- I have tutored the students of the ESO-OHP Summer School (Haute-Provence Observatory, 1988) on the subject of long-slit spectroscopy.
- In 1995-96 I acted as supervisor for the degree thesis in physics of the student L. Fabbroni, dealing with lunar occultations, at the University of Florence.
- I have taught short monographic courses to students at the Physical Research Laboratory in Ahmedabad (India, 1995).
- I have taken part in the Scientific Committee for Adaptive Optics on the National Italian Telescope Galileo (1995).
- I was a member of the Interferometry Science Advisory Committee of ESO (ISAC, 1996-1997).
- From 1997 till 2000 I have been a co-Investigator for the AMBER instrument for the ESO VLT Interferometer (acting also as chair of the scientific group).
- I have tutored the French student S. Correia during his DAE stage in Florence (1999) on image reconstruction methods for the Large Binocular Telescope, and later at ESO during his PhD period (2001-2002).

- I have taught lessons at the Techno2000 and Techno2002 schools (Naples, Italy) on the subject of methods and observations for high angular resolution imaging and long-baseline interferometry.
- I have taken part in the Large Binocular Telescope working group for interferometry.
- I am a member of the IAU Working Group on Optical/IR interferometry.
- I am a member of the Visitor Selection Committee at ESO since 2000.
- I am a member of the ESO Science Demonstration Team for interferometry (which I have led jointly with F. Paresce during his time appointment as Division Head).
- I am member of the panel in charge of writing the VLTI BLue Book (2002/2003).
- I have arranged and supervised the visit of the russian student M. Khristoforova in summer 2002, working on the analysis of VINCI/VLTI photometric data for the estimation of atmospheric parameters. Her work on this topic has been recognized by UNESCO among "Youth Scientific Projects" (Moscow, July 2003).
- I am member of the ESO/ESA Genie/Darwin Science Team.