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# *Optical and Infrared Interferometry IV*

**Jayadev K. Rajagopal**
**Michelle J. Creech-Eakman**
**Fabien Malbet**
*Editors*

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# Introduction

Optical and IR Interferometry IV at the SPIE 2014 symposium in Montreal had a strong and vibrant program. After initial fears about budget cuts and travel-funding constraints, the Program Committee had to work hard to accommodate as many quality submissions as possible. Innovative, creative and visionary work ensured that the field has progressed well, despite the bleak funding climate felt in the US, Europe and elsewhere. Montreal proved an excellent venue for this, the largest of Interferometry conferences and the only one that brings together practitioners from the world over. Let us summarize a few highlights to convey a glimpse of the excitement that is detailed in the rest of these Proceedings.

Day 1:
The Air and Space Interferometry session was perhaps the one most affected by the tight funding. Compared to just a few years ago, there are few programs with funding to design or build space interferometers. The balloon-borne mid-IR interferometer, BETTI (making rapid progress with its first flight scheduled for next year), provided the silver lining, capable of strong science with path-finding technology. The Observing Techniques session had talks featuring first results from the Large Binocular Telescope Interferometer (LBTI) program to detect exo-zodiacal dust disks and progress on multi-baseline stellar imaging efforts at NPOI.

The IAU-sponsored Michelson and Fizeau prizes were awarded (see Prizes section); and we took a moment to remember two of our colleagues, Stan Stefl and Olivier Chesneau, whose recent passings cast a shadow over the community.

Day 2:
We had an inspiring and entertaining Historical Perspectives section, starting off with the story of the Narrabri Intensity Interferometer (celebrating the 50$^{th}$ anniversary of the first results), an experiment that changed not only interferometry, but also stellar astronomy and laid the foundation for optical quantum coherence theory. Intensity Interferometry is having a revival, as you will see when you peruse these Proceedings. We then heard of the unique conception and execution of the leading interferometer facility in the US, the CHARA array, and its spectacular success built on working together with groups from the world over. Sobering news came from Magdalena Ridge with serious funding issues slowing down the project, but the team remains strong as MROI works hard to gather funding to start demonstrating its unique capabilities. The community eagerly anticipates the tremendous boost that Gravity and Matisse, the second-generation VLTI instruments, will bring in the near future; and we heard of their remarkable progress. The large number of excellent poster papers on Gravity also indicates how mature the project is.

Day 3:
Day 3 saw a mixture of Data Processing/Analysis, Science, Planned Facilities, and Facility Issues talks. It was evident that we are moving towards increasingly complex reconstruction from multi-color data as spectral capabilities improve. Polarimetry and birefringence effects were discussed, so were impressive improvements from System Engineering efforts at VLTI. New capabilities big and small – like nulling with the LBTI, the VAMPIRES polarimetric aperture masking instrument and the FIRST nuller – were presented.
The first poster session saw no less than thirteen papers on gravity, covering hardware and software.

Day 4:
The Future session was devoted to the Planet Formation Imager (the Chairs and the SOC worked hard to put this together after the community expressed a strong desire). The beginnings of a "coherent" long–term vision could be seen and the focus was on kick-starting community involvement in putting together the science case and technology roadmap for this very exciting project in the making. Innovative mid-IR heterodyning ideas as well as pragmatic plans on building on the MROI experience were discussed. The seed has been sown and a lot of work waits in the future: watch this space closely as we move forward towards Edinburgh.

Long-term plans for the VLTI were also discussed, with Gravity and Matisse filling the near horizon. The cancelling of VLTI-Prima, the astrometry instrument, was a serious setback, but valuable lessons are being learned for the future. The Technologies session saw talks on 3D-integrated waveguides for pupil remapping and spectro-interferometry, and a report on the successful testing of the MROI fringe tracker. The second poster session had very diverse papers ranging from photonic on-chip nulling to a new scheme to estimate angular diameters of calibrators from photometric colors.

Day 5:
The concluding day had many highlights: the Critical Subsystems and Technologies sessions saw talks on external fringe-tracking for MIDI and GRAVITY; the GRAVITY beam combiner and detectors; and the much-talked about new, fast, low noise near–IR APD array. We finished off a very exciting meeting with the Imaging Beauty Contest results in the last session: the contest had a new look, with real data used as the test set and it was very informative to see the results from the best reconstruction techniques out there.

The theme of the Symposium was "from the drawing-board to the sky" and the Interferometry Conference had much to show on that. For the past decade or so, practical concerns saw us aiming more for getting the best out of existing facilities than large future plans. We certainly saw very real progress on that front, with new

science results and enhanced capabilities ranging from the new AO system at CHARA to system-wide improvements at VLTI. Now a new excitement is in the air and visionary plans are being drawn up. We cannot wait for Edinburgh.

**Jayadev Rajagopal**
**Michelle Creech-Eakman**
**Fabien Malbet**

**The Michelson and Fizeau Prizes**

These prestigious, IAU-endorsed prizes are awarded every two years at the SPIE venue.

**The Michelson Prize**, jointly awarded by the IAU Commission 54 and the Mount Wilson Institute (MWI), will, to quote from the Commission 54 description, "recognize outstanding achievement in the scientific research and facility areas of optical interferometry."

The Michelson Prize for 2014 is awarded to **Dr. John Monnier**. Dr. Monnier's prize was presented in Montreal by the MWI Director, Dr. Hal McAlister. The Prize citation reads: *The 2014 Michelson Investigator Prize is awarded to John Monnier for his extensive and varied contributions throughout a rich and vigorous career in high angular resolution methods and applications. His leadership in developing the unique Michigan InfraRed Combiner, and its use at the CHARA Array in interferometric imaging, has led the community in delivering on the promise of optical interferometry to science. His group's imagery of rapidly rotating stars has excited the imagination of scientists and public alike and has given physicists new constraints on stellar structure. This Prize also recognizes his earlier heavily cited work on Young Stellar Objects. The first interferometric YSO angular diameters are a fundamental contribution to the understanding of preplanetary disks, guiding theoretical understanding and constraining modeling of the planet formation zone.*

*From left:* Michelson Prize winner John Monnier, MWI Director Hal McAlister, and IAU Comm. 54 Former President Steve Ridgway.

**The Fizeau Prize**, jointly awarded by the IAU Commission 54 and the Observatiore de la Côte d'Azur (OCA) is, quoting from the IAU Commission 54 description, "to provide recognition within the interferometry community, as well as in the broader science community, of theoretical and technical progress and developments in the rapidly growing field of optical interferometry, and to assist the OCA and the IAU Commission with engaging the community in promoting the future of optical interferometry."

Two Fizeau Prizes were awarded this year.

*The Fizeau Lifetime Achievement Prize for 2014 is awarded to* **Dr. William Tango** *for his long-term efforts in forwarding the theory, technology and practice of optical interferometry. This is most clearly demonstrated in the publication of the seminal paper on interferometry in 1980, along with many other original works on a broad range of topics in the field. Dr. Tango has been involved in the construction and operation of several major ground-based instruments, including most recently the Sydney University Stellar Interfereometer (SUSI). The students he has mentored have themselves gone on to positions of leadership in this field, extending even further his wide-ranging influence on optical interferometry.*

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*The Fizeau Investigator Prize for 2014 is awarded to* **Professor Christoph Leinert** *for his considerable scientific achivements throughout his career, and specifically for his role as Principal Investigator for the MIDI instrument on the VLTI. His noteworthy career connects to a recurring theme of high angular resolution astronomy, which ultimately led him to long-baseline interferometry at the VLTI. The remarkable success of MIDI can be directly connected to the scientific and technical leadership of Professor Leinert, resulting in breakthroughs in our understanding of active galactic nuclei, protoplanetary disks, and circumstellar envelopes of asymptotic giant branch stars; this leadership has also been instrumental in significantly expanding the interferometry user community. Professor Leinert's success with the VLTI is inspiring the next generation of researchers and instrumentation to build on these successes.*