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Cosmic Masers – from OH to H₀

Edited by

Roy S. Booth

Elizabeth M. L. Humphreys

Wouter H. T. Vlemmings

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COSMIC MASERS - FROM OH TO H₀

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COVER ILLUSTRATION:

A picture of Table Mountain, Cape Town, taken from Robben Island.

This iconic symbol of South Africa was recently voted one of the 'New 7 Wonders of the World'.

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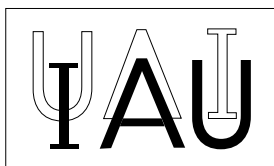
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COSMIC MASERS - FROM OH TO H₀

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JANUARY 29 - FEBRUARY 3, 2012

Edited by

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Preface

The fourth IAU Symposium on Astronomical *masers*, IAUS 287, entitled *Cosmic Masers-from OH to H₀* was held in South Africa from January 29 February 3. The venue was the excellent Wallenberg Conference Centre in the beautiful old town of Stellenbosch nestling in the foothills of one of the countrys foremost wine districts.

The meeting was opened by Dr. Bernie Fanaroff, Director of the South African SKA Project, who pointed out that human-kind had its origins in Africa and learned basic skills before migration and continental drift led to the population of the rest of the World.

Despite a strenuous programme with lively discussions, the participants found time to visit the Cape Town Water Front and take a boat trip to historical Robben Island, where the present political structure was formulated in the mid 90s. They also enjoyed an African evening at a local hospice, where they sampled truly African food, song and dance.

Interstellar hydroxyl *masers* were first reported in 1965, at the beginning of an avalanche of detections of interstellar molecules and the emergence of the science of Cosmo-chemistry. Many molecules are now found to exhibit polarized (circular and linear) stimulated emission in a variety of astrophysical environments and the hierarchy extends from the interstellar medium and regions of stellar formation through winds around evolved stars and even the compressed gas surrounding Supernova remnants. *masers* are also detected in other galaxies as analogues of Galactic *masers*, and in the dense molecular regions near AGN. Most recently, *masers* have been detected in Comets and other regions of the Solar System. In all cases they have proved to be important diagnostics of their associated regions, pinpointing dense gas, its motions and the local magnetic field structure in great detail.

This phenomenon has proved to be invaluable in astrometry and the details of Galactic structure and rotation have been refined through precise observation of *masers*. The same properties of *masers* have been used to great effect to measure the study of Galactic nuclei and because of the precise measurement of position and velocity, water *masers* have enabled the unambiguous determination of the Hubble Constant at small red-shifts.

Recent *maser* surveys, and measurements of the above phenomena were discussed at the Stellenbosch meeting along with new detections of known *masers* and detections of new *maser* species. Discussion extended from reviews of the theory of the phenomenon, *maser* properties such as variability and polarisation, to its use in astrometry and in cosmology.

More than 110 participants, including some 25 students (many securing IAU grants) attended the meeting. There were 68 oral contributions, including 8 by students and many posters, displayed all week and discussed in 3 separate poster sessions. In general the meeting followed its predecessor with 10 different scientific themes, each with a review talk, one or two invited talks and contributed talks.

Finally we thank our sponsors the South African SKA project and the Natural Science Research Council, NRF.

Roy Booth, Liz Humphreys & Wouter Vlemmings

THE ORGANIZING COMMITTEE

Scientific

A. Bartkiewicz (Poland)	M. Honma (Japan)
R.S. Booth (Chair, South Africa)	E.M.L. Humphreys (co-Chair, Germany)
V. Bujarrabal (Spain)	A.J. Kemball (USA)
J.M. Chapman (Australia)	K.-T. Kim (Taiwan)
M. Elitzur (USA)	H.J. van Langevelde (Netherlands)
S.P. Ellingsen (Australia)	J.M. Moran (USA)
Y. Gómez (Mexico)	W.H.T. Vlemmings (co-Chair, Sweden)
M.D. Gray (UK)	

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M.J. Gaylard	D.J. van der Walt
S. Goedhart (co-Chair)	P.A. Whitelock
R. Hames	

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Tribute to Yolanda Gómez Castellano

The proceedings of IAU Symposium 287 are dedicated to the memory of Yolanda Gómez Castellano. Yolanda died on 16 February 2012, shortly after the symposium, at the age of forty-nine. She had struggled with cancer for a number of years, and her illness took a sudden, and unexpected, turn for the worse just weeks before the meeting. She was a member of the Scientific Organizing Committee of the symposium, and had planned to attend the meeting, canceling her travel plans only days before her scheduled departure for South Africa. Despite the state of her health, Yolanda still had sufficient energy to fulfill her wish to participate in the conference by sending her contribution as a poster (*Imaging the water masers toward the H₂O-PN IRAS 18061-2505*) through Mexican colleagues.

Yolanda's professional career was based at the National Autonomous University of Mexico (UNAM). Her professional degrees (in physics) were all obtained from the UNAM, although her doctoral research (*A study in Radio Frequencies of Young Planetary Nebulae and OH/IR Stars*) was carried out at the Harvard-Smithsonian Center for Astrophysics. Upon her return to Mexico from Boston, she worked side-by-side with her husband, Luis Felipe Rodríguez, to establish a Mexican presence in the international radio astronomy community.

Yolanda worked for more than twenty years at the UNAM; she began her research career at the Institute for Astronomy at the Mexico City campus. Later, she was a founding member of the Center for Radio Astronomy and Astrophysics (CRyA) at the Morelia Campus of the UNAM, where she was a full professor.

Yolanda's primary research area was the study of gaseous nebulae, both young planetary nebulae associated with evolved stars and compact HII regions associated with young massive stars. She also did significant work on protoplanetary disks and jets associated with young stellar objects. Her research resulted in more than 65 published papers with numerous important contributions. Among her most notable discoveries was the first detection of water vapor around a planetary nebula. This was unexpected because the radiation field around these stars should destroy any nearby molecules. She was actively pursuing this fascinating line of research at the time of her death and in fact this was the topic of her contribution at the Symposium. In addition, Yolanda was a generous and cheerful teacher, always willing to help and guide her students. Her enthusiasm led many of her students to become astronomers: without exception her former masters and doctoral students have joined the research community, and are now independent researchers.

She was a firm believer that science is for everyone — not just for specialists but also for the general public. Consequently, Yolanda not only assumed an active role in the postgraduate astronomy program of the UNAM but she also taught undergraduate physics at the state university of Michoacán, in addition to giving courses in astronomy in several Latin American countries. Particularly notable was Yolanda's extensive involvement in public outreach. She gave innumerable talks, workshops, radio and television interviews and published more than 40 popular science articles. She had a key role in the International Year of Astronomy as celebrated in Mexico, organizing all of the events of the CRyA and serving as president of the state organizing committee. The 350 public outreach events that took place that year attracted more than 100,000 participants. The highlight was the *Noche de las Estrellas* at the prehispanic ruins in Tzintzuntzan, Michoacán, which an estimated 10,000 people attended. In addition, Yolanda contributed to the development of teaching materials for popularizing astronomy and the design of

astronomical displays and activities for science museums. Thanks to the warmth, enthusiasm and dedication with which Yolanda took astronomy to the public, the state government of Michoacán awarded her the 2008 State Prize for Public Outreach of Science and Technology.

Although perhaps little recognized by her professional colleagues, Yolanda was a avid lover of the arts. Not only did she come from a very musically-talented family, but she was also a devoted follower of the visual arts, decorating her home with outstanding works by national and regional Mexican artists. Moreover, she herself had a creative, artistic side: the logo of the CRyA — a radio telescope depicted in the style of Oriental calligraphy — was of her own design.

Those of us who knew Yolanda personally will miss her ready smile and the cheerfulness that accompanied her wherever she went. She will be greatly missed, by her former students, by her colleagues and friends in Morelia, in Mexico, and around the world, and most of all by her family, in particular by her children, Vicente and Cecilia, and her husband Luis Felipe, to whom we extend the warmest embrace.

Rest in Peace, Yolanda.

S. Kurtz & J.M. Torrelles

