Jeffrey Gary Mangum

CONTACT INFORMATION

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RESEARCH INTERESTS

- Molecular spectral line and continuum studies of galactic and extragalactic star formation
- Far-infrared/submillimeter continuum studies of young and forming stars
- Supernova remnants and their effects on the interstellar medium
- Cometary astrophysics
- Radio telescope design
- Radio astronomical calibration
- Education and public outreach

EDUCATION

University of Virginia, Charlottesville, VA USA

Ph.D., Astronomy, August 1990

- Dissertation Title: "The Throes of Star Formation: A Study of the Orion–KL and DR21(OH) Molecular Clouds"
- Advisors: Dr. H. A. Wootten (NRAO) and Dr. R. T. Rood (University of Virginia)
- Area of Study: Molecular spectroscopy of galactic star formation

M.A., Astronomy, January 1988

- Thesis Title: "Observations of the ^{13}C Isotopes of HC_3N: Implications for Carbon Isotope Studies in the Milky Way"
- Advisor: Dr. R. T. Rood (University of Virginia)
- Area of Study: Galactic carbon isotope studies

University of California at Berkeley, Berkeley, CA USA

B.A., Astronomy, May 1985

AWARDS

University of Virginia, Charlottesville, VA USA

- Dean's Reserve Fellowship, 1988–1999
- du Pont Fellowship, 1985–1986

Professional Experience

National Radio Astronomy Observatory, Charlottesville, VA USA

Scientist **June 2002 to present**

ALMA Calibration Group Lead **March 2003 to 2010**

- Lead for overall ALMA calibration system development.
- Responsible for the coordination, design, and development of all ALMA calibration systems and techniques.

ALMA Test Facility
Director **January 2000 to December 2004**

- Leader of the international Antenna Evaluation Group assigned the task of evaluating the ALMA prototype antennas. The ALMA Test Facility was located on the site of the Very Large Array in New Mexico, USA.
- As leader of the Antenna Evaluation Group, I was responsible for the evaluation task planning, organization, execution, and interpretation of evaluation results, which comprise the ALMA prototype antenna evaluation plan.
- I was also responsible for the design, installation, integration, and operation of the ALMA Test Facility.

Associate Scientist **December 1998 to June 2002**

Deputy Assistant Director
Tucson Operations **December 1996 to December 2001**

- In collaboration with the Assistant Director, responsible for general management of NRAO Tucson office.
- Duties included preparation of reports and presentations for NSF and NRAO oversight committees, personnel management, and computer system management as Division Head for Computing.

Assistant Scientist **December 1995 to December 1998**

Resident Scientist **December 1995 to July 2000**

- Resident Scientist for the NRAO 12 Meter Telescope.
- Responsible for system oversight and upgrades, software and hardware tests, and observer support.
- Duties include personnel management of a staff of 11 operators, maintenance personnel, and programmers.

Research Collaborator
(Adjunct Position) **March 1992 to December 1995**

- Appointment affiliated with the NRAO Tucson operation.
- Provided advice on the development of new equipment and observing techniques for the NRAO 12 Meter Telescope.

Junior Research Associate **September 1989 to September 1990**

- Graduate research position for Ph.D. candidates in their final two years of graduate study.
- My dissertation research during this period made extensive use of millimeter–wavelength single–antenna and interferometric observatories.

Summer Student Researcher **June 1987 to August 1987**

- Under the direction of Dr. H. A. Wootten, conducted a single–antenna and interferometric spectral line study of the Orion–KL star formation region.

University of Virginia, Charlottesville, VA USA

Visiting Scholar in the Department of Astronomy **May 2012 to present**

Research Professor of Astronomy **September 2005 to May 2012**

Teaching Assistant **September 1986 to June 1989**

- Full responsibility for the development and maintenance of astronomy laboratory exercise material for use in teaching undergraduate astronomy courses.
- Conducted night observing laboratory sessions, office hours, and substitute lectures for undergraduate astronomy courses.
- Served as Head Teaching Assistant (1987–1988), during which I developed a management system and handbook for astronomy department teaching assistant duties.

Research Assistant **September 1985 to September 1986**

- Worked under the direction of Dr. T. X. Thuan on the reduction and analysis of an HI survey of dwarf galaxies.

Submillimeter Telescope Observatory, Tucson, AZ USA

Staff Scientist **September 1992 to December 1995**

- Resident Scientist for the Submillimeter Telescope Observatory (SMTO).
- Responsible for development of the SMTO user support environment.
- In collaboration with the National Radio Astronomy Observatory, I was also involved in the design and implementation of the on-the-fly (OTF) observing technique for the NRAO 12 Meter Telescope and the SMTO.

University of Texas, Austin, TX USA

Postdoctoral Research Fellow **September 1990 to September 1992**

- Postdoctoral research position with the millimeter/submillimeter wave research group at the University of Texas.
- In collaboration with Dr. N. J. Evans and Dr. D. T. Jaffe, our primary research effort involved the study of star formation using molecular spectroscopy and infrared/submillimeter dust continuum measurements.

PUBLICATIONS Most recent refereed publications listed. Please see full publications list for complete bibliography.

- Henkel, C., Muehle, S., Bendo, G., Jozsa, G. I. G., Gong, Y., Viti, S., Aalto, S., Combes, F., Garcia-Burillo, S., Hunt, L. K., Mangum, J., Martin, S., Muller, S., Ott, J., van der Werf, P., Malawi, A. A., Ismail, H., Alkhuja, F., Asiri, H. M., Aladro, R., Alves, F., Ao, Y., Baan, W. A., Costagliola, F., Fuller, G., Greene, J., Impellizzeri, C. M. V., Kamali, F., Klessen, R. S., Mauersberger, R., Tang, X. D., Tristram, K., Wang, M., Zhang, J. S., 2018, Molecular line emission in NGC 4945 Imaged with ALMA, A&A, 615, A155
- Martini, P., Leroy, A. K., Mangum, J. G., Bolatto, A., Keating, K. M., Sandstrom, K., & Walter, F., 2018, HI Kinematics Along The Minor Axis of M82, ApJ, 856, A61
- Falstad, N., Aalto, S., Mangum, J. G., Bolatto, A., Keating, K. M., Sandstrom, K., & Walter, F., 2018, A Hidden Molecular Outflow in the LIRG Zw 049.057, A&A, 609, A75
- ALMA Partnership et al., 2015, An Overview of the ALMA Long Baseline Campaign, ApJL, 808, L1
- ALMA Partnership et al., 2015, ALMA Observations of Asteroid 3 Juno at 60 Kilometer Resolution, ApJL, 808, L2
- ALMA Partnership et al., 2015, First Results from High Angular Resolution ALMA Observations Toward the HL Tau Region, ApJL, 808, L3
- ALMA Partnership et al., 2015, ALMA Long Baseline Observations of the Strongly Lensed Submillimeter Galaxy HATLAS J090311.6+003906 at z=3.042, ApJL, 808, L4
- Mangum, J. G. & Shirley, Y. L. 2015, How to Calculate Molecular Column Density, PASP, 127, 949, pp. 266-298
- Mangum, J. G. & Wallace, P. T. 2015, Atmospheric Refractive Electromagnetic Wave Bending and Propagation Delay, PASP, 127, 947, pp. 74-91
- Mangum, J. G., Darling, J., Henkel, C., Menten, K. M., MacGregor, M., Svoboda, B. E., & Schinnerer, E. 2013, Ammonia Thermometry of Star-Forming Galaxies, ApJ, 779, A33
- Mangum, J. G., Darling, J., Henkel, C., & Menten, K. M. 2013, Formaldehyde Densitometry of Starburst Galaxies: Density-independent Global Star Formation, ApJ, 766, A108
- Ao, Y., Henkel, C., Menten, K. M., Requena-Tores, M. A., Stanke, T., Mauersberger, R., Aalto, S., Mühle, S., & Mangum, J., 2013, The thermal state of molecular clouds in the Galactic center: evidence for non-photon-driven heating, A&A, 550, A135

- Lebrón, M., Mangum, J. G., Mauersberger, R., Henkel, C., Peck, A. B., Menten, K. M., Tarchi, A., & Weiß, A. 2011, Dense Gas in Nearby Galaxies: XVII. The Distribution of Ammonia in NGC253, Maffei2, and IC342, A&A, 534, A56
- McCauley, P. I., Mangum, J. G., & Wootten, A. 2011, Formaldehyde Densitometry of Galactic Star-Forming Regions Using the H_2CO $3_{12} - 3_{13}$ and $4_{13} - 4_{14}$ Transitions, ApJ, 742, 58
- Shirley, Y. L., Mason, B. S., Mangum, J. G., Bolin, D. E., Devlin, M. J., Dicker, S. R., & Korngut, P. M. 2011, Mustang 3.3 mm Continuum Observations of Class 0 Protostars, AJ, 141, 39
- Mangum, J. G., Darling, J., Menten, K. M., and Henkel, C. 2008, Formaldehyde Densitometry of Starburst Galaxies, ApJ, 673, 832
- Greve, A. and Mangum, J. G. 2008, Mechanical Measurements of the ALMA Prototype Antennas, IEEE Antennas and Propagation Magazine, vol 50, no. 2
- Snel, R. C., Mangum, J. G., and Baars, J. W. M. 2007, Study of the Dynamics of Large Reflector Antennas with Accelerometers, IEEE Antennas and Propagation Magazine, vol. 49, no. 4, pp. 84-101
- Baars, J. W. M., Lucas, R., Mangum, J. G., and Lopez-Perez, J. A. 2007, Near-Field Radio Holography of Large Reflector Antennas, IEEE Antennas and Propagation Magazine, Vol. 49, No. 5
- Mangum, J. G., Emerson, D. T., and Greisen, E. W. 2007, The On The Fly Imaging Technique, A&A, 474, 679
- Mangum, J. G., Baars, J. W. M., Greve, A., Lucas, R., Snel, R. C., Wallace, P., and Holdaway, M. 2007, Evaluation of the ALMA Prototype Antennas, PASP, 118, 1257

Professional Activities

Editor-in-Chief, Publications of the Astronomical Society of the Pacific (PASP), January 2013 to present

- Editing and publication oversight for all articles published in PASP
- Includes regular interaction with publisher (IOP), Astronomical Society of the Pacific management, and Publications Committee

United States National Committee (USNC) International Union of Radio Science (URSI)

- Commission J Vice Chair, January 2015 to January 2018
- Commission J Chair, January 2018 to present

International Union of Radio Science (URSI)

- Individual Member, April 2018 to present

NRAO Community Support Programs Coordinator, National Radio Astronomy Observatory, October 2008 to March 2014

- Summer student research program coordination and management
- Graduate student support program management
- Cooperative education program management
- Student observing support program management
- Scientific and engineering visitor support program management

Research Experience for Undergraduates (REU) program coordinator, National Radio Astronomy Observatory, May 1996 to March 2014

- Tucson Coordinator (1996 – 2004)
- Charlottesville Coordinator (2004 – 2014)
- NRAO REU Program Coordinator (2006, 2008 – 2014)

Z-Machines Conference Organizer, National Radio Astronomy Observatory, 2007

- Organizing committee member.
- Proceedings editor for *From Z-Machines to ALMA: (Sub)Millimeter Spectroscopy of Galaxies*

Imaging at Radio through Submillimeter Wavelengths Conference Organizer, National Radio Astronomy Observatory, 1999

- Organizing committee chair.
- Proceedings editor for *Imaging at Radio through Submillimeter Wavelengths.*

ALMA prototype antenna evaluation plan developer, National Radio Astronomy Observatory, February 1998 to May 2004

- In collaboration with ALMA/US and ALMA/Europe engineers and scientists, coordinated the detailed planning and organization for the ALMA prototype antenna tests.

Academic Program for Excellence (APEX) secondary school lecturer, National Radio Astronomy Observatory, May 1996 to May 2004

- Member of the University of Arizona APEX speakers bureau.
- Duties involved giving presentations to middle and high school science classes in the Tucson and surrounding area on careers in science, with an emphasis on astronomy.

NRAO Tucson Webmaster, National Radio Astronomy Observatory, May 1996 to May 2004

- Develop and maintain the NRAO Tucson web site.

Education and Public Outreach (EPO) Coordinator, National Radio Astronomy Observatory, May 1996 to May 2004

- Develop and coordinate EPO activities at NRAO Tucson.
- These activities included conducting guided tours of the 12 Meter Telescope on Kitt Peak and operating and maintaining an "Ask the Astronomer" public outreach page on the NRAO Tucson and main NRAO web sites.

Atacama Large Millimeter Array (ALMA) group member, National Radio Astronomy Observatory, May 1996 to present

- Member of the imaging and calibration, antenna, and receiver working groups for the ALMA project.

IAU Symposium 170 proceedings editor and local organizing committee member, National Radio Astronomy Observatory, May 1995

Advisor for University of Arizona/NASA Space Grant Undergraduate Research Internship Program (SGURIP), University of Arizona, May 1995

- Future science teacher mentor program designed to introduce entering secondary school science teachers to research.

Technical Skills

Extensive hardware and software development experience in scientific computing, information technology, and high-precision antenna design and evaluation

Programming: Fortran, C, C++, Python, Perl, HTML, Javascript, UNIX shell scripting, SQL, RCS, CVS, and others

Applications: TEX, LATEX, Microsoft Office, and other common productivity packages for Windows, OS X, and Linux platforms

Analysis: Mathematica, IDL, AIPS, CASA, Miriad, Gildas suite

Operating Systems: Apple Mac OS X, Microsoft Windows, Linux, and other UNIX variants