

Curriculum Vitae

James M. Moran, Jr.

Home Address: 93 Anson Road
Concord, MA 01742

Date of Birth: January 3, 1943
Place of Birth: Plainfield, New Jersey
Marital Status: Married (Barbara Putney Smith–Moran)
Two children (Susan Harrison, 1976; Michael Putney, 1979)

Education: 1963 B.S., University of Notre Dame
1965 S.M., Massachusetts Institute of Technology
1968 Ph.D., Massachusetts Institute of Technology

Professional Experience

1964–1968 Research Assistant, Research Laboratory of Electronics, MIT
1968–1970 Staff Scientist, Group 31–Surveillance Techniques, Lincoln Laboratory, MIT
1970–1981 Radio Astronomer, Smithsonian Astrophysical Observatory (SAO)
1973–1979 Lecturer, Astronomy Department, Harvard University
1979–1989 Professor of the Practice of Astronomy, Harvard University
1981– Senior Radio Astronomer, Smithsonian Astrophysical Observatory
1982–1983 Visiting Research Scientist, Radio Astronomy Lab, University of CA at Berkeley
1987–1992 Associate Director, Radio and Geoastronomy Division,
Harvard–Smithsonian Center for Astrophysics
1989–2000 Professor of Astronomy, Harvard University
1995–2005 Director, SAO Submillimeter Array (SMA)
2001– Donald H. Menzel Professor of Astrophysics, Harvard University
2005– Concurrent Professor of Astronomy, Nanjing University
2006– Chair, Department of Astronomy, Harvard University

Awards

Rumford Prize (1971) (shared), American Academy of Arts and Sciences
Outstanding Publication Award (1975) (shared), Naval Research Laboratory
Outstanding Publication Award (1979) (shared), Naval Research Laboratory
Newton Lacy Pierce Prize (1978), American Astronomical Society
Senior Humboldt Award (1992), Alexander von Humboldt Stiftung
Jansky Lectureship (1996), National Radio Astronomy Observatory

External Committees

1973–1982 Committee on Operations and Proposals, Haystack Observatory, Northeast Radio Observatory Corporation (NEROC)

1976–1982, 1985–1987 National Radio Astronomy Observatory (NRAO) Users Committee

1976–1992 Network Users Group for the organization of Very Long Baseline Interferometry, Scheduler (1976–1977), Chair (1977–1981)

- 1978–1980 National Advisory Committee, Owens Valley Radio Observatory, California Institute of Technology
- 1978–1981 Committee, NRAO, Green Bank, West Virginia, Chair (1981)
- 1978–1986 Haystack Scientific Advisory Committee, Haystack Observatory, NEROC
- 1981–1989 U.S. VLBI Consortium, Executive Officer (1981—1983), Secretary (1983–1986), Vice Chair (1986–1989)
- 1982–1984 Arecibo Scientific Advisory Committee
- 1982–1987 Scientific Advisory Committee to NRAO for the Very Long Baseline Array (VLBA)
- 1982–1989 QUASAT Science Working Group
- 1982 – NEROC, Board of Trustees
- 1984–1987 NAS, Committee on Radio Frequencies
- 1986–1987 Scientific Organizing Committee, IAU Symposium 129, “The Impact of VLBI on Astrophysics and Geophysics,” Chair
- 1987–1989 FCRAO Proposal Review Committee
- 1988 NRAO Long Range Planning Committee
- 1988–1990 International Union of Radio–Science (URSI), Commission J (US), Vice Chair
- 1988–1994 Scientific Organizing Committee, International Astronomical Union (IAU) Commission 40
- 1989–1991 Radio Astronomy Panel of the Astronomy and Astrophysics Survey Committee, National Research Council, (John Bahcall, Chair)
- 1990–1996 Scientific Working Group for the Green Bank Telescope
- 1989–1991 Radio Astronomy Panel of the Astronomy and Astrophysics Survey Committee, National Research Council, (John Bahcall, Chair)
- 1991–1993 URSI, Commission J (US), Chair
- 1994–1997 Vice–President, IAU Commission 40 (Radio Astronomy)
- 1995–1997 Visiting Committee, National Astronomy and Ionospheric Center (Arecibo), (Chair, 1997)
- 1995 – 2004 Scientific Advisory Board (Fachbeirat), Max Planck Institute for Radio Astronomy (Chair 2001)
- 1997 – 2000 President, IAU Division X and Commission 40 (Radio Astronomy)
- 1998–2000 Astronomy & Astrophysics Survey Committee, NAS (also Radio Panel, Vice Chair)
- 2000– M.I.T. Barrett Prize Committee
- 2000–2003;
2006 – IAU/U.S. National Committee
- 2001–2004 Council Delegate, Astronomy Section, American Association for the Advancement of Science
- 2002 Visiting Committee, University of Maryland, Astronomy Department

- 2004–2009 NRC Committee on Radio Frequencies
- 2005 MacArthur Fellowship Program, Nominator
- 2005 NRL, Advisory Panel for Large Array HF/VHF Imaging Program
- 2005–2006 The International SKA Site Selection Advisory Committee (ISSAC)
- 2005 – Board of Trustees, Associated Universities, Inc. (AUI)
- 2007 Haystack Observatory Futures Committee
- 2007–2009 NAS Committee on a Survey of the Scientific Use of the Radio Spectrum

Professional Societies

- National Academy of Sciences (1998)
- American Astronomical Society
- American Association for the Advancement of Science (Fellow, 1982)
- International Astronomical Union (President of Division X and Commission 40, 1997 – 2000)
- Institute of Electrical and Electronic Engineers (Senior Member, 1983, Fellow, 2002)
- International Union of Radio Sciences

General Fields of Interest

- Radio Astronomy (Star Formation, Masers, Interstellar Medium, Active Galactic Nuclei);
Signal Processing; Interferometry

Teaching Experience (Harvard University)

- 1973/F Astronomy 160 (Radio Astronomy)
- 1975/F Astronomy 218 (Radio Astronomy)
- 1977/F Astronomy 218 (Radio Astronomy)
- 1979/F Astronomy 218 (Radio Astronomy)
- 1981/F Astronomy 150 (Radiation Processes in Astrophysics)
- 1983/F Astronomy 150 (Radiation Processes in Astrophysics)
- 1984/F Astronomy 150 (Radiation Processes in Astrophysics)
- 1986/S Astronomy 218 (Radio Astronomy) (with Mark Reid)
- 1987/S Astronomy 193 (Noise and Data Analysis in Astrophysics)
- 1988/S Astronomy 218 (Radio Astronomy)
- 1989/S Astronomy 193 (Noise and Data Analysis in Astrophysics)
- 1990/S Astronomy 218 (Radio Astronomy)
- 1990/F Astronomy 193 (Noise and Data Analysis in Astrophysics)
- 1992/S Astronomy 218 (Radio Astronomy)
- 1992/F Astronomy 193 (Noise and Data Analysis in Astrophysics)
- 1994/S Astronomy 218 (Radio Astronomy)
- 1994/F Astronomy 193 (Noise and Data Analysis in Astrophysics)
- 1995/F Astronomy 193 (Noise and Data Analysis in Astrophysics)
- 1996/S Astronomy 218 (Radio Astronomy)
- 1998/S Astronomy 218 (Radio Astronomy)
- 1999/S Astronomy 1 (The Astronomical Universe) (with Simon Steel)
- 2000/S Astronomy 218 (Radio Astronomy) (with Alyssa Goodman)
- 2000/F Astronomy 193 (Noise and Data Analysis in Astrophysics)
- 2001/F Astronomy 218 (Radio Astronomy)
- 2002/F Astronomy 193 (Noise and Data Analysis in Astrophysics)

- 2004/S Astronomy 218 (Radio Astronomy)
 2005/S Astronomy 193 (Noise and Data Analysis in Astrophysics)
 2005/F Astronomy 218 (Radio Astronomy)
 2007/S Astronomy 193 (Noise and Data Analysis in Astrophysics)
 2007/F Astronomy 218 (Radio Astronomy)
 1973– Frequent contributor to sophomore, junior, and senior tutorial program;
 Department of Astronomy

Bibliography for James M. Moran, Jr.

Thesis and Reports

- Moran, J.M., 1965. "Observations of the Moon Near One Centimeter Wavelength" S.M. Thesis, Massachusetts Institute of Technology, Cambridge, Massachusetts.
- Moran, J.M. 1968. "Interferometer Observations of Galactic OH Emission," Ph.D. Thesis, Massachusetts Institute of Technology, Cambridge, Massachusetts.
- Moran, J.M. 1969. "Calibration of the Millstone Antenna's Pointing," Lincoln Laboratory Technical Memorandum No. 31L-0048.
- Moran, J.M. 1969. "Program to Solve a Magnetic Geometry Problem for Auroral Backscatter," Lincoln Laboratory Technical Memorandum No. 31L-0047.
- Rogers, A.E.E., and Moran, J.M., 1970. "Very Long Baseline Interferometry as a Means of Worldwide Time Synchronization," Lincoln Laboratory Technical Report 478.
- Moran, J.M., and Penfield, H., 1976. "Test and Evaluation of Water Vapor Radiometers and Determination of Their Capability to Measure Tropospheric Path Length," NASA Contract Report NAS5-20975.
- Moran, J.M. 1980. "Notes on Using the VLA for VLBI," VLA Test Memorandum 128, National Radio Astronomy Observatory, Socorro, New Mexico.
- Moran, J.M., 1981. "Program Summary of the U.S. VLBI Network," 1976-1981.
- Moran, J.M. 1982. "Phased Arrays as VLBA Elements," VLB Array Memo 178.
- Moran, J.M. 1983. "Phased Arrays as VLBA Elements," NRAO VLBA memo 178.
- Moran, J.M., Elvis, M.S., Fazio, G.G., Ho, P.T.P., Myers, P.C., Reid, M.J., and Willner, S.P. 1984. "A Submillimeter-Wavelength Telescope Array: Scientific, Technical, and Strategic Issues," SAO Report.
- Division X, Radio Astronomy, Triennial Summary (1996 - 1999), in Reports on Astronomy, eds. J. Anderson (ASP, San Francisco), Vol. XX1VA, pp. 347-356.

Books

- Thompson, A.R., Moran, J.M., and Swenson, G.W., *Interferometry and Synthesis in Radio Astronomy* (Wiley — Interscience, New York), 1986, 528 pages. Russian edition, 1989. Reprinted by Krieger (Melbourne, FL) 1992. [244]
- Thompson, A.R., Moran, J.M., and Swenson, G.W., *Interferometry and Synthesis in Radio Astronomy* (Wiley — Interscience, New York), 2001, Second Edition, 692 pages. [86]

Book Chapters

- Moran, J.M., “Very Long Baseline Interferometer Systems,” in *Methods of Experimental Physics*, **12**, Part C, eds. M.L. Meeks (Academic Press, New York), 174-197 (1976).
- Moran, J.M., “Very Long Baseline Interferometric Observations and Data Reduction,” in *Methods of Experimental Physics*, **12**, Part C, ed. M.L. Meeks (NY: Academic Press), 228–260 (1976).[30]
- Moran, J.M., “Radio Observations of Galactic Masers,” in *Frontiers of Astrophysics*, ed. E.H. Avrett (Cambridge, MA: Harvard University Press), 385-437 (1976).
- Reid, M.J., and Moran, J.M., “Masers,” *Annual Review of Astronomy and Astrophysics*, **19**, 231-276 (1981). [226]
- Moran, J.M., “Maser Action in Nature,” in *CRC Handbook on Laser Science and Technology*, **1**, Lasers and Masers, ed. M.J. Weber (CRC Press, Boca Raton), 483-506 (1982).
- Reid, M.J., and Moran, J.M., “Astronomical Masers,” in *Galactic and Extra Galactic Radio Astronomy*, 2nd edition, eds. K. Kellermann and G. Verschuur (Springer-Verlag, Berlin), 255-293 (1988). [59]
- Moran, J.M., “Masers in the Envelopes of Young and Old Stars,” in *Molecular Astrophysics*, eds. T. Hartquist (Cambridge, U.K.: Cambridge University Press), 397-423 (1990).
- Moran, J.M., “Progress in the Study of Maser Action in Nature,” in *CRC Handbook on Laser Science and Technology*, eds. M.J. Weber (CRC Press, Boca Raton) 579-588 (1990).
- Moran, J.M., and Dhawan, V., “An Introduction to Calibration Techniques for VLBI,” eds. A. Zensus, P. Diamond, and P. Napier (SF: ASP), 1995, ASP Conference Series, **82**, 161-188 (1995).
- Kellermann, K.I. and Moran, J.M., “The Development of High Resolution Imaging in Radio Astronomy,” *Annual Reviews of Astronomy and Astrophysics* **39**, 457–510 (2001).

Books Edited

- Reid, M.J., and Moran, J.M., *The Impact of VLBI on Astrophysics and Geophysics*, Proceedings of IAU Symposium 129 (D. Reidel, Dordrecht), 1988, 599 pages.
- Moran, J.M., and Ho, P.T.P., *Interstellar Matter*, Proceedings of a Symposium on Interstellar Molecules and Grains in Honor of Alan H. Barrett (NY: Gordon and Breach), 1988, 418 pages.
- Moran, J.M., Hewitt, J.N., and Lo, K.-Y., *Gravitational Lenses* (Springer-Verlag, Berlin), 1989, 238 pages.
- Backer, D.C., Moran, J.M., and Turner, J.L., *Revealing the Molecular Universe: One Antenna is Never Enough*, ASP Conference Series, 356, Proceedings of the ASP Conference held 9-10 Sept., 2005, at University of California, Berkeley (SF: ASP), 2006, 314 pages.

Popular Articles

- Moran, J.M., “Interstellar Hydroxyl Clouds,” *Science Journal*, **5A**, 60 (1969).
- Moran, J.M., “Black Holes”, in McGraw–Hill Yearbook of Science and Technology, eds. S.P. Parker (NY: McGraw–Hill), 51–54 (1996).
- Myers, P.C., Moran, J.M., and Ho, P.T.P., “Alan H. Barrett–Obituary,” *Physics Today*, June 1992.
- Moran, James M., “Nanjing’s Historic Refractor,” *Sky & Telescope*, **105:2**, 86, Feb. 2003.

Moran, James, “The Submillimeter Array,” *The Magellanic Times*, Day Seven, IAU General Assembly XXV (2003).

Kondratko, Paul T., Greenhill, Lincoln J., and Moran, James M., “Thick, Flared, Disorganized, and Clumpy Accretion Disk in NGC 3079,” *NRAO Newsletter*, **97**, Oct. 2003.

Moran, J.M., Kirby, K., Chance, K., Brown, J., “Harrison Radford–Obituary,” *Bull. A.A.S.*, **35**, 1470-72 (2003).

Articles in Refereed Journals

1966

- 1 Rogers, A.E.E., Moran, J.M., Crowther, P.P., Burke, B.F., Ball, J.A., Meeks, M.L., and Hyde, G.M., “Interferometric Study of Cosmic Line Emission at OH Frequencies,” *Phys. Rev. Letters*, **17**, 450-451 (1966). [17]¹

1967

- 2 Rogers, A.E.E., Moran, J.M., Crowther, P.P., Burke, B.F., Meeks, M.L., Ball, J.A., and Hyde, G.M., “The Positions and Angular Extent of OH Emission Associated with the H II Regions in W3, W24, W49, and NGC6334,” *ApJ*, **147**, 369-377 (1967). [22]
- 3 Moran, J.M., Barrett, A.H., Rogers, A.E.E., Burke, B.F., Zuckerman, B., Penfield, H., and Meeks, M.L., “Observations of OH Emission in the H II Region W3 with a 74400 Wavelength Interferometer,” *ApJL*, **148**, L69-L72 (1967). [9]
- 4 Moran, J.M., Crowther, P.P., Burke, B.F., Barrett, A.H., Rogers, A.E.E., Ball, J.A., Carter, J.C., and Bare, C., “Spectral Line Interferometry with Independent Time Standards at Stations Separated by 845 Kilometers,” *Science*, **157**, 676–677 (1967). [14]

1968

- 5 Moran, J.M., Burke, B.F., Barrett, A.H., Rogers, A.E.E., Carter, J.C., Ball, J.A., and Cudaback, D.D., “The 18 cm Flux of the Unresolved Component of 3C273,” *ApJL*, **151**, L99-L101 (1968). [4]
- 6 Moran, J.M., Burke, B.F., Barrett, A.H., Rogers, A.E.E., Carter, J.C., Ball, J.A., Cudaback, D.D., “The Structure of the OH Source in W3,” *ApJL*, **152**, L97-L101 (1968). [67]

1970

- 7 Wilson, W.J., Barrett, A.H., and Moran, J.M., “OH Radio Emission Associated with Infrared Stars,” *ApJ*, **160**, 545–571 (1970). [100]
- 8 Burke, B.F., Papa, D.C., Papadopoulos, G.D., Schwartz, P.R., Knowles, S.H., Sullivan, W.T., Meeks, M.L., and Moran, J.M., “Studies of H₂O Sources by Means of a Very-Long–Baseline Interferometer,” *ApJL*, **160**, L63-L68 (1970). [26]
- 9 Hagfors, T. and Moran, J.M., “Detection and Estimation Practices in Radio and Radar Astronomy,” *Proc. of I.E.E.E.*, **58**:5, 743–759 (1970).
- 10 Rönnäng, B.O., Rydbeck, O.E.H., and Moran, J.M., “Very Long Baseline Interferometry of Galactic OH Sources,” *Radio Science*, **5**, 1227–1231 (1970).

¹ Bracketed numbers indicate the number of citations to the work in the ADS survey of astronomy journals.

1971

- 11 Johnston, K.J., Knowles, S.H., Sullivan, W.T., Moran, J.M., Burke, B.F., Lo, K.Y., Papa, D.C., Papadopoulos, G.D., Knight, C.A., Shapiro, I.I., and Welch, W.J., “An Interferometer Map of the Water Vapor Sources in W49,” *ApJL*, **166**, L21-L26 (1971). [22]
- 12 Evenson, K.M., Radford, H.E., and Moran, J.M., “CH Free Radicals Detected by Infrared Laser Magnetic Resonance,” *Applied Phys. Letters*, **18**, 426-429 (1971).

1972

- 13 Hinteregger, H.F., Shapiro, I.I., Robertson, D.S., Knight, C.A., Ergas, R.A., Whitney, A.R., Rogers, A.E.E., Moran, J.M., Clark, T.A., and Burke, B.F., “Precision Geodesy via Radio Interferometry,” *Science*, **178**, 396-398 (1972). [8]
- 14 Burke, B.F., Johnston, K.J., Efanov, V.A., Clark, B.G., Kogan, L.R., Kostenko, V.I., Lo, K.Y., Matveyenko, L.I., Moiseev, I.G., Moran, J.M., Knowles, S.H., Papa, D.C., Papadopoulos, G.D., Rogers, A.E.E., and Schwartz, P.R., “Observations of Maser Radio Sources with an Angular Resolution of 0".0002,” *Soviet Astronomy* **16**, 379-382 (1972). [14]

1973

- 15 Knowles, S.H., Johnston, K.J., Moran, J.M., and Ball, J.A., “Interferometric Observations of the $^2\Pi_{3/2}$ $J = 5/2$ State of Interstellar OH,” *ApJL*, **180**, L117-L121 (1973). [13]
- 16 Moran, J.M., “Spectral-Line Analysis of Very Long Baseline Interferometric Data,” *Proc. of I.E.E.E.*, **61:9**, 1236–1242 (1973).
- 17 Moran, J.M., Papadopoulos, G.D., Burke, B.F., Lo, K.Y., Schwartz, P.R., Thacker, D.L., Johnston, K.J., Knowles, S.H., Reisz, A.C., and Shapiro, I.I., “Very Long Baseline Interferometric Observations of the H₂O Sources in W49N, W3(OH), Orion A, and VY Canis Majoris,” *ApJ*, **185**, 535–567 (1973). [79]
- 18 Reisz, A.C., Shapiro, I.I., Moran, J.M., Papadopoulos, G.D., Burke, B.F., Lo, K.Y., and Schwartz, P.R., “W3(OH): Accurate Relative Positions of Water Vapor Emission Features,” *ApJ*, **186**, 537–544 (1973). [3]

1974

- 19 Knowles, S.H., Johnston, K.J., Moran, J.M., Burke, B.F., Lo, K.Y., and Papadopoulos, G.D., “Further Interferometer Observations of the Water Vapor Sources in W49,” *Astron. J.*, **79**, 925–932 (1974). [25]

1975

- 20 Mader, G.L., Johnston, K.J., Moran, J.M., Knowles, S.H., Mango, S.A., Schwartz, P.R., and Waltman, W.B., “The Relative Positions of the OH and H₂O Masers in W49N and W3(OH),” *ApJL*, **200**, L111-L114 (1975). [23]
- 21 Lo, K.Y., Walker, R.C., Burke, B.F., Moran, J.M., Johnston, K.J., and Ewing, M.S., “Evidence for Zeeman Splitting in 1720 MHz OH Line Emission,” *ApJ*, **202**, 650–654 (1975). [50]

1976

- 22 Walker, R.C., Lo, K.Y., Burke, B.F., Johnston, K.J., and Moran, J.M., “6 Centimeter Observations of Radio Galaxies Over a 228 Kilometer Baseline,” *ApJ*, **208**, 296–297 (1976). [5]
- 23 Lo, K.Y., Morris, M., Moran, J.M., and Haschick, A.H., “The Unusual H₂O Maser Source Near Herbig–Harro Object 11,” *ApJL*, **204**, L21-L24 (1976). [27]

- 24 Barrett, A.H., Bologna, J.M., Cheung, A.C., Chui, M.F., Ho, P.T.P., Johnston, K.J., Martin, R.N., Matsakis, D., Moran, J.M., and Schwartz, P.R., “A Lower Limit to the Angular Size of the Methanol Source in Orion,” *ApJL*, **18**, 13–14 (1976). [4]

1977

- 25 Johnston, K.J., Knowles, S.H., Moran, J.M., Burke, B.F., Lo, K.Y., Papadopoulos, G.D., Read, R.B., and Hardebeck, E.G., “Observations of H₂O Masers with a Resolution of 0.0008 Arcsec,” *Astron. J.*, **82**, 403-407 (1977). [13]
- 26 Moran, J.M., Ball, J.A., Yen, J.L., Schwartz, P.R., Johnston, K.J., and Knowles, S.H., “Very Long Baseline Interferometric Observations of OH Masers Associated with Infrared Stars,” *ApJ*, **211**, 160–169 (1977). [30]
- 27 Reid, M.J., Muhleman, D.O., Moran, J.M., Johnston, K.J., and Schwartz, P.R., “The Structure of the Stellar Hydroxyl Masers,” *ApJ*, **214**, 60–77 (1977). [127]
- 28 Moran, J.M., Johnston, K.J., Spencer, J.H., and Schwartz, P.R., “Observations of the SiO and H₂O Masers in Orion A,” *ApJ*, **217**, 434-441 (1977). [20]
- 29 Hansen, S.S., Moran, J.M., Reid, M.J., Johnston, K.J., Spencer, J.H., and Walker, R.C., “The Hydroxyl Masers in the Orion Nebula,” *ApJL*, **218**, L65-L69 (1977). [22]

1978

- 30 Rosen, B.R., Moran, J.M., Reid, M.J., Walker, R.C., Burke, B.F., Johnston, K.J., and Spencer, J.H., “Observations of OH and H₂O Microwave Maser Emission from VY Canis Majoris,” *ApJ*, **222**, 132–139 (1978). [38]
- 31 Genzel, R., Downes, D., Moran, J.M., Johnston, K.J., Spencer, J.H., Walker, R.C., Haschick, A., Matveyenko, L.I., Kogan, L.R., Kostenko, V.I., Rönnäng, B., Rydbeck, O.E.H., and Moiseev, I.G., “Structure and Kinematics of H₂O Sources in Clusters of Newly Formed OB Stars,” *Astron. and Astrophys.*, **66**, 13–29 (1978). [111]
- 32 Moran, J.M., Reid, M.J., Lada, C.J., Johnston, K.J., Spencer, J.H., and Yen, J.L., “Evidence for the Zeeman Effect in the OH Emission from W3(OH),” *ApJL*, **224**, L67-L71 (1978). [96]
- 33 Rodriguez, L.F., Moran, J.M., Dickinson, D.F., and Gyulbudaghian, A.L., “Five New H₂O Masers Near Herbig–Haro Objects,” *ApJ*, **226**, 115–118 (1978). [55]
- 34 Walker, R.C., Burke, B.F., Haschick, A.D., Crane, P.C., Moran, J.M., Johnston, K.J., Lo, K.Y., Yen, J.L., Broten, N.W., Legg, T.H., Greisen, E.W., and Hansen, S.S., “VLBI Aperture Synthesis Observations of H₂O Masers Associated with Molecular Clouds,” *ApJ*, **226**, 95–114 (1978).[31]
- 35 Matveenko, L.I., Kogan, L.R., Moiseev, I.G., Efanov, V.A., Moran, J.M., and Burke, B.F., “The Crimea–Haystack Radio Interferometer,” *Soviet Astron. Lett.*, **4**, 26–28 (1978).
- 36 Matveenko, L.I.; Kostenko, V.I.; Kogan, L.R.; Moran, J.M.; Burke, B.F.; and Moiseev, I.G., “Observations of the W51 H₂O Source with the Crimea–Haystack Radio Interferometer,” *Soviet Astron. Lett.*, **4**, 29-32 (1978).
- 37 Mader, G.L., Johnston, K.J., and Moran, J.M., “The Spatial Distribution of the OH and H₂O Masers Associated with W3(OH), W49N, and W51,” *ApJ*, **224**, 115–124 (1978). [28]

1979

- 38 Reid, M.J., Moran, J.M., Leach, R.W., Ball, J.A., Johnston, K.J., Spencer, J.H., and Swenson, G.W., “Stellar OH Masers and Magnetic Fields: VLBI Observations of U Orionis and IRC+10420,” *ApJL*, **227**, L89-L92 (1979). [55]

- 39 Elmegreen, B.G., and Moran, J.M., “Observations of the Shock in a Region of Shock–Induced Star Formation: NGC 281,” *ApJL*, **227**, L93-L96 (1979). [19]
- 40 Spencer J.H., Johnston, K.J., Moran, J.M., Reid, M.J., and Walker, R.C., “The Structure of H₂O Masers Associated with Late–Type Stars,” *ApJ*, **230**, 449-455 (1979). [45]
- 41 Moran, J.M., Ball, J.A., Predmore, C.R., Lane, A.P., Huguenin, G.R., Reid, M.J., and Hansen, S.S., “VLBI Observations of SiO Masers at a Wavelength of 7 millimeters,” *ApJL*, **231**, L67-L71 (1979). [63]
- 42 Genzel, R., Downes, D., Moran, J.M., Johnston, K.J., Spencer, J.H., Matveyenko, L.I., Kogan, L.R., Kostenko, V.I., Rönnäng, B., Haschick, A.D., Reid, M.J., Walker, R.C., Giuffrida, T.S., Burke, B.F., and Moiseev, I.G., “H₂O in W51 Main: An Expanding Bubble Around a Young Massive Star?” *Astron. and Astrophys.*, **78**, 239–247 (1979). [27]
- 43 Downes, D., Genzel, R., Moran, J.M., Johnston, K.J., Matveyenko, L.I., Kogan, L.R., Kostenko, V.I., and Rönnäng, B., “New VLBI Maps of H₂O Sources in Different Stages of Evolution,” *Astron. and Astrophys.*, **79**, 233–242 (1979). [40]
- 44 Genzel, R., Moran, J.M., Lane, A.P., Predmore, C.R., Ho, P.T.P., Hansen, S.S., and Reid, M.J., “VLBI Observations of the SiO Maser in Orion,” *ApJL*, **231**, L73-L76 (1979). [36]

1980

- 45 Rodriguez, L.F., Moran, J.M., Ho, P.T.P., and Gottlieb, E.W., “Radio Observations of Water Vapor, Hydroxyl, Silicon Monoxide, Ammonia, Carbon Monoxide, and Compact H II Regions in the Vicinities of Herbig–Haro Objects,” *ApJ*, **235**, 845–865 (1980). [218]
- 46 Moran, J.M., and Rodriguez, L.F., “Water Vapor Masers and Star Formation in NGC 6334,” *ApJL*, **236**, L159-L163 (1980). [57]
- 47 Haschick, A.D., Moran, J.M., Rodriguez, L.F., Burke, B.F., Greenfield, P., and Garcia–Barreto, J.A., “Observations of a Compact H II Region and Water Vapor Maser Sources in the Vicinity of the Herbig–Haro Objects 7–11,” *ApJ*, **237**, 26-37 (1980). [73]
- 48 Reid, M.J., Haschick, A.D., Burke, B.F., Moran, J.M., Johnston, K.J., and Swenson, G.W., “The Structure of Interstellar Hydroxyl Masers: VLBI Synthesis Observations of W3(OH),” *ApJ*, **239**, 89–111 (1980). [194]
- 49 Rodriguez, L.F., Ho, P.T.P., and Moran, J.M., “Anisotropic Mass Outflow in Cepheus A,” *ApJL*, **240**, L149-L152 (1980). [142]
- 50 Bowers, P.F., Reid, M.J., Johnston, K.J., Spencer, J.H., and Moran, J.M., “The Structure of OH Masers Around Late–Type Stars,” *ApJ*, **242**, 1088–1011 (1980). [43]
- 51 Elmegreen, B.G., Genzel, R., Moran, J.M., Reid, M.J., and Walker, R.C., “VLBI Observations of the H₂O Masers in Sagittarius B2,” *ApJ*, **241**, 1007–1013 (1980). [23]

1981

- 52 Haschick, A.D., Moran, J.M., Reid, M.J., Davis, M., and Lilley, A.E., “VLBI Observations of the Double Quasar 0957+561,” *ApJL*, **243**, L57-L59 (1981). [5]
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