

Curriculum Vitae

Dr. Crystal L. Brogan

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Current Positions

- 2006-present Associate Astronomer (tenure-track) National Radio Astronomy Observatory / North American ALMA Science Center (NAASC)
- Group Lead for User Support at the NRAO North American ALMA Science Center
 - ALMA CASA subsystem scientist
- 2006-present Adjunct Faculty, University of Virginia Astronomy Department

Previous Employment

- 2003-2006 James Clerk Maxwell Telescope Fellow, Institute for Astronomy, University of Hawaii
- 2000-2003 Jansky Postdoctoral Fellow, National Radio Astronomy Observatory, Socorro
- 1996-2000 Research Assistant, Department of Physics & Astronomy, University of Kentucky
- 1999 National Radio Astronomy Observatory Graduate Summer Student (Socorro)
- 1993-1996 Teaching Assistant, Department of Physics & Astronomy, University of Kentucky

Education

- 1993-2000 Ph. D. University of Kentucky Department of Physics and Astronomy (July, 2000)
“*Observational Study of the Role of Magnetic Fields in Star Formation*”, Supervisor: Dr. Thomas H. Troland
- 1989-1993 B.S. James Madison University, Harrisonburg, VA (Major: Physics)

Professional Experience

- 2010 NASA Origins Grant Proposal Review Committee
- 2010 NRAO/NAASC Scientific Staff Selection Committee
- 2009-2010 Astro2010 Program Prioritization Panel for Radio, Millimeter, and Submillimeter Astronomy
- 2009 Chair NRAO/NAASC post-doctoral fellowship selection committee
- 2009 Chair NRAO/NAASC Scientific programmer selection committee
- 2009 NASA post-doctoral selection committee
- 2009 CONICYT ALMA Fund for Development of Chilean Astronomy selection committee
- 2008 Cycle-5 Spitzer Proposal Review Committee
- 2008 University of Virginia Astronomy Department Graduate Student Selection Committee
- 2008 Reviewer for the National Science Foundation - AST Radio Spectrum Management
- 2008 Reviewer for the Natural Sciences and Engineering Research Council of Canada
- 2007-2008 Jansky Prize Lecture Selection Committee
- 2006-present NRAO Strategic Planning Council
- 2005-2007 ALMA North American Science Advisory Committee
- 2003-2006 VLA/VLBA Proposal Referee
- 2001-present ApJ, AJ, A&A, and MNRAS referee

Professional Organizations

- 2004-present Member International Union of Radio Science
- 1998-present Member of the American Astronomical Society

Student and Post-doc Mentoring

- 2009-present Co-advisor of Ph.D. thesis of Bill Dirienzo (University of Virginia)
- 2009-present Supervisor NAASC Post-doctoral fellow Rachel Friesen (NRAO)
- 2009-present Ph.D. thesis committee of Amy Reines (University of Virginia)

2007 REU summer student Mary Wilkins (James Madison University)
 2006-2010 Co-advisor of Ph.D. thesis of Claudia Cyganowski (University of Wisconsin)
 2001-2004 Ph.D. thesis committee of Ian Hoffman (University of New Mexico)
 2002 Coordinator of NRAO, Socorro REU/Graduate Summer Student Program
 2002 REU summer student Katheryn Devine (University of Wisconsin)

Grants, Awards, & Fellowships

2008 Spitzer Cycle 5 Observing Grant "Direct Physical Diagnostics of Triggered Star Formation" - \$76,320
 2008 James Madison University Physics Department Alumni of the Year
 1996-2000 NASA/EPSCoR Research Fellowship from the Kentucky Space Grant Consortium
 1999 University of Kentucky Dissertation Enhancement Award

Successful Telescope Proposals

Interferometers: VLA, EVLA, VLBA, ATCA, GMRT, SMA, CARMA
 Single Dish: JCMT, CSO, GBT, Mopra
 Space: *Chandra, XMM, Spitzer*

Recent Scientific Meeting Organization

2010 LOC "*Building on New Worlds, New Horizons: New Science from Millimeter to Meter Wavelengths*", March 7-10, 2011, Santa Fe, New Mexico
 2009 SOC "*From Data Cubes to Science: Ancillary Data and Advanced Tools for ALMA*", Oct 5-7, 2009, Cologne, Germany
 2008 SOC and LOC "*Transformational Science with ALMA: The Birth and Feedback of Massive Stars Within and Beyond the Galaxy*", September, 25-27, 2008, Charlottesville, VA

Recent Invited Talks and Colloquia

1. "A Diagnostic EVLA Survey of Massive Young Stellar Objects" EVLA Special Session, AAS, Seattle, WA, Jan. 11, 2011
2. "ALMA: Early Science is Almost Here!" NRAO Townhall, AAS, Seattle, WA, Jan. 10, 2011
3. "Observations of Massive Star Formation in the Era of ALMA and EVLA", Great Barriers in Massive Star Formation, Townsville, Australia, Sept. 17, 2010
4. "Observational Constraints on Massive Protoclusters", From Planets to Galaxies, Gainesville, FL, April 8, 2010
5. "Searching for the Secrets of Massive Star Birth", Boston University, Boston, February 16, 2010
6. "Searching for the Secrets of Massive Star Birth", University of Arizona, Tucson, October, 1, 2009
7. "ALMA Update and Early Science Observing" Early ALMA Workshop on Disks and the Epoch of Planet Formation, Boston July 20-21 2009
8. "Searching for the Secrets of Massive Star Birth", University of California, Berkeley, March 19, 2009
9. "Cosmic Cradle of Life: Searching for the Secrets of Massive Star Birth", American Association for the Advancement of Science in special session, February, 13, 2009

Publications in Refereed Journals

1. "An Actively Accreting Massive Black Hole in the Dwarf Starburst Galaxy Henize 2-10", A. Reines, G. Sivakoff, K. Johnson, **C. Brogan**, 2011, Nature, in press
2. "Bipolar Molecular Outflows and Hot Cores in GLIMPSE Extended Green Objects (EGOs)", C. Cyganowski, **C. Brogan**, T. Hunter, E. Churchwell, Q. Zhang, 2011, ApJ, in press arXiv:1012.0851
3. "Identification of a Population of X-ray Emitting Massive Stars in the Galactic Plane" G. Anderson, B. Gaensler, D. Kaplan, B. Posselt, P. Slane, S. Murray, J. Mauerhan, R. Benjamin, **C Brogan**, et al. 2011, ApJ, in press, arXiv:1011.3295
4. "Water Masers associated with Star Formation in the Antennae Galaxies" **C. Brogan**, K. Johnson, & J. Darling, 2010, ApJ, 716, L51
5. "Confirmation of a Recent Bipolar Ejection in the Very Young Hierarchical Multiple System IRAS 16293-2422" G. Pech, L. Loinard, C. Chandler, Luis F. Rodriguez, P. D'Alessio, **C. Brogan**, D. Wilner, P. Ho 2010, ApJ, 712, 1403
6. "Digging Into NGC 6334 I(N): Multiwavelength Imaging of a Massive Protostellar Cluster", **C. L. Brogan**, T. R. Hunter, C. J. Cyganowski, R. Indebetouw, H. Beuther, K. M. Menten, S. Thorwirth, 2009, ApJ, 707, 1
7. "A Class I and Class II CH₃OH Maser Survey of EGOs from the GLIMPSE Survey", C.J. Cyganowski, **C.L. Brogan**, T.R. Hunter, E. Churchwell, 2009, ApJ, 702, 615
8. "The Extended Environment of M17: A Star Formation History" Matthew S. Povich, Ed Churchwell, John H. Bieging, Miju Kang, Barbara A. Whitney, **Crystal L. Brogan**, et al., 2009, ApJ, 696, 1278
9. "Spatial Variations in Galactic H I Structure on Au-Scales Toward 3C 147 Observed with the Very Long Baseline Array", T. Joseph W. Lazio, **C. L. Brogan**, W. M. Goss, & S. Stanimirovic, 2009, AJ, 137, 4526
10. "A Catalog of Extended Green Objects in the Glimpse Survey: a New Sample of Massive Young Stellar Object Outflow Candidates", C. J. Cyganowski, B. A. Whitney, E. Holden, E. Braden, **C. L. Brogan**, et al., AJ, 136, 2391
11. "Synergy of multi-frequency studies from observations of NGC 6334!" A. Seifahrt, S. Thorwirth, H. Beuther, S. Leurini, **C. L. Brogan**, T. R. Hunter, et al. JPhCS, 131, 2030
12. "Ubiquitous Water Masers in Nearby Star-Forming Galaxies", J. Darling, **C. L. Brogan**, & K. Johnson, 2008, ApJL, 685, 39
13. "The (Re-)Discovery of G350.1-0.3: A Young, Luminous Supernova Remnant and Its Neutron Star", B. M. Gaensler, A. Tanna, P. O. Slane, **C. L. Brogan** et al. 2008, ApJL, 680, 37
14. "Subarcsecond Submillimeter Imaging of the Ultracompact HII Region G5.89-0.39", T. R. Hunter, **C. L. Brogan**, R. Indebetouw, & C. J. Cyganowski, 2008, ApJ, 680, 1271
15. "Discovery of a New X-ray Filled Radio Supernova Remnant Around the Pulsar Wind Nebula in 3EG J1809-2328" M. Roberts & **C. L. Brogan**, 2008, ApJ, 681, 320

16. "High Resolution Submillimeter Observations of Massive Protostars", **C. L. Brogan**, T. R. Hunter, R. Indebetouw, C. J. Chandler, Y. L. Shirley, R. Rao, A. Sarma, 2008, Ap&SS, 313, 53
17. "New Radio Sources and the Composite Structure of Component B in the Very Young Protostellar System IRAS 16293-2422", L. Laurent, C. Chandler, L. Rodriguez, P. D'Alessio, **C. L. Brogan**, D. Wilner, P. Ho, 2007, ApJ, 670, 1353
18. "Evidence for a Millimeter Protocluster in S255N", C. Cyganowski, **C. L. Brogan**, & T. R. Hunter, 2007, AJ, 134, 346
19. "Arcsecond-Scale Kinematic and Chemical Complexity in Cepheus A-East" **C. L. Brogan**, C. J. Chandler, T. R. Hunter, Y. L. Shirley, & A. P. Sarma, 2007, ApJ, 660, L133
20. "The Low Frequency Radio Emission and Spectrum of the Extended SNR W44: New VLA Observations at 74 and 324 MHz" G. Castelletti, G. Dubner, **C. L. Brogan**, N. E. Kassim, 2007, A&A, 471, 537
21. "A Magnetically-Supported PDR in M17" E. W. Pellegrini, J. A. Baldwin, **C. L. Brogan**, M. M. Hanson, N. P. Abel, G. J. Ferland, H. B. Nemala, G. Shaw, and T. H. Troland, 2007, 658, 1119
22. "V733 Cep (Persson's Star): A New FUor in Cepheus", Bo Reipurth, Colin Aspin, Tracy Beck, **Crystal Brogan**, Michael S. Connelley, and G. H. Herbig, 2007, AJ, 133, 1000
23. "Millimeter Multiplicity in NGC 6334 I and I(N)", T. R. Hunter, **C. L. Brogan**, S. T. Megeath, H. K. M. Menten, Beuther, S. Thorwirth, 2006, ApJ, 649, 888
24. "Discovery of 35 New Supernova Remnants in the Inner Galaxy", **C. L. Brogan**, J. D. Gelfand, B. M. Gaensler, N. E. Kassim, J. W. Lazio, 2006, ApJL, 639, 25
25. "A Spitzer Space Telescope Infrared Survey of Supernova Remnants in the Inner Galaxy", W. T. Reach, J. Rho, A. Tappe, T. G. Pannuti, **C. L. Brogan**, et al., 2006, AJ, 131, 1479
26. "IRAS 16293-2422: Proper Motions, Jet Precession, the Hot Core, and the Unambiguous Detection of Infall", C. J. Chandler, **C. L. Brogan**, Y. L. Shirley, L. Loinard, 2005, ApJ, 632, 371
27. "Discovery of a Radio Supernova Remnant and Nonthermal X-Rays coincident with the TeV Source HESS J1813-178", **C. L. Brogan**, B. M. Gaensler, J. D. Gelfand, J. S. Lazendic, T. J. W. Lazio, N. E. Kassim, N. M. McClure-Griffiths, 2005, ApJL, 629, 105
28. "Spatial and Temporal Variations in Small-Scale Galactic HI Structure Toward 3C138", **C. L. Brogan**, B. A. Zauderer, T. J. Lazio, W. M. Goss, C. D. De Pree & M. D. Fasion, 2005, AJ, 130, 689
29. "The OH (1720 Mhz) Supernova Remnant Masers in W44: MERLIN and VLBA Polarization Observations", I. M. Hoffman, W. M. Goss, **C. L. Brogan**, & M. J. Claussen, 2005, ApJ, 627, 803
30. "Spatially Resolved 74 MHz Absorption Toward the Supernova Remnant 3C 391," **C. L. Brogan**, T. J. Lazio, N. E. Kassim, & K. K. Dyer, submitted to 2005, AJ, 130, 148
31. "Evidence for a Weak Global Galactic Center Magnetic Field from the Detection of Low Frequency Diffuse Nonthermal Radio Emission", T. N. LaRosa, **C. L. Brogan**, S. N. Shore, T. J. Lazio, N. E. Kassim, & M. E. Nord, 2005, ApJL, 626, 23
32. "Pulsar Wind Nebulae in Egret Error Boxes", M. S. E. Roberts, **C. L. Brogan**, B. M. Gaensler, J. W. T. Hessels, C.-Y. Ng, R. W. Romani, 2005, Ap&SS, 297, 93

33. "The OH (1720 Mhz) Supernova Remnant Masers in W28: MERLIN and VLBA Polarization Observations", I. M. Hoffman, W. M. Goss, **C. L. Brogan**, & M. J. Claussen, 2005, ApJ, 620, 257
34. "High-Resolution, Wide-Field Imaging of the Galactic Center Region at 330 MHz" M. E. Nord, T. J. Lazio, N. E. Kassim, S. D. Hyman, T. N. LaRosa, **C. L. Brogan**, N. Duric, 2004, AJ128, 1646
35. "OH (1720 MHz) Maser Search Toward the Large Magellanic Cloud", **C. L. Brogan**, W. M. Goss, J. Lazendic, & A. J. Green, 2004, AJ, 128, 700
36. "Physical Conditions in Orion's Veil", N. P. Abel, **C. L. Brogan**, G. J. Ferland, C. R. O'Dell, G. Shaw, & T. H. Troland, 2004, ApJ, 609, 247
37. "A Low Frequency Survey of the Galactic Plane Near $l=11$ degrees: Discovery of Three New Supernova Remnants", **C. L. Brogan**, K. E. Devine, T. J. Lazio, N. E. Kassim, C. R. Tam, W. F. Brisken, K. K. Dyer, & M. S. E. Roberts, 2004, AJ, 127, 355
38. "VLA Observations of the "Eye of the Tornado" – the High Velocity HII Region G357.63- 0.06," **C. L. Brogan** & W. M. Goss, 2003, AJ, 125, 272
39. "The Sizes of OH (1720 MHz) Supernova Remnant Masers: MERLIN and VLBA Observations of IC 443" I. M. Hoffman, W. M. Goss, **C. L. Brogan**, M. J. Claussen, & A. M. S. Richards, 2003, ApJ, 583, 272
40. "The Size of Extragalactic Source J1801-231 and the Association of Pulsar PSR B1758-23 with the Supernova Remnant W 28" M. J. Claussen, W. M. Goss, K. M. Desai, & **C. L. Brogan**, 2002, ApJ, 580, 909
41. "High Resolution VLA HI and OH Zeeman Observations toward M17", **C. L. Brogan**, & T. H. Troland, 2001, ApJ, 560, 821
42. "VLA HI Zeeman Observations toward the W49 Complex", **C. L. Brogan**, & T. H. Troland, 2001, ApJ, 550, 799
43. "OH Zeeman Magnetic Field Detections toward Five Supernova Remnants", **C. L. Brogan**, D. A. Frail, W. M. Goss, & T. H. Troland, 2000, ApJ, 537, 875
44. "The Detection of Magnetic Fields in M17 Through the HI Zeeman Effect", **C. L. Brogan**, T. H. Troland, D. A. Roberts, & R. M. Crutcher, 1999, ApJ, 515, 304

Selected Recent Non-refereed Publications

1. "Report on the Workshop Data Needs for ALMA From Data Cubes to Science: Ancillary Data and Advanced Tools for ALMA", L. Testi, P. Schilke, **C. Brogan**, 2010, The Messenger, vol. 139, p. 53-55
2. "Insights into star cluster formation from $\lambda \approx 1\mu\text{m}$ " R. Indebetouw; R. Chen, **C. Brogan**, B. Whitney, T. Robitaille, L. Looney, 2010, IAU Symposium, 266, 177
3. "Young stellar clusters and star formation throughout the Galaxy" E. Feigelson, F. Adams, L. Allen, E. Bergin, J. Bally, John; Z. Balog, T. Bourke, **C. Brogan**, et al., 2010, Astro2010: The Astronomy and Astrophysics Decadal Survey, 2010, 77

4. "*Revealing Magnetic Fields in the Neutral ISM: Outlook and Goals for the Next Decade*" **C. Brogan**, et al., 2010, Astro2010: The Astronomy and Astrophysics Decadal Survey, Science White Papers, no. 69
5. "*Searching for the Secrets of Massive Star Birth*", J. Bally, **C. Brogan**, et al. 2010, Astro2010: The Astronomy and Astrophysics Decadal Survey, Science White Papers, no. 10
6. "*The Full Spectrum Galactic Terrarium: MHz to TeV Observations of Various Critters*" M. Roberts, **C. Brogan**, et al. 2008, American Institute of Physics Conference Series, 1085, 328