

## CURRICULUM VITAE – Dr. Todd R. Hunter

### CONTACT INFORMATION:

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### EDUCATION:

- California Institute of Technology, **Ph.D.** Astronomy, October 1996; **M.S.** Astronomy, 1993.  
Dissertation: “[A Submillimeter Imaging Survey of Ultracompact HII Regions](#)”, Advisor: Tom Phillips
- Pennsylvania State University, **B.S.** Astronomy & Astrophysics, 1991, Advisor: Lawrence Ramsey

### EMPLOYMENT HISTORY:

- 01/2011 – present      **Scientist** at National Radio Astronomy Observatory (NRAO)  
North American ALMA Science Center / Telescope Support Group
- 11/2006 – 01/2011      **Associate Scientist**, NRAO; NA ALMA Front End Project Scientist and Instrumentation Scientist for the Green Bank Telescope (GBT) PTCS Project
- 03/1999 – 10/2006      **Astrophysicist**, Harvard-Smithsonian Center for Astrophysics, Cambridge, MA  
Engineering Test Program Leader for Submillimeter Array (SMA) (2004-2006)
- 10/1996 – 03/1999      **Postdoctoral Fellow**, Submillimeter Array, Harvard-Smithsonian  
Center for Astrophysics, Cambridge, MA, Mentors: R. Blundell, E. Tong, P Ho
- 09/1991 – 10/1996      Graduate Research Assistant, Astronomy Department, Submillimeter group  
California Institute of Technology, Pasadena, CA, Mentors: D. Lis & G. Serabyn
- 05/1991 – 08/1991      Summer Research Student, Global Oscillation Network Group (GONG) Project  
National Solar Observatory, NOAO, Tucson, AZ; Mentor: Dr. Jack Harvey
- 05/1990 – 08/1990      Summer Research Student (NSF/REU program), Very Large Array, National  
Radio Astronomy Observatory, Socorro; NM, Mentor: Dr. R. Craig Walker

### OUTSIDE APPOINTMENTS:

- 06/2016 – 07/2016      Scottish Universities Physics Alliance Distinguished Visitor (Univ. St. Andrews)
- 02/2014 – present      Research Associate at Smithsonian Astrophysical Observatory (SAO)

### KEY TECHNICAL ACCOMPLISHMENTS:

- Led ALMA pipeline heuristics development for calibration and continuum finding (2013–present)
- Served as calibration and imaging expert during ALMA Long Baseline Campaigns (2014-2015)
- Wrote dozens of python tasks to enable manual calibration of ALMA science data (2011–2019)
- Wrote CASA task `plotbandpass` which revealed many ALMA system problems (2010–2017)
- Led holography campaign to improve GBT surface accuracy from 390 to 240 $\mu$ m rms (2008-2010)
- Designed and developed the GBT `Auto00F` holography observer tool (2008)
- Commissioned the ALMA Front-End receiver beam pattern analysis software (2008-2010)
- Obtained the first ALMA interferometric spectrum at the ATF in New Mexico (January 2008)
- Organized and tested the upgrade of the GBT pointing model after azimuth track repair (2007)

- Led the Submillimeter Array (SMA) science and engineering testing team (2004-2006)
- Led the SMA 690 GHz astronomical imaging and phase transfer testing campaign (2005-2006)
- Designed and wrote the SMA Optical CCD guidescope Linux device driver (2001-2006)
- Developed SIS receiver and HEMT total power stabilization algorithms for SMA (2001-2006)
- Devised tuning software and field-tested an optically-generated submillimeter LO (2001-2006)
- Obtained first fringes with SMA antennas at Haystack Observatory (1998) and Mauna Kea (1999)
- Contributed large portions of the SMA real-time monitor & control software (1997-2006)
- Designed and wrote the SMA Receiver, LO & Antenna servo firmware & software (1996-2006)
- Designed the Submillimeter High-Angular Resolution Camera (SHARC I) optics (1993-1994)
- Designed and programmed the real-time control software for SHARC I (1994-1996)

NRAO

pre-NRAO

## **PROFESSIONAL RESEARCH AND DEVELOPMENT ACTIVITIES:**

### **Observational Astronomy pursuits:**

- Accretion outbursts in massive protostars: SMA, ALMA, VLA, SOFIA (2017-present)
- Detections of new molecules and masers toward massive protostars: ALMA, SMA (2017-present)
- Search for massive protostars and hot cores: CSO, BIMA, OVRO, SMA, ALMA (1995-present)
- Imaging of high-mass protostellar disks: VLA, OVRO, GBT, SMA, ALMA (1998-present)
- Imaging protostellar outflows, masers, and jets: OVRO, CSO, 12m, VLA, SMA, ALMA (1993-present)
- Imaging ultracompact HII regions at submm wavelengths: CSO, SMA, ALMA (1994-present)
- High-resolution imaging of water masers in evolved stars: SMA, ALMA (2005-2014)
- Search for high-redshift CO and CII line emission: CSO, GBT, SMA (1998-2006)

### **Technical Service Roles:**

- ALMA Integrated Development Team representative for North America (2021-present)
- ALMA Signal Chain Requirements Working Group member (2021-present)
- ngVLA Antenna Test Group member (2021-present)
- ngVLA CSV Working Group chair and AIV Working Group member (2018-present)
- ALMA Front-End and Digitizer Requirements Upgrade Working Group (2018-present)
- ALMA Pipeline Calibration Heuristics Leader (2013-present)
- ALMA Observing Modes Working Group (2011-present)
- eSMA (SMA/JCMT/CSO) scientific planning and commissioning team (2005-2006)

### **Technical Review Panels:**

- ALMA Band 2 CDR (2022)
- ALMA Band 1 3D Printed Corrugated Horn Review observer (2021)
- ngVLA Central Signal Processor Design Review Panel (2021)
- ngVLA Front-End Requirements Specification Review Panel (2021)
- GBT Active Surface Upgrade Conceptual Design Review Panel (2021)
- ALMA Band 6 version 2 Conceptual Design Review observer (2018)
- ALMA Cycle 0 Science Proposal Technical Assessment Panel (August 2011)
- ALMA EU FEIC Operational Readiness Review Panel (October 2009)
- ALMA NA FEIC Operational Readiness Review Panel (July 2009)
- GBT Antenna Servo Replacement Design Review (May 2009)
- ALMA Band 3 Manufacturing Readiness Review Panel (February 2009)
- ALMA Band 6 Manufacturing Readiness Review Panel (September 2008)
- ALMA Front End Local Oscillator Manufacturing Readiness Review Panel (May 2008)
- ALMA Front End Local Oscillator Critical Design Review Panel (May 2006)

### **Academic Service:**

- Referee for ApJ, ApJL, A&A, PASA, MNRAS, New Astronomy, Cambridge Univ. Press (1997-present)
- Referee for FONDECYT Regular 2017 grant competition of CONICYT (2017)
- Referee for Vici research proposals of Netherlands Institute for Space Research (2017)
- Referee for National Science Centre of Poland (2016)
- Assessment of book proposal for Cambridge University Press (2011)
- LOC for September 2008 ALMA/NAASC workshop: “The Birth and Feedback of Massive Stars”
- LOC for June 2007 ALMA/NAASC workshop: “Through Disks to Stars and Planets”
- Organizer of Workshop on Out-Of-Focus (OOF) Holography at Green Bank (2007)
- External Referee for NRAO Green Bank Telescope Time Allocation Committee (2005-2006)
- NSF ATI Radio Panel Proposal Review Committee (2006)
- NASA APRA Proposal Review Committee (2004)
- SMA Time Allocation Committee (2003-2006)
- Co-organizer of the CfA Radio & Geoastronomy Division Lunch Talk Series (2003-2005)
- SMA Postdoc Selection Committee (2002-2006)
- Harvard University Clay and Menzel Fellowship Selection Committee (2001-2003)

**PROFESSIONAL AFFILIATIONS:**

- American Astronomical Society (AAS)
- International Union of Radio Scientists (URSI, USNC-URSI)
- International Astronomical Union (IAU)
- Maser Monitoring Organization (M2O)

**HONORS AND AWARDS:**

- Distinguished Performance Award, NRAO, 2016
- Best poster (instrumentation) at Revolution in Astronomy with ALMA, Tokyo, Japan, Dec 2014
- Smithsonian Institution Certificates of Award in official recognition of special achievement reflecting a high standard of accomplishment: July 30, 2000 and July 28, 2002
- University Scholar at Penn State University (1987-1991)
- Braddock Scholarship at Penn State University Eberly College of Science (1987-1991)

**GRANTS AND CONTRACTS:**

- Co-I of NASA SOFIA Cycle 7 observing program “Measuring the luminosity of the accretion outburst in the massive protostellar system NGC6334I-MM1”, \$27,700 (2019)
- PI of ALMA Cycle 3 North American Development Study “Improving the calibration of atmospheric spectral features in ALMA data” (FY2016-17), \$66,000
- Co-I of NASA SOFIA Cycle 4 observing program ‘Resolving the mid-infrared population in massive protoclusters’, \$123,000 (2015)
- Co-Investigator on “Terahertz frequency HEB receiver for the observation of NH<sup>+</sup>”, granted by NASA/JPL for a Director’s Research and Development Fund Proposal (FY2004-06)
- Participant in “Exploration of terahertz emission from astronomical sources”, CfA IR&D grant program (FY2004)
- Co-Investigator on “Terahertz-frequency Phonon-cooled Hot-electron Bolometer Mixers with Wide Intermediate Frequency Bandwidth”, submitted to NASA/JPL for a 1-Year Cost-Reimbursement (No-Fee) Research and Development Contract (FY2003)

**INVITED TALKS AND COLLOQUIA (2007–present):**

- “Accretion outburst from a massive protostar: a sequences of extraordinary observational results”, SOFIA/ALMA Summer Webinar Series, June 24, 2021
- “ALMA Front-end and Digitizer Technical Requirements to Enable the ALMA 2030 Development Roadmap”, Smithsonian Receiver Lab Lunch Talk Series, March 20, 2021
- “ALMA Offline Software Considerations for Improved Bandwidth and Resolution”, The ALMA2030 Vision: Design considerations for Digitizers, Backend and Data Transmission System, Mitaka, Japan, October 14, 2020
- “Increasing the Collecting Area of ALMA in the 2030s”, The ALMA 2030 Vision: Design Considerations for the Next ALMA Correlator, Charlottesville, VA, February 11, 2020
- “Introduction to Interferometric Imaging”, University of St. Andrews, June 24, 2016
- “Observational Challenges for Measuring Protocluster Multiplicity and Evolution”, Mass Assembly from Clouds to Clusters, Sexten, Italy, July 8, 2014
- “Subarcsecond imaging of the massive protocluster NGC6334I(N): two dozen compact sources and a massive disk candidate”, University of St. Andrews, June 12, 2014
- “Antennas and Receivers in Radio Astronomy”, 14th Synthesis Imaging Summer School, Socorro, NM, May 13, 2014
- “ALMA Overview for Early Science Cycle 0”, ALMA CfA Community Day Event, Cambridge, MA, April 20, 2011
- “ALMA Observing Tool”, ALMA CfA Community Day Event, Cambridge, MA, April 20, 2011
- “ALMA Millimeter Observing Considerations”, ALMA Tutorial, Santa Fe, NM, March 11, 2011
- “Science at Band 10 and Beyond”, NA ALMA Development Workshop, Charlottesville, VA, March 21, 2011
- “Portrait of a Forming Massive Protocluster: NGC6334I(N)”, Great Barriers in High Mass Star

Formation, Townsville, Australia, September 2010

- “Recent Surface Improvements to the GBT”, SMA, Hilo, HI, July 16, 2010
- “Recent Surface Improvements to the GBT”, AOC, Socorro, NM, May 19, 2010
- “Surface Improvements for the GBT”, Advancing Chemical Understanding through Astronomical Observations, Green Bank, May 29, 2009
- “658 GHz vibrationally-excited water masers with the Submillimeter Array”, IAU Symposium 242, Astrophysical masers and their environments, Alice Springs, Australia, March 2007

#### **RECENT TALKS AT ASTRONOMY CONFERENCES (2016–present)**

- “JVLA detection of dramatic changes in the outbursting massive protostar NGC6334I-MM1B”, Tracing the Flow: Galactic Environments and the Formation of Massive Stars, Lake Windermere, UK, 2-6 July 2018
- “Dramatic changes in the massive protostellar system NGC6334I-MM1 from an ongoing accretion outburst”, Olympian Symposium 2018, Paralia Katerini, Greece, May 29, 2018
- “The extraordinary outburst in NGC6334I-MM1: the rise of dust and emergence of 6.7 GHz methanol masers”, IAU Symposium 336, Cagliari, Sardinia, Italy, September 7, 2017
- “An accretion outburst in NGC6334I-MM1: New insights into massive protostellar evolution”, Multi-Scale Star Formation, Morelia, Mexico, April 7, 2017
- “The Massive Protostellar Maelstrom of NGC6334I”, Half Decade of ALMA: Cosmic Dawns Transformed, Indian Wells, CA, September 21, 2016

#### **TRAINING, TEACHING, ADVISING, AND MENTORING EXPERIENCE:**

- Mentor to Univ. of Virginia astronomy graduate student Allison Towner (2015-2020)
- Mentor to Univ. of Virginia astronomy graduate student Mengyao Liu (2018-2020)
- Advisor and PhD committee member to Univ. of Virginia graduate student Paul Ries (2007-2012)
- PhD committee member for Univ. of Virginia graduate student Chaitale Parashare (2009-2011)
- Mentor to software engineer Josh Crabtree in ALMA Front-End Integration Center (2008-2010)
- Project Management Training: 2-day course by Michael Greer at Green Bank (11-12 June 2007)
- Laboratory & scientific mentor to Harvard graduate student Dan Marrone (2002-2006)
- Laboratory & scientific mentor to Harvard graduate student James Battat (2002-2004)
- Scientific mentor and PhD committee member for Dr. Peter Sollins (2004-2005)
- Predoctoral Research Review Committee chair for CfA pre-doc student Yang Wang (2004-2005)
- Scientific mentor for CfA Summer Intern Student Mark Kramer (2000)
- T.A. for “Astronomical Instrumentation Lab”, J.K. McCarthy (Caltech, 1992)
- T.A. for “Radiative Processes in Astrophysics”, M. Cohen (Caltech, 1992)
- T.A. and occasional lecturer for “Interstellar Medium and Galaxies”, M. Schmidt (Caltech, 1993)

#### **EXTERNAL REFERENCES:**

- Dr. Robert W. Wilson, Harvard-Smithsonian CfA, 617-496-7744, rwilson@cfa.harvard.edu
- Dr. Ray Blundell, Harvard-Smithsonian CfA, 617-495-7367, rblundell@cfa.harvard.edu
- Prof. James Moran, Harvard-Smithsonian CfA, 617-495-7477, jmoran@cfa.harvard.edu
- Dr. Karl Menten, Max-Planck-Institut für Radioastronomie (MPIfR), Bonn, Germany, +49 228 525 297, kmenten@mpifr-bonn.mpg.de

#### **REFEREED PUBLICATIONS: 126 (citations: 8408, *h*-index: 55, acknowledgments: 20)**

- Highest-cited first author paper: “Millimeter Multiplicity in NGC 6334 I and I(N)”, ApJL (2006), 649, 888 (133 citations)
- Highest-cited second author paper: “Search for CO Outflows toward a Sample of 69 High-Mass Protostellar Candidates. II. Outflow Properties”, ApJ (2005), 625, 864 (271 citations)
- Highest-cited 3rd author paper: “The 2014 ALMA Long Baseline Campaign: First Results from High Angular Resolution Observations toward the HL Tau Region”, ApJL (2015), 808, 3 (1008 citations)