

**CONTACT:**

National Radio Astronomy Observatory  
520 Edgemont Rd, Charlottesville, VA 22903, USA

thunter@nrao.edu, +1 (434) 244-6836

ORCID: 0000-0001-6492-0090

URL: <http://www.cv.nrao.edu/~thunter>

**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**, SMA, [Submillimeter Receiver Lab](#), 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 – 09/2023 Research Associate at [Smithsonian Astrophysical Observatory \(SAO\)](#)

**KEY TECHNICAL ACCOMPLISHMENTS:**

- Led the ALMA 2030 Wideband Sensitivity Upgrade Conceptual System Design (2022-23)
  - 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)
  - 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)
- NRAO
- Led the Submillimeter Array (SMA) science and engineering testing team (2004-2006)
  - Obtained first fringes with the SMA 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)
- pre-NRAO

**REFEREED PUBLICATIONS: 145 (citations: 10144, h-index: 58, acknowledgments: 21)**

- Highest-cited first author paper: “[Millimeter Multiplicity in NGC 6334 I and I\(N\)](#)”, *ApJL* (2006), 649, 888 (182 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 (291 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 (1268 citations)

**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 of ultracompact HII regions at submm wavelengths: CSO, SMA, ALMA (1994-present)
- Imaging protostellar outflows, masers, and jets: OVRO, CSO, 12m, VLA, SMA, ALMA (1993-present)

**Technical Service Roles:**

- ALMA WSU Online Calibration Group member (2023-present)
- ALMA Integrated Development Team representative for North America (2021-present)
- ALMA Signal Chain Requirements Working Group member (2021-present)
- ALMA Renormalization Working Group member (2021-2023)
- 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:**

- RADPS System Requirements Review panelist (Jan 2025)
- ALMA Data Transmission System PDR observer (Sept 2024)
- ngVLA Central Signal Processor CoDR internal reviewer (Jan 2024)
- ATAC Subsystem Requirements Review observer (Nov 2023)
- ALMA Digitizer/DSPOT CoDR/SRR observer (Feb 2023)
- ACA Spectrometer Acceptance Review observer (Nov 2022)
- ALMA WSU System Requirements Review presenter (Oct 2022)
- ALMA Band 2 CDR observer (Apr 2022)
- ALMA Band 1 3D Printed Corrugated Horn Review observer (Dec 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 NA and EU FEIC Operational Readiness Review Panels (July-October 2009)
- GBT Antenna Servo Replacement Design Review Panel (May 2009)
- ALMA Band 3 and 6 Manufacturing Readiness Review Panels (2008-009)
- 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, Radio Science, CUP (1997-present)
- Referee for FONDECYT and Netherlands Institute for Space Research (2017)
- Referee for Vici research proposals of Netherlands Institute for Space Research (2017)
- Referee for National Science Centre of Poland (2016)
- 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)
- SMA Postdoc Selection Committee (2002-2006)
- Harvard University Clay and Menzel Fellowship Selection Committee (2001-2003)

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

- “Maser science with the ngVLA”, IAU 380, Kagoshima, Japan, March 2023
- “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
- “Performance of the GBT at 3mm”, 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 CONTRIBUTED TALKS AT 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

**HONORS AND AWARDS:**

- NRAO Distinguished Performance Award, 2016
- NRAO Star Award, 2023
- Best poster (instrumentation) at Revolution in Astronomy with ALMA, Tokyo, Japan, Dec 2014
- Smithsonian Institution Certificates of Awards for special achievement (2000 and 2002)
- Braddock Scholarship at Penn State University Eberly College of Science (1987-1991)

**GRANTS AND CONTRACTS:**

- Co-I of ALMA FY2023 North American Development Study “A Detailed Characterization of Spectral Re-gridding and Noise in the WSU Era”, in-kind contributor
- 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)