

Benjamin R. Setterholm

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Education

University of Michigan

Doctor of Philosophy in Astronomy and Astrophysics
Master of Science in Astronomy and Astrophysics

Ann Arbor, MI
May 2018 – Dec 2022
Sep 2016 – May 2018

University of Minnesota

Bachelor of Aerospace Engineering and Mechanics (With Distinction)
Bachelor of Science in Astrophysics (Magna Cum Laude)

Minneapolis, MN
Sep 2012 – May 2016
Sep 2012 – May 2016

Research Experience

Sun Radio Interferometer Space Experiment

Assistant Research Scientist (40 hours/week)
Graduate Student Research Assistant (20 hours/week)

Ann Arbor, MI
Jan 2023 – Present
Sep 2022 – Dec 2022

Lead development and testing of the science data pipeline for the JPL/NASA SunRISE mission. Created routines for radio signal calibration of six independent spacecraft and post-facto interferometric correlation. Development conducted largely in Julia with some Python.

Optical Interferometric Instrumentation

Ph.D. Research (Advisor: John D. Monnier)

Ann Arbor, MI
Oct 2016 – Nov 2022

Designed, fabricated, constructed, tested, and commissioned hardware and software for major subsystems of two new infrared instruments (MIRC-X and MYSTIC) for the CHARA optical interferometer array. Won a small grant (\$5K) to develop and commission a polarimetric observing mode for MIRC-X. Lead author of the MYSTIC instrument paper. Experience with design, alignment, and management of optics (including fiber optics), opto-mechanical mounts, component fabrication (aluminum machining and 3D printing), and management of vacuum/cryogenic systems. Extensive use of SolidWorks, Python, Julia, C and some use of Zemax OpticStudio and C#.

Young Stellar Disk Observation and Modelling

Ph.D. Research (Advisor: John D. Monnier)

Ann Arbor, MI
Sep 2016 – Nov 2022

Planned and lead a large observing campaign of protoplanetary disks via infrared scattered light measurements at Gemini South. Proposed and conducted optical interferometric observations of young stellar objects with multiple instruments at CHARA and VLTI. Reconstructed the disk emission profile of the inner few au, combining data from multiple sources. Developed custom analytic profile fitting routines.

Polarimetric Instrument Concept Study

Undergraduate Astronomy Senior Thesis (Advisor: Terry J. Jones)

Minneapolis, MN
Jun 2015 – May 2016

Concept design of an alternative, reflective element optical system for the MMTPol instrument. Extensive use of Zemax OpticStudio and some SolidWorks.

CubeSat Space Vehicle Design

Undergraduate Engineering Senior Design Project (Advisor: Demoz Gebre-Egziabehers)

Minneapolis, MN
Sep 2015 – Dec 2015

Computed a data link budget, investigated data-transfer and error-checking algorithms, and proposed optimized orbital parameters for communication with the SOCRATES CubeSat.

Teaching Experience

Graduate Student Instructor

Astronomical Techniques (ASTRO 361 – 1 semester)
Stars, Galaxies, and the Universe (ASTRO 102 – 1 semester)

University of Michigan

Fall 2017

Spring 2017

Teaching Assistant

Introduction to Astrophysics (AST 2001 – 6 semesters)

University of Minnesota

Fall 2013 – Spring 2016

Awards

Future Investigators in NASA Earth and Space Science and Technology Grant	Jul 2019
Michigan Space Grant Consortium Fellowship	Mar 2019
Richard G. Brasket Aerospace Engineering Scholarship	Oct 2015
LaVerne and Ted Jones Scholarship	May 2014
Chester Gaskell Aeronautical Engineering Scholarship	Oct 2014
University of Minnesota Presidential Scholarship	Sep 2012

First Author Publications

B. R. Setterholm, J. D. Monnier, J.-B. Le Bouquin, N. Anugu, J. Ennis, L. Jocou, N. Ibrahim, S. Kraus, M. D. Anderson, S. Chhabra, I. Codron, C. D. Farrington, B. Flores, T. Gardner, M. Gutierrez, C. Lanthermann, O. W. Majoinen, D. J. Mortimer, G. Schaefer, N. J. Scott, T. ten Brummelaar, N. L. Vargas. "MYSTIC: a high angular resolution K-band imager at CHARA." In *Journal of Astronomical Telescopes, Instruments, and Systems* **9**, 2 SPIE, 2023.

B. R. Setterholm. "Advancing Optical Interferometry to Unveil Sub-au Protoplanetary Disk Structures." Ph.D. Thesis. University of Michigan, 2022.

B. R. Setterholm, J. D. Monnier, J.-B. Le Bouquin, N. Anugu, A. Labdon, J. Ennis, K. J. C. Johnson, S. Kraus, T. A. ten Brummelaar. "MIRC-X polarinterferometry at CHARA." In *Optical and Infrared Interferometry and Imaging VII*. SPIE, 2020.

B. R. Setterholm, J. D. Monnier, C. L. Davies, A. Kreplin, S. Kraus, F. Baron, A. Aarnio, J.-P. Berger, N. Calvet, M. Curé, S. Kanaan, B. Kloppenborg, J.-B. Le Bouquin, R. Millan-Gabet, A. E. Rubinstein, M. L. Sitko, J. Sturmman, T. A. ten Brummelaar, Y. Touhami. "Probing the Inner Disk Emission of the Herbig Ae Stars HD 163296 and HD 190073." *The Astrophysical Journal* **869**, 164 American Astronomical Society, 2018.

Other Selected Publications

E. A. Rich, J. D. Monnier, A. Aarnio, A. S. E. Laws, B. R. Setterholm, D. J. Wilner, N. Calvet, T. Harries, C. Miller, C. L. Davies, F. C. Adams, S. M. Andrews, J. Bae, C. Espaillat, A. Z. Greenbaum, S. Hinkley, S. Kraus, L. Hartmann, A. Isella, M. McClure, R. Oppenheimer, L. M. Pérez, Z. Zhu. "Gemini-LIGHTS: Herbig Ae/Be and Massive T Tauri Protoplanetary Disks Imaged with Gemini Planet Imager." *The Astronomical Journal* **164**, 109 American Astronomical Society, 2022.

N. Anugu, J.-B. Le Bouquin, J. D. Monnier, S. Kraus, B. R. Setterholm, A. Labdon, C. L. Davies, C. Lanthermann, T. Gardner, J. Ennis, K. J. C. Johnson, T. A. ten Brummelaar, G. H. Schaefer, J. Sturmman. "MIRC-X: A Highly Sensitive Six-telescope Interferometric Imager at the CHARA Array." *The Astronomical Journal* **160**, 4 American Astronomical Society, 2020

A. Labdon, John D. M. S. Kraus, J.-B. Le Bouquin, B. R. Setterholm, N. Anugu, T. A. ten Brummelaar, C. Lanthermann, C. L. Davies, J. Ennis, T. Gardner, G. H. Schaefer, L. Sturmman, J. Sturmman. "A new frontier for J-band interferometry: dual-band NIR interferometry with MIRC-X." In *Optical and Infrared Interferometry and Imaging VII*. SPIE, 2020.

A. S. E. Laws, T. J. Harries, B. R. Setterholm, J. D. Monnier, E. A. Rich, A. N. Aarnio, F. C. Adams, S. Andrews, J. Bae, N. Calvet, C. Espaillat, L. Hartmann, S. Hinkley, A. Isella, S. Kraus, D. Wilner, Z. Zhu. "Irregular Dust Features around Intermediate-mass Young Stars with GPI: Signs of Youth or Misaligned Disks?" *The Astrophysical Journal* **888**, 7 American Astronomical Society, 2019.

J. D. Monnier, T. J. Harries, J. Bae, **B. R. Setterholm**, A. Laws, A. Aarnio, F. C. Adams, S. Andrews, N. Calvet, C. Espaillat, L. Hartmann, S. Kraus, M. McClure, C. Miller, R. Oppenheimer, D. Wilner, Z. Zhu. "Multiple Spiral Arms in the Disk around Intermediate-mass Binary HD 34700A." *The Astrophysical Journal* **872**, 122 American Astronomical Society, 2019.

N. Anugu, J. D. Monnier, S. Kraus, J. Ennis, **B. Setterholm**, J.-B. Le Bouquin, C. Lanthermann, C. Davies, T. ten Brummelaar, M. Haidar, V. Dubravec, S. Peters. "MIRC-X/CHARA: sensitivity improvements with an ultra-low noise SAPHIRA detector." In *Optical and Infrared Interferometry and Imaging VI*. SPIE, 2018.

S. Kraus, J. D. Monnier, N. Anugu, J.-B. Le Bouquin, J. Ennis, **B. Setterholm**, C. Lanthermann, C. Davies, T. ten Brummelaar, A. Labdon. "The MIRC-X 6-telescope imager: Key science drivers instrument design and operation." In *Optical and Infrared Interferometry and Imaging VI*. SPIE, 2018.

J.-B. Le Bouquin, S. Kraus, J. D. Monnier, N. Anugu, **B. Setterholm**, J. Ennis, C. Lanthermann, T. ten Brummelaar, L. Jocou. "MYSTIC: Michigan Young STar Imager at CHARA." In *Optical and Infrared Interferometry and Imaging VI*. SPIE, 2018.

Public Presentations

CHARA Science Meeting (Session Chair) Atlanta, GA
"The Dynamic Inner Disk of HD 163296" (Talk) Mar 2023

SPIE Astronomical Telescopes + Instrumentation 2022 Montréal, Canada
"MYSTIC: a high angular resolution K-band imager at CHARA" (Talk) Jul 2022

The Sharpest Eyes on the Sky Exeter, England
"The Michigan Young STar Imager at CHARA" (Talk) Apr 2022
"A temporal study of a Herbig Ae inner disk" (Talk)

SPIE Astronomical Telescopes + Instrumentation 2020 Online
"MIRC-X polarinterferometry at CHARA" (Talk) Dec 2020

ESO Colloquium Santiago, Chile
"Probing the Inner AU of Disks with Infrared Polarinterferometry" (Invited Talk) Dec 2019

AAS Meeting 233 Seattle, WA
"Smooth Inner Emission in the Herbig Ae Disks HD 163296 and HD 190073" (Poster) Jan 2019

ESO – Take a Closer Look Garching b. München, Germany
"A Closer Look at the Inner Disks of Herbig Ae Stars HD 163296 and HD 190073" (Poster) Oct 2018

MIRA Workshop: The Origins of Volatiles in Habitable Planets Ann Arbor, MI
"The Inner Disk Emissions of MWC 275 and V1295 Aql" (Poster) Oct 2017