Sarah Betti

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Appointments

Space Telescope Science Institute **July 2023–present**
STScI Prize Postdoctoral Fellow *Baltimore, MD*
50% independent science + 50% work for the Nancy Grace Roman Space Telescope
Deputy Lead of the Roman Telescope Branch calibration block

University of Massachusetts, Amherst **Sept 2017–July 2023**
NASA Earth and Space Science and Technology Fellow | Sept. 2022 – July 2023 *Amherst, MA*
Graduate Research Assistant | Jan.–Aug. 2018, Sept 2020–Sept. 2022
Five College Astronomy Consortium Graduate Observational Teaching Assistant | Sept. 2018–Sept. 2020
Graduate Teaching Assistant | Sept.–Dec. 2017

Haverford College **Sept. 2015–June 2017**
Thesis Research Writer | June 2017 *Haverford, PA*
Undergraduate Research Assistant | Sept. 2015–May 2017

National Radio Astronomy Observatory **Summer 2015**
Research Experience for Undergraduates Intern *Green Bank, WV*

Education

University of Massachusetts, Amherst **Sept. 2023**
Ph.D. in Astronomy *Amherst, MA*
Advisor: Dr. Kate Follette
Dissertation: "Probing the Physical Mechanisms Responsible for Brown Dwarf and Giant Planet Formation"

University of Massachusetts, Amherst **May 2021**
M.S. in Astronomy *Amherst MA*

Haverford College **May 2017**
B.S. cum laude Astrophysics, GPA: 3.763/4.0 *Haverford PA*
High Honors in Astrophysics
Thesis: "VLA Observations of the Magnetic Field of the Smith High Velocity Cloud"

Research Experience

- Current research experience on near infrared high contrast imaging and modeling of protoplanetary and debris disks, and near infrared spectroscopic observations of accretion onto brown dwarfs and protoplanets.
- Past research experience building an analysis pipeline for molecular cloud core surveys, synthetic observations of molecular cloud cores, sub-mm observations of dusty high redshift galaxies, and millimeter observations of high velocity clouds.
- Advising experience teaching optical data reduction and star cluster research for high school and undergraduate students. Running, teaching, and developing high school curriculum on observational astronomy and Python programming.

Professional Experience

- Technical experience working for the Roman Space Telescope at STScI on the Improved Roman Reference Calibration algorithm
  - Led the implementation and characterization of the Improved Roman Reference Calibration algorithm into the Roman Reference File Pipeline for the Roman Space Telescope. Wrote and published IRRC characterization and analysis technical report.
  - Improved the IRRC to work with roman filetypes, and made compatible with the Roman Pipeline (romancal)
  - Analyzed calibration data from the Roman Wide Field Imager Thermal Vacuum Test 1, including the effect of bias and pink 1/f noise
- Oversaw the characterization of dark reference files and bad pixel mask reference file implementation

Fellowships and Grants

NASA FINESST | $50,000 **2022–2023**
Title: "Probing the Physical Mechanisms Responsible for Brown Dwarf and Giant Planet Formation"

UMass Amherst Department of Astronomy Research Grant | $500 **2022**

UMass Amherst Department of Astronomy Research Grant | $110 **2021**

UMass Graduate School Dissertation Research Grant | $750 **2020**
University grant for research travel during the 2020-2021 semester; postponed due to COVID-19

Massachusetts Space Grant Consortium Fellowship | $5500 **2019**

Mary Dailey Irvine Graduate Travel Award **2018–2022**
2022-Spirit of Lyot Conference in Leiden, Netherlands June 2022 | $900
2019-AAS Meeting 235 | $1192
2018-16th Synthesis Imaging Workshop | $400
2018-AAS Meeting 231 | $400

Massachusetts Space Grant Consortium Fellowship | $5500 **2018**

Frances Velay Womens' Science Research Fellowship **2016**
Frances Velay Womens' Science Research Fellowship Program grant for research

Refereed Publications: First Author

Betti, S. K., et al., "The Comprehensive Archive of Substellar and Planetary Accretion Rates", *AJ*, 166, 262B, 2023.

Betti, S. K., et al., "Erratum: Near-infrared Accretion Signatures from the Circumbinary Planetary Mass Companion Delorme 1 (AB)b", *ApJL*, 941, L20, 2022.

Betti, S. K., et al., "Near-infrared Accretion Signatures from the Circumbinary Planetary Mass Companion Delorme 1 (AB)b", *ApJL*, 935, L18, 2022.

Betti, S. K., et al., "Detection of Near-Infrared Water Ice at the Surface of the (pre)Transitional Disk of AB Aur: Informing Icy Grain Abundance, Composition, and Size", *AJ*, 163, 145, 2022.

Betti, S. K., et al., "The Robustness of Synthetic Observations in Producing Observed Core Properties: Predictions for the TolTEC Clouds to Cores Legacy Survey", *ApJ*, 923, 25, 2021.

Betti, S. K., et al., "Environmental Effect on the Interstellar Medium in Galaxies across the Cosmic Web at z = 0.73", *ApJ*, 874, 53, 2019.

Betti, S. K., et al., "Constraining the Magnetic Field of the Smith High-velocity Cloud Using Faraday Rotation", *ApJ*, 871, 215, 2019.

Non-Refereed Publications: First Author

Technical Reports

Betti, S. K., et al., "Application and Characterization of IRRC on Roman/WFI TVAC1 Data", *Technical Report Roman-STScI-000673*, 2024.

Refereed Publications: Co-Author

Rebollido, I., et al., incl. **Betti, S. K.**, "JWST-TST High Contrast: Asymmetries, dust populations and hints of a collision in the β Pictoris disk with NIRCam and MIRI", *AJ*, 167, 69, 2024.

Sallum, S., et al., incl. **Betti, S. K.**, "The JWST Early Release Science Program for Direct Observations of Exoplanetary Systems IV: NIRISS Aperture Masking Interferometry Performance and Lessons Learned", arXiv:2310.11499, 2023.

Ray, S., et al., incl. **Betti, S. K.**, "The *JWST* Early Release Science Program for Direct Observations of Exoplanetary Systems III: Aperture Masking Interferometric Observations of the star HIP 65426 at 3.8μm", arXiv:2310.11508, 2023.

Jorquera, S., Bonnefoy, M., **Betti, S. K.**, et al., "LBTI search for companions and sub-structures in the (pre)transitional disk of AB Aurigae", *ApJ*, 926, 71, 2022.

Hutschenreuter, S., Anderson, C. S., **Betti, S. K.**, et al., "The Galactic Faraday rotation sky 2020", *A&A*, 657, A43, 2022.

Pokhrel R., Gutermuth R. A., **Betti S. K.**, et al., "Star-Gas Surface Density Correlations in Twelve Nearby Molecular Clouds I: Data Collection and Star-Sampled Analysis", *ApJ*, 896, 1, 2020.

Ma Y. K., Mao S. A., Stil J., Basu A., West J., Heiles C., Hill A. S., **Betti, S. K.**, "A broad-band spectro-polarimetric view of the NVSS rotation measure catalogue - II. Effects of off-axis instrumental polarization", *MNRAS*, 487, 3, 2019.

Ma Y. K., Mao S. A., Stil J., Basu A., West J., Heiles C., Hill A. S., **Betti, S. K.**, "A broad-band spectro-polarimetric view of the NVSS rotation measure catalogue - I. Breaking the nπ-ambiguity", *MNRAS*, 487, 3, 2019.

Non-Refereed Publications: Co-Author

Dacus, B., Plunkett, C., Wang, H., Follette, K., **Betti, S. K.**, et al., "Toward Assembling a Comprehensive Database of Substellar Accretion Rates", RNAAS, 5, 174, 2021.

Lockman F., **Betti S. K.**, Hill A. S., Lehner N., Shelton R. L., Wakker B. P. (names listed in alphabetical order after first author): "High velocity Clouds: Building Blocks of the Local Group?" *Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, no. 255; Bulletin of the American Astronomical Society*, Vol. 51, Issue 3, id. 255, 2019.

Technical Reports

Desjardins, T. D., **Betti, S. K.**, Cosentino, R. G., Hoffmann S. L., Otor, O. J., Sánchez, J., Sharma S., "Roman SOC Science Validation Report for SOC Release 2 DMS", *Technical Report Roman-STScI-000619*, 2024.

Petric, A., Casertano, S., Beaton R., **Betti, S. K.**, Bellini, A., Costentino, R., Desjardins, T., Fadda D., Hoffmann S., Koekemoer, A., Otor, J., Schultz, W., Sharma, S., Wu, J., "Approximating Uncertainties for Calibration Reference Files", *Technical Report Roman-STScI-000571*, 2024.

Conference Proceedings

Ma Y. K., Mao S. A., Stil J., Basu A., West J., Heiles C., Hill A. S., **Betti, S. K.**, "From the NVSS

RM Catalogue to Future Polarisation Surveys", *Proceedings to IAU Focus Meeting: New Insights in Extragalactic Magnetic Fields*, XXXth IAU General Assembly, 2018.

Kobelski A., Bastian T. S., **Betti, S. K.**, "Probing Solar Wind Turbulence with the Jansky Very Large Array", *Coimbra Solar Physics Meeting: Ground-based Solar Observations in the Space Instrumentation Era Proceedings of a Meeting* (eds.) Ivan Dorotovic, Catherine E. Fischer, and Manuela Temmer, (San Francisco: ASP), 504, 2015.

Presentations & Workshops

Talks

8/2024: Star and Planet Formation Seminar, Space Telescope Science Institute, Baltimore, MD,
"Water Ice in the Debris Disk of β Pictoris"

2/2024: Star and Planet Formation Seminar, ESO Headquarters, Garching, Germany
"CASPAR: Characterizing Accretion across the Brown Dwarf Regime"

12/2023: Planet and Star Formation Tea, MPIA, Heidelberg, DE
"CASPAR: Characterizing Accretion across the Brown Dwarf Regime"

1/2023: American Astronomical Society Winter Meeting, Seattle, WA
"Characterizing Accretion and Formation Mechanisms across the Brown Dwarf and Planetary Mass Regimes"

11/2022: Planet and Star Formation Tea, MPIA, Heidelberg, DE
"NIR Accretion Signatures in the Circumbinary Planetary Mass Companion Delorme 1 (AB)b"

10/2022: Planetary Lunch Series, Massachusetts Institute of Technology, MA
"Observing Water Ice in the AB Aurigae Transitional Disk"

07/2022: Northeast Star and Planet Formation 2022, Wesleyan University, CT
"The Role of Environment in Core Evolution"

07/2022: Cool Stars 21: Gaia and Spitzer's Neighbourhood Watch Program: From Stars to Brown Dwarfs to Planets Splinter Session, Toulouse, France
"NIR Accretion Signatures in the Circumbinary Planetary Mass Companion Delorme 1 (AB)b"

06/2022: In the Spirit of Lyot 2022, Leiden, Netherlands
"Mapping Icy Grains in the Circumstellar Disk around AB Aurigae"

12/2020: Five Years after HL Tau: A New Era in Planet Formation Conference, Virtual
"Mapping Icy Grains in the Circumstellar Disk around AB Aurigae"

11/2020: Southern Maine Astronomy Club Public Lecture, Virtual
"Formation of Exoplanets in Circumstellar Disks"

10/2018: Past, Current and Future Galaxy Surveys. CANDELS Meeting and TolTEC Workshop, University of Massachusetts, Amherst, MA,
"Environmental Effect on Interstellar Medium in Galaxies across the Cosmic Web at z=0.73"

11/2016: Physics with Friends, Haverford, PA
"Gas Clouds in Space"

07/2015: National Radio Astronomy Observatory Lunch Talk, Jansky Lab, Green Bank, WV
"Type III Bursts and the Solar Wind"

- Final REU summer presentation

Posters

07/2024: Cool Stars 22, San Diego, CA
"Characterizing Accretion and Formation Mechanisms across the Brown Dwarf and Planetary

Mass Regimes"

03/2024: Extreme Solar Systems V, Christchurch, NZ
"Coronagraphic JWST/NIRCam Images of the 49 Ceti Debris Disk"

06/2023: Origins of Solar Systems Gordon Research Seminar, Holyoke, MA
"Detection of Near-infrared Water Ice at the Surface of the (Pre)Transitional Disk of AB Aur"

05/2023: Planetary Systems and the Origins of Life in the Era of JWST, Baltimore, MD
"Characterizing Accretion and Formation Mechanisms across the Brown Dwarf and Planetary Mass Regimes"

04/2023: Protostars and Planets VII, Kyoto, Japan
"Characterising Accretion and Formation Mechanisms across the Brown Dwarf and Planetary Mass Regimes"

07/2022: Cool Stars 21, Toulouse, France
"NIR Accretion Signatures in the Circumbinary Planetary Mass Companion Delorme 1 (AB)b"

07/2021: 2021 Sagan Exoplanet Summer Virtual Workshop: Circumstellar Disks and Young Planet, Virtual
"Mapping Icy Grains in the Transitional Disk AB Aur"

04/2021: 2021 Virtual STScI Spring Symposium: Towards the Comprehensive Characterization of Exoplanets: Science at the Interface of Multiple Measurement Techniques, Virtual
"Mapping Icy Grains in the Transitional Disk AB Aur"

01/2021: American Astronomical Society Winter Meeting, Virtual
"Mapping Icy Grains in AB Aur: Constraining Composition, Growth, and Filtration"
- iPoster Plus: gave a 5 min talk discussing poster

01/2020: American Astronomical Society Winter Meeting, Honolulu, HI '
'The Role of Environment in Core Formation: Predictions for the TolTEC Clouds to Cores Legacy Survey"
- iPoster Plus: gave a 5 min talk discussing poster

01/2018: American Astronomical Society Winter Meeting, National Harbor, Oxon Hill MD
"Quantifying the Role of Environment in Star Formation: ISM masses along the Cosmic Web with ALMA"

01/2017: American Astronomical Society Winter Meeting, Grapevine, TX
"VLA Observations of the Magnetic Field of the Smith High Velocity Cloud"

09/2016: Start Talking Science

Chemical Heritage Foundation, Philadelphia, PA
"Gas Clouds in Space: How the Smith Gas Cloud survived passing through the Milky Way"
- Only undergraduate presenter

09/2016: Koshland Natural Integrated Science Center Research Symposium, Haverford College, Haverford PA
"Gas Clouds in Space: How the Smith Gas Cloud survived passing through the Milky Way"

01/2016: American Astronomical Society Winter Meeting, Kissimmee, FL
"Probing Solar Wind Turbulence Using JVAS and VLA Calibrator Sources"

Panels

04/2016: Young Women in Physics Conference, Bucknell University, Lewisburg, PA
- Spoke about experiences as a woman in STEM as one of two undergraduates

Workshops

07/2021: Circumstellar Disks and Young Planets, 2021 Sagan Exoplanet Summer Virtual Workshop,

Virtual
03/2020: ALMA Proposal Workshop, Amherst, MA
01/2020: JWST Proposal Planning Workshop, Amherst, MA
05/2018: 16th NRAO Synthesis Imaging Workshop, Soccoro, NM

Observational Programs (*PI)

SOAR 4.1m:
- *2 nights (PID 2023A-267101, PI: S. Betti)
- *3 nights (PID 2022B-171130, PI: S. Betti)
- *2 nights (PID 2022A-336353, PI: S. Betti)
- *4.5 nights (PID 2021B-0311, PI: S. Betti)
- *1 night (PID 2021A-0261, PI: S. Betti)

APO 4.5m:
- * 1 night (2024 JH03, PI: S. Betti)

Hubble Space Telescope:
- 9 orbits (PID GO 17122, PI: C. Robinson)

JWST:
- 17.29 hours (PID 6086, PI: K. Ward-Duong)
- 20.92 hours (PID 6361, PI: K. Follette)
- 4.11 hours (PID 5390, PI: C. Lu)

Keck I:
- 1 night (2022B, PI: K. Follette)
- 1.5 nights (2021B, PI: K. Follette)
- 1 nights (2021A, PI: K. Follette)

VLT:
- 6 hours (113.26AR, PI: S. Ringqvist)
- 7.5 hours (113.26J1, PI: D. Demars)

Teaching Experience

UMass Precollege Summer Astronomy Program **2019–2021**
Course Head and Coordinator | 2020–2021 *Amherst, MA*
Organized and ran a 3 week pre-college astronomy course centered around students learning fundamentals of astronomy through lectures and optical data reduction labs; supervised graduate student teachers, ran observing nights, and organized final student presentations.

Lab Coordinator | 2019, 2022
Developed and taught 3-week Python based optical data reduction and analysis lab course. Organized and managed an observing night at the Amherst College Observatory using 11" Schmidt-Cassegrain telescopes with eyepieces and CCDs.

University of Massachusetts, Amherst **2018–2021**
FCAD Graduate Observational Teaching Assistant | Spring 2018–Fall 2021 *Amherst, MA*
Astronomy 337 & 341 Observational Astronomy courses: Research based courses using the Smith College 12" and 16" Schmidt-Cassegrain telescope and the 0.9 m telescope at Kitt Peak Observatory. Assisted in teaching & mentoring students in conducting research projects.

Lab Teaching Assistant | Fall 2017
Ran and taught Astronomy 100 Laboratory and Discussion sections. Introduced students to basic astronomy concepts using Stellarium.

Haverford College **2015–2017**
Telescope/Lecture Teaching Assistant | 2015–2017 *Haverford, PA*
Trained Astronomy 205: Intro to Astrophysics students on 12" Schmidt-Cassegrain telescope. Assisted Astronomy 206: Intro to Astrophysics students on problem sets and coding in Python.

Grader | 2015–2016
Graded Fundamental Physics student problem sets (Fall 2015), Introduction to Electrodynamics student problem sets (Spring 2016), and Waves and Optics student problem sets (Fall 2016), Introduction to Astrophysics student problem sets (Spring 2017)

Outreach, Service & Activities

Reviewer for: ***ApJ***

Telescope Allocation Committee Member for NOIRLab **2024**

Space Telescope Science Institute **2024-present**

Diversity, Culture, Respect Working Group | Feb. 2024–present *Baltimore, MD*

Part of the DCRWG whose mission is to analyze and address issues of diversity, culture and respect within the STScI Instruments Division

JWST Cycle 3 Panel Support Scientist | Feb. 2024

Maryland Science Center **2024-present**

Observatory Volunteer *Baltimore, MD*

- Run safe solar observing at the Clark Observatory. Set up and operate 8" aperture refractor telescope and dome, engage the public through discussions of solar sunpots, telescope filters, and general astronomy
- Run astronomy-based demonstrations, such as demonstrating the physics of black holes and spectroscopy. Operate the Science on a Sphere visualization system to showcase and describe solar system bodies in 3D.

ULLYSES: Continuing the Voyage of Discovery Workshop at STScI **March 2024**

Science Organizing Committee, Conference Moderator *Baltimore, MD*

University of Massachusetts, Amherst **2019–2023**

UMass Amherst Graduate Student Senate Senator | 2020–2023 *Amherst, MA*

Graduate Women in Stem Sound Bites Cafe Volunteer | 2020–2021

Led discussion and gave presentations about exoplanets and their formation to middle and high school science classes

Department of Astronomy, University of Massachusetts, Amherst **2018–2023**

Member of Graduate DEI Committee | 2020–2023 *Amherst, MA*

Grad student-led committee formed to promote DEI within the astronomy department including retention, diversity, and inclusion within all levels of the department.

Faculty Meeting Graduate Student Representative | Fall 2019, Fall 2020

Graduate Student Recruitment Committee | 2018–2022

Astronomy in the Community, University of Massachusetts, Amherst **2018–2020**

Interview with an Astronomer | 2020 *Amherst, MA*

Led discussions about social issues in space science and was interviewed for a sixth grade project

Astronomy Day Girl Scout Camp Volunteer | Summer 2018

Ran day long event teaching and leading astronomy activities to kindergarten to middle school girl scouts

Local High School Astronomy Club | Spring 2018

Led discussions and presentations about hot astronomy topics including gravitational waves and black holes for students in high school astronomy

Astronomy Public Observing Program, Haverford College **2014–2017**

Astronomy Public Outreach Head | 2015–2017 *Haverford, PA*

Managed and organized the public observing program. Interacted with professional astronomers and astronomy. Delegated jobs and oversaw volunteers at events. Hosted private groups for personal observing by giving talks, leading discussions, and running telescopes.
Public talk: "The Sun: From Birth to Death", March 18, 2016

Astronomy Public Outreach Volunteer | 2014–2015

Ran telescopes and helped with crafts at public observing program
Public talk: "Constellations: What are they and Their Place in Modern Astronomy", March 21, 2015

Haverford College **2014–2017**

Koshland Integrated Natural Science Center Student Advisory Committee *Haverford, PA*

Met with the KINSC program coordinator and the faculty to ensure student funding and programs were available for all Haverford students

Organization Membership

2016-present: American Astronomical Society

2011-2019: International Dark Sky Association

2016-2017: Society of Physics Students

Skills

Software:

- Confluence, JIRA
- Python, IDL, LaTeX, GitHub/GitLab/Grit, (basic) SQL
- CASA, SAOImage ds9
- Querying Large Databases including GAIA and MAST
- Amazon End-User Computing Workspaces
- Software package and tool development
- Data analysis: yt, MCFOST, pyKLIP, photutils, specutils
- Telescope data reduction pipeline development (Roman, LMT, LBT/LMIRCam)

Multiwavlength Data Reduction Experience:

- Optical Imaging: WIYN 0.9 m telescope
- IR Imaging: LBT, APO, IRTF, JWST
- IR Spectroscopy: SOAR
- Sub-mm Interfermetry imaging: Atacama Large Millimeter Array
- Sub-mm imaging: Large Millimeter Telescope Alfonso Serrano
- Radio Interfermetry imaging : Very Large Array

Observing Experience:

- Keck I/LRIS
- Southern Astrophysical Research Telescope/TripleSpec 4.1
- Apache Point Observatory/TripleSpec
- IRTF/iSHELL
- Kitt Peak Observatory 0.9 m WIYN telescope/HDI
- 11" alt-az and equatorial Schmidt-Cassegrain Amherst College telescopes including the SBIG CCD

References

(Functional): Dr. Rachael Beaton, Assistant Astronomer, Space Telescope Science Institute, Baltimore MD, email: `rbeaton@stsci.edu`, 410-338-6751

(Science): Dr. Christine Chen, Astronomer, Space Telescope Science Institute, Baltimore MD, email: `cchen@stsci.edu`, 410-338-5087

(Science): Dr. Kate Follette, Assistant Professor of Astronomy, Amherst College, Amherst MA, email: `kfollette@amherst.edu`, 413-542-593