

SARAH STEIGER

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I am a technologist with experience in high-contrast imaging systems, superconducting detector technologies, and in observing and performing data analysis with large telescopes.

PROFESSIONAL APPOINTMENTS

Space Telescope Science Institute
STScI Postdoctoral Fellow

August 2023 - present

EDUCATION

University of California, Santa Barbara
Ph.D., Physics – Astrophysics Emphasis
Department of Physics

June 2023

Boston College
Bachelor of Science (B.S.), Physics
Minor in Mathematics

May 2017
Cum Laude

RESEARCH EXPERIENCE

Space Telescope Science Institute
Postdoctoral Research

August 2023 - Present
Baltimore, MD

- Demonstrated increased efficiency using superconducting detectors over semiconducting detectors for performing wavefront sensing and control (i.e. “digging a dark zone”) with the Habitable World’s Observatory.
- Developed the Error Budget Software to incorporate wavefront sensing and control information into exoplanet imaging exposure time calculators.
- Assisted with the completion of the Strategic Astrophysics Technology milestones for the High-contrast Imager for Complex Aperture Telescopes (HiCAT) testbed. My work focused on improving the testbed control software and installing a mid-order Zernike wavefront sensor.

UCSB Department of Physics
Graduate Research

July 2017 - June 2023

High-Contrast Imaging with the MKID Exoplanet Camera (MEC)

Santa Barbara, CA

- Lead MEC operator for 20+ engineering and science nights behind SCEXAO at the Subaru Telescope.
- Wrote a Stochastic Speckle Discrimination (SSD) module to leverage the timing ability of MKID detectors to separate starlight and companion signals using only photon arrival time statistics.
- Discovered a low mass stellar companion to the nearby A star HIP109427 with SCEXAO/MEC and SSD.
- Developed The MKID Pipeline, an open-source data reduction and analysis pipeline for current and future UVOIR MKID instruments.

Boston College Department of Physics

August 2016 - May 2017

*Undergraduate Research**Nanoscale Synthesis of Topological Materials using MBE**Chestnut Hill, MA*

- Prepared samples on which to grow topological insulators using Molecular Beam Epitaxy (MBE).
- Utilized the Boston College Clean Room and NanoFabrication Facility to perform photolithography of nano-structures and characterized them using Scanning Electron Microscopy.

TEACHING EXPERIENCE

Adjunct Faculty

August 2022 - June 2023

Santa Barbara City College Department of Earth and Planetary Sciences

- EARTH 103A: Observational Astronomy Lab.
- Utilized the Santa Barbara Museum of Natural History planetarium to illustrate key concepts in observational astronomy such as celestial motion, astronomical coordinate systems, and seasonal constellations.
- Led students in the use of their own Celestron 5SE 5-inch telescopes and performed demonstrations using the 20-inch RCOS Ritchey-Chrétien Telescope for on-sky observations of planets, stars, and deep sky objects.

Teaching Assistant

September 2017 - June 2018

University of California, Santa Barbara

- PHYS 3L. Introductory Physics Laboratory.
- PHYS 134L: Observational Astrophysics.
- PHYS 128L. Advanced Experimental Physics

AWARDS AND HONORS

SPIE Astro 2024 Paper Prize, Summer 2024

STScI Postdoctoral Fellowship, Winter 2023

51 Pegasi b Postdoctoral Fellowship, Winter 2023 [*declined*]

Mananya Tantiwawat Fellowship, Fall 2020

Worster Fellowship, Summer 2019

UCSB Physics Department Service Award, Spring 2019

UCSB Physics Chair's Outstanding Service Award, Spring 2018

UCSB Physics Outstanding Teaching Assistant Award, Spring 2018

Boston College George J. Goldsmith Award, Spring 2017

OUTREACH AND MENTORSHIP

Astronomy Programming Volunteer

July 2021 - June 2023

Santa Barbara Museum of Natural History

- Perform decent duties in the Space Sciences Hall that include providing scientific background for exhibits and answering guest questions.
- Twice a month give solar observing demonstrations at the on-site Palmer Observatory.
- Host six public planetarium shows per month.

Worster Summer Fellowship Graduate Student Mentor June 2019 - October 2019
University of California, Santa Barbara

- Mentored an undergraduate student (now a Ph.D. student in the Stanford University Physics Department) in the use of the UCSB NanoFabrication Facility and our own AJA Sputter system to test the effects various substrate cleaning methods on deposited superconducting film quality.
- Assisted mentee with the preparation of an end of year public presentation on the research project.

Osterbrock Sierra Conference Local Organizing Committee July 2019 - July 2021
University of California, Santa Barbara

- Organizing committee member for a 20-50 person (year depending) graduate student run conference located in the California Sierra Mountains.
- Coordinated food, lodging, activities, and transportation for the 5-10 UCSB conference attendees.

UCSB Physics GradLife President/Communications Officer June 2018 - January 2020
University of California, Santa Barbara

- Served as a Physics Department representative at monthly UCSB Graduate Student Association meetings.
- Organized graduate student lunches with visiting colloquium speakers.
- Designed and distributed a monthly graduate student newsletter highlighting campus and department events of interest.
- Instituted a seminar for incoming physics graduate students on the mental health resources available on campus

UCSB Women and Gender Minorities in Physics Officer October 2018 - January 2022
University of California, Santa Barbara

- Served as club liaison with the UCSB Physics Department Climate Task Force attending bi-monthly meetings and representing Women and Gender Minorities in Physics (WaGMP) issues.
- Organized a day of WaGMP events as part of the broader UCSB prospective graduate student visit day.

PROFESSIONAL PRESENTATIONS

21st International Workshop on Low Temperature Detectors (LTD-21) June 2025
Santa Fe, NM

- Contributed Talk: Wavefront sensing and control with superconducting detectors for the Habitable Worlds Observatory.
- Invited Panelist: The Future of LTDs for Discovery Science to Understand the Universe (Astronomy, Astrophysics, and Cosmology)

- 245th AAS meeting** January 2025
National Harbor, MD
- Poster: yieldplotlib: A unified library for exoplanet yield code visualizations.
- HWO Spectral Retrievals Workshop** November 2024
Baltimore, MD
- Invited Talk: Modeling noise and exposure times for directly imaged exoplanets.
- SPIE Astronomical Telescopes and Instrumentation** June 2024
Yokohama, Japan
- Contributed Talk: Simulated performance of energy-resolving detectors towards exoplanet imaging with the Habitable Worlds Observatory. [awarded SPIE Astro 2024 Paper Prize]
- In the Spirit of Lyot 2022** June 2022
Leiden, Netherlands
- Contributed Talk: The MKID Exoplanet Camera (MEC) for Subaru SCEXAO: Using Stochastic Speckle Discrimination for High-Contrast Imaging with The MKID Pipeline.
- SPIE Optics and Photonics** August 2021
San Diego, CA
- Contributed Talk: On-sky demonstration of stochastic speckle discrimination for companion detection with the MKID Exoplanet Camera (MEC).
- 19th International Workshop on Low Temperature Detectors (LTD-19)** July 2021
Virtual
- Contributed Talk: Discovery of a Low Mass Stellar Companion to HIP 109427 Using Stochastic Speckle Discrimination with The MKID Exoplanet Camera.
- University of California, Santa Cruz PLunch** April 2021
Virtual
- Invited Talk: Using Stochastic Speckle Discrimination to Uncover Directly Imaged Companions with SCEXAO and the MKID Exoplanet Camera.
- Subaru Users Meeting** March 2021
Virtual
- Poster: SCEXAO/MEC and CHARIS Discovery of a Low Mass 6 au Separation Companion using Stochastic Speckle Discrimination and High Contrast Spectroscopy.
- Exoplanets in Southern California** September 2020
Virtual
- Contributed Talk: High Contrast Imaging with the MKID Exoplanet Camera (MEC).
- 18th International Workshop on Low Temperature Detectors (LTD-18)** July 2019
Milan, Italy
- Poster: Anti-reflection Coatings to Improve the Optical Quantum Efficiency of MKID Arrays.

[NASA ADS Library Link](#)

Steiger, S., Chen, P., and Pueyo, L. (submitted). Incorporating Wavefront Error, Wavefront Sensing and Control, and Sensitivities into Exposure Time Calculations with the Error Budget Software (EBS). *Journal of Astronomical Telescopes, Instruments, and Systems*.

Steiger, S. and Spohn, C. (submitted). yieldplotlib: A unified library for exoplanet yield code visualizations. *Journal of Open Source Software*. doi: 10.5281/zenodo.15013340

Mennesson, B., Belikov, R., Por, E.H., [and 34 others including **Steiger, S.**] (2024). Current laboratory performance of starlight suppression systems, and potential pathways to desired Habitable Worlds Observatory exoplanet science capabilities. *Journal of Astronomical Telescopes, Instruments, and Systems*. doi: 10.1117/1.JATIS.10.3.035004

Steiger, S., Brandt, T., Guyon, O., et. al. (2022). Probing Photon Statistics in Adaptive Optics Images with SCExAO/MEC. *AJ*, 164(5), 186. doi: 10.3847/1538-3881/ac922f

Swimmer, N., Currie, T., **Steiger, S.**, et. al. (2022). SCExAO and Keck Direct Imaging Discovery of a Low-Mass Companion Around the Accelerating F5 Star HIP 5319. *AJ*, 164(4), 152. doi: 10.3847/1538-3881/ac85a8

Steiger, S., Bailey, J., Zobrist, N., et. al. (2022). The MKID Pipeline: A Data Reduction and Analysis Pipeline for UVOIR MKID Data. *AJ*, 163(5), 193. doi: 10.3847/1538-3881/ac5833

Steiger, S., Currie, T., Brandt, T., et. al. (2021). SCExAO/MEC and CHARIS Discovery of a Low-mass, 6 au Separation Companion to HIP 109427 Using Stochastic Speckle Discrimination and High-contrast Spectroscopy. *AJ*, 162(2), 44. doi: 10.3847/1538-3881/ac02cc

Zobrist, N., Klimovich, N., Ho Eom, B., Coiffard, G., Daal, M., Swimmer, N., **Steiger, S.**, et. al. (2021). Improving the dynamic range of single photon counting kinetic inductance detectors. *Journal of Astronomical Telescopes, Instruments, and Systems*, 7, 010501. doi: 10.1117/1.JATIS.7.1.010501

Smith, J., Mazin, B., Walter, A., Daal, M., Bailey, I., Bockstiegel, C., Zobrist, N., Swimmer, N., **Steiger, S.**, and Fruitwala, N. (2021). Flexible Coaxial Ribbon Cable for High-Density Superconducting Microwave Device Arrays. *IEEE Transactions on Applied Superconductivity*, 31(1), 3008591. doi: 10.1109/TASC.2020.3008591

Lozi, J., Guyon, O., Vievard, S., [and 49 others, including **Steiger, S.**] (2020). Status of the SCExAO instrument: recent technology upgrades and path to a system-level demonstrator for PSI. In *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series* (pp. 114480N). doi: 10.1117/12.2562832

Swimmer, N., Mazin, B., Bockstiegel, C., [and 14 others, including **Steiger, S.**] (2020). The PICTURE-C MKID camera. In *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series* (pp. 114479B). doi: 10.1117/12.2561770

Walter, A., Fruitwala, N., **Steiger, S.**, et. al. (2020). The MKID Exoplanet Camera for Subaru SCExAO. *PASP*, 132(1018), 125005. doi: 10.1088/1538-3873/abc60f

Coiffard, G., Daal, M., Zobrist, N., Swimmer, N., **Steiger, S.**, Bumble, B., and Mazin, B. (2020). Characterization of sputtered hafnium thin films for high quality factor microwave ki-

netic inductance detectors. *Superconductor Science Technology*, 33(7), 07LT02. doi: 10.1088/1361-6668/ab8d99

Zobrist, N., Coiffard, G., Bumble, B., Swimmer, N., **Steiger, S.**, Daal, M., Collura, G., Walter, A., Bockstiegel, C., Fruitwala, N., Lipartito, I., and Mazin, B. (2019). Design and performance of hafnium optical and near-IR kinetic inductance detectors. *Applied Physics Letters*, 115(21), 213503. doi: 10.1063/1.5127768

Mazin, B., Bailey, J., Bartlett, J., [and 22 others, including **Steiger, S.**] (2019). MKIDs in the 2020s. In *Bulletin of the American Astronomical Society* (pp. 17).

CONFERENCE PROCEEDINGS

Steiger, S., Pueyo, L., Por, E. H., et. al. (2024). Simulated performance of energy-resolving detectors towards exoplanet imaging with the Habitable Worlds Observatory. *Proc. SPIE 13092, 130921W* (June 2024). doi: 10.1117/12.3020603

Soummer, R., Pourcelot, R., Por, E. H., **Steiger, S.**, et. al. (2024). High-contrast imager for complex aperture telescopes (HiCAT): 11. System-level demonstration of the apodized pupil Lyot coronagraph with a segmented aperture in air. *Proc. SPIE 13092, 130921Z* (June 2024). doi: 10.1117/12.3018037

Buralli, B., N'Diaye, M., Pourcelot, R., [and 13 others including **Steiger, S.**] (2024). Mid-order wavefront control for exoplanet imaging: preliminary characterization of the segmented deformable mirror and Zernike wavefront sensor on HiCAT. *Proc. SPIE 13092, 1309268* (June 2024). doi: 10.1117/12.3018900