Sophia K. Vlahakis

NSF Graduate Fellow, PhD Candidate
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EDUCATION

Massachusetts Institute of Technology — Cambridge, MA
Doctor of Philosophy in Aeronautics and Astronautics — Expected May 2026
Master of Science in Aeronautics and Astronautics — May 2022
GPA: 5.0/5.0
Relevant Coursework: *Spacecraft Sensors & Instrumentation, Planetary Science, Satellite Engineering, Physics & Detection of Extrasolar Planets, Exoplanet Atmospheres, Fundamentals of Systems Engineering, System Safety, Waves & Imaging*

The University of Chicago — Chicago, IL
Bachelor of Arts in Physics — June 2020
Relevant Coursework: *Computational Astrophysics, Intermediate Mechanics, Experimental Physics, Observational Astrophysics, Computer Science, Electronics, Quantum Mechanics I&II, Quantum Optics*

Fellowships, Grants, and Awards:

- NSF Graduate Research Fellowship, 2022-2027
- MIT AeroAstro Communication Lab Fellowship, 2025
- NASA FINESST Astrophysics Grant (declined in favor of NSF GRFP), 2022
- 3rd place, Small Satellite Conference FJR Student Research Competition, 2022
- University of Chicago Dean's List, 2016-2019
- Poster Award, Greater Chicago Conference for Undergraduate Women in Physics, 2018
- Heising-Simons Undergraduate Physics Research Award, 2018
- Jeff Metcalf Internship Award, 2017

RESEARCH EXPERIENCE

STAR Lab, Massachusetts Institute of Technology — Cambridge, MA
Doctoral Student Researcher — 2022 – Present

- Designing a Near-Earth Asteroid (NEA) survey for an optical telescope in geosynchronous orbit
- Simulating detections of NEAs to predict the ability of a space telescope to characterize NEAs discovered by Rubin Observatory and NEO Surveyor

STAR Lab, Massachusetts Institute of Technology — Cambridge, MA
Master's Student Researcher — 2020 – 2022

- Developed novel planet-matching algorithms and simulated exoplanet direct imaging detections to improve observation scheduling for exoplanet-finding missions
- Analyzed data from the DeMi CubeSat adaptive optics payload including a Shack-Hartmann wavefront sensor and MEMS deformable mirror to verify successful on-orbit performance
- Led a team performing ground testing and calibration of the multi-spectral Earth-observing payload for the BeaverCube CubeSat, and performed payload trade studies for BeaverCube-II

Vieregg Lab, University of Chicago — Chicago, IL
Undergraduate Researcher — 2019 – 2020

- Improved antenna hardware used for radio detection of ultra-high energy neutrinos in Antarctica
- Simulated antennas using finite element analysis software HFSS, analyzed radio signals and measurements of trigger circuitry, and confirmed simulated antenna gain patterns

University of Chicago Physics Department Chicago, IL
Heising-Simons Research Intern 2018 – 2019

- Designed, constructed, and tested a cosmic ray spark chamber, including creating a circuit amplifying a 1.3 V pulse to 8 kV and delivering it to the chamber plates within 500 nanoseconds

INVITED TALKS

- ❖ Washington University in St. Louis, Department of Physics, AstroMusers Research Group, "Near-Earth Asteroid Follow-Up Observations with a Future Optical Telescope in Geosynchronous Orbit", February 13th, 2026
- ❖ University of Maryland, Department of Aerospace Engineering, Strategic Space Sensing Group, "Near-Earth Asteroid Follow-Up Observations with a Future Optical Telescope in Geosynchronous Orbit", February 13th, 2026
- ❖ MIT Lincoln Laboratory, Group 91 meeting, "Simulating Near-Earth Asteroid Detections for a Future Telescope in Geosynchronous Orbit", July 1st, 2025
- ❖ University of Connecticut, Astronomy Seminar, "The DeMi CubeSat: An Adaptive Optics Demonstration in Space", October 26th, 2022
- ❖ NASA Jet Propulsion Laboratory (JPL), Exoplanet Journal Club, "Reducing Detection Confusion in Multi-Exoplanet Direct Images", May 17th, 2021
- ❖ Massachusetts Institute of Technology, Exoplanet Tea Seminar, "Reducing Detection Confusion in Multi-Exoplanet Direct Images", May 3rd, 2021

PUBLICATIONS

S. K. Vlahakis, T. Daylan, G. Ricker and K. Cahoy, "Designing a Near-Earth Asteroid Survey for a Telescope in Geosynchronous Orbit," 2025 IEEE Aerospace Conference, Big Sky, MT, USA, 2025, pp. 1-10, https://doi.org/10.1109/AERO63441.2025.11068648

Sophia Vlahakis, "On-Orbit Characterization of a Microelectromechanical Systems (MEMS) Deformable Mirror (DM) on the Deformable Mirror Demonstration Mission (DeMi) CubeSat", Small Satellite Conference, Logan, UT, USA, 2022

Leonid Pogorelyuk, Riley Fitzgerald, **Sophia Vlahakis**, Rhonda Morgan, and Kerri Cahoy, "Deconfusing Detections in Directly Imaged Multiplanet Systems", The Astrophysical Journal, Volume 937, Number 2, 2022, https://doi.org/10.3847/1538-4357/ac8d56

Rachel E. Morgan, **Sophia Vlahakis**, Ewan Douglas, Greg Allan, Paula do Vale Pereira, Mark Egan, Gabor Furesz, Jennifer Gubner, Christian Haughwout, Bobby Holden, John Merk, Thomas Murphy, Leonid Pogorelyuk, Danilo Roascio, Yinzi Xin, Kerri Cahoy, "On-orbit operations summary for the Deformable Mirror Demonstration Mission (DeMi) CubeSat," Proc. SPIE 12185, Adaptive Optics Systems VIII, 121857O (29 August 2022); https://doi.org/10.1117/12.2630563

Sophia K. Vlahakis, M.S. Thesis, "On-Orbit Characterization of a Microelectromechanical Systems (MEMS) Deformable Mirror (DM): Mission Results from the Deformable Mirror Demonstration Mission (DeMi) CubeSat", Dept of Aeronautics and Astronautics, Massachusetts Institute of Technology, 2022, https://hdl.handle.net/1721.1/144748

H. Tomio, A. Thieu, A. Gagnon, **S. K. Vlahakis**, S. Kacker, J. Kusters, K. Cahoy, "Commercially Available Imaging Payloads for CubeSat Earth Observation Missions," 2022 IEEE Aerospace Conference (AERO), Big Sky, MT, USA, 2022, pp. 1-19, https://doi.org/10.1109/AERO53065.2022.9843446

Rachel Morgan, **Sophia K. Vlahakis**, Greg Allan, Paula do Vale Pereira, Jennifer Gubner, Christian Haughwout, Bobby Holden, Thomas Murphy, Yinzi Xin, and Kerri L. Cahoy, "Operations Update for the

Deformable Mirror Demonstration Mission (DeMi) CubeSat", Advanced Maui Optical and Space Surveillance Technologies Conference, (31 August 2021)

Rhonda Morgan, **Sophia K. Vlahakis**, Leonid Pogorelyuk, Jenny Grubner, Riley Fitzgerald, Sophia Wang, and Kerri Cahoy "Planet matching and orbit determination in multi-planet systems for exoplanet direct imaging", Proc. SPIE 11823, Techniques and Instrumentation for Detection of Exoplanets X, 118230F (3 September 2021); https://doi.org/10.1117/12.2594998

Lisa Lin, Robin Peter, **Sophia Vlahakis**, Tara Vogel, "Design, Construction, and First Tests of a Demonstration Spark Chamber", Greater Chicago Conference for Undergraduate Women in Physics, Chicago, IL, 2018, https://indico.cern.ch/event/746023/#8-design-construction-and-firs

TEACHING AND MENTORSHIP

Communication Lab, MIT AeroAstro — Cambridge, MA
Comm Lab Fellow — 2025 – Present
- Developing and leading interactive workshops to teach technical communication and writing skills
- Tutoring peers with academic and professional writing, presentations, applications, and more

BeaverWorks Summer Institute, MIT Lincoln Lab — Cambridge, MA
Teaching Assistant — Summer 2025
- Taught principles of remote sensing and disaster response to high schoolers, including python coding skills, Geospatial Information Systems (GIS), image processing, and deep learning
- Assisted with development of course material and designed an interactive lesson on asteroids

Graduate Applicant Assistance Program, MIT AeroAstro — Cambridge, MA
GAAP mentor — 2020 – Present
- Six-time volunteer mentoring marginalized applicants to the AeroAstro graduate program

Graduate Women in Aerospace Engineering, MIT — Cambridge, MA
Outreach Committee Leader — 2020 – 2023
- Taught several space science and engineering guest classes to K-12 students through SPLASH and Skype a Scientist, including to classrooms with majority blind and disabled students
- Volunteered as a NetPals mentor assisting local high school students with science fair projects

IDATA Education Research Project, Yerkes Observatory — Williams Bay, WI
IDATA Project Mentor — 2018 – 2019
- Developed accessible data processing software and promoted accessibility in astronomy for blind and low-vision individuals as part of an NSF-funded STEM education research project
- Designed and implemented accessible classroom activities to teach computer science and astronomy principles to both blind and sighted students across the US

COMMUNITY LEADERSHIP

Disabled@MIT, MIT — Cambridge, MA
President and founder — 2023 – Present
- Founded MIT's first student-led disability affinity group, building community among disabled students through planning educational and social events, and advocating for campus accessibility
- Managed mutual aid projects including distributing masks as a COVID-Safe Campus Ambassador

American Sign Language (ASL) and Deaf Culture Club, MIT — Cambridge, MA
President — 2022 – Present
- Organized ASL classes at MIT with local Deaf instructors through a Mind, Hand, Heart grant

- Hosting a recurring event series for both Deaf and hearing MIT community members to share experiences, practice ASL skills, and learn about Deaf culture
- Teaching Assistant for a beginner-level ASL class taught by a Deaf MIT student

Adaptive Climbing Group Somerville, MA

Volunteer 2024 – Present

- Teaching disabled children rock climbing and serving as a belay partner for disabled adults