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, Computational Sci & Eng I*

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, Math Methods of Physics, Statistical Methods, Electronics, Quantum Mechanics I & II, Foundations of Quantum Optics, Intro to Data Science*

Fellowships, Grants, and Awards:
❖ NSF Graduate Research Fellowship, 2022-2027
❖ NASA FINESST Astrophysics Grant (declined in favor of NSF GRFP), 2022-2025
❖ MIT AeroAstro Communication Lab Fellowship, 2025
❖ MIT GSC Conference Travel Grant, 2024
❖ NASA Exploration Science Forum Travel Award, 2022
❖ 3rd place, Small Satellite Conference FJR Student Research Competition, 2022
❖ Small Satellite Conference Travel Award, 2022
❖ University of Chicago Dean's List, 2016-2019
❖ Enrico Fermi Institute Undergraduate Research Stipend Award, 2019
❖ Greater Chicago Conference for Undergraduate Women in Physics Poster Award, 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, Graduate Research Assistant 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
Masters Student, Graduate Research Assistant 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 for verification of on-orbit performance
- Led a team performing ground testing and calibration of the multi-spectral Earth-observing payload for the BeaverCube CubeSat

Vieregg Lab, University of Chicago   Chicago, IL
Undergraduate Research Assistant   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

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

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

Communication Lab, MIT AeroAstro
Cambridge, MA
Comm Lab Fellow — 2025 – Present
- Developing and leading writing workshops to teach scientific and technical communication 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 asteroid lesson

Graduate Women in Aerospace Engineering, MIT
Cambridge, MA
Outreach Committee Leader — 2020 – 2023
- Taught multiple 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 their science fair projects
- Mentoring marginalized applicants to the AeroAstro graduate program through GAAP

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 country

COMMUNITY INVOLVEMENT

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

American Sign Language (ASL) and Deaf Culture Club, MIT   Cambridge, MA
President   2022 – Present
- Hosting a successful event series for hearing and Deaf MIT community members to share experiences, practice ASL skills, and learn about Deaf culture
- Organized ASL classes with a local Deaf instructor through a Mind, Hand, Heart grant

Adaptive Climbing Group   Somerville, MA
Volunteer   2024 – Present
- Teaching disabled children rock climbing and serving as a belay partner for disabled adults