

Sophia K. Vlahakis
NSF Graduate Fellow, PhD Candidate
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EDUCATION

Massachusetts Institute of Technology

Doctor of Philosophy in Aeronautics and Astronautics
Master of Science in Aeronautics and Astronautics
GPA: 5.0/5.0

Cambridge, MA
Expected May 2026
May 2022

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

Bachelor of Arts in Physics

Chicago, IL
June 2020

Relevant Coursework: *Computational Astrophysics, Experimental Physics, Intermediate Mechanics, Observational Astrophysics, Computer Science, Math Methods of Physics, Statistical Methods, Electronics, Quantum Mechanics I & II, Foundations of Quantum Optics, Intro to Data Science*

Awards, Grants, and Fellowships:

- ❖ NSF Graduate Research Fellowship, 2022-2027
- ❖ MIT AeroAstro Communication Lab Fellowship, 2025
- ❖ MIT GSC Conference Travel Grant, 2024
- ❖ NASA Exploration Science Forum Travel Award, 2022
- ❖ NASA Astrophysics FINESST Grant (declined), 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

Doctoral Student, Graduate Research Assistant

Cambridge, MA
June 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

Masters Student, Graduate Research Assistant

Cambridge, MA
June 2020 – May 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, Kavli Institute for Cosmological Physics, Univ. of Chicago

Chicago, IL

Undergraduate Research Assistant

March 2019 – June 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

Univ. of Chicago Physics Department

Chicago, IL

Heising-Simons Research Intern

June 2018 – March 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

BeaverWorks Summer Institute, MIT Lincoln Lab

Cambridge, MA

Teaching Assistant

July 2025 – August 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

September 2020 – June 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

March 2018 – December 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