

Advik D. Vira, Ph.D.

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Education

- 2020 – 2026  **Ph.D., Physics, Georgia Institute of Technology**
 Dissertation: *Radiation Effects, Dust Dynamics, and Petrology of Lunar Materials: Insights from Computational Modeling and Electron Microscopy*,
Advisors: Prof. Phillip N. First & Prof. Zhigang Jiang (co-advisor).
 Doctoral Minor in Teaching and Learning for Higher Education.
-  **M.S., Physics, Georgia Institute of Technology**
- 2014 – 2018  **B.A., Physics, Smith College** with highest honors.
 Honors Thesis: *High Precision Spectroscopy of Beryllium Lowest Singlet State*,
Advisor: Prof. William D. Raven.
-  **B.A., Mathematics, Smith College**

Research

- 2026-Present  **Postdoctoral Research Associate in Space Division, Los Alamos National Laboratory.**
- 2020-2026  **Doctoral Research in Materials Physics, Georgia Institute of Technology.**
- Experimental Characterization of Lunar Materials via High-Resolution Electron Microscopy:
 - Performed nanoscale characterization of Apollo Rock 75035 using focused ion beam (FIB) and electron microscopy techniques (STEM/EELS) to advance lunar petrology:
 - Measured Ti^{3+} in ilmenite to uncover Moon's early chemistry [*Nat. Comm.* **17**, 2712 (2026)];
 - Identified pyroxene lamellae exhibiting antiphase domain boundaries (manuscript, in prep).
 - Irradiated terrestrial ilmenite to recreate the solar wind plasma and demonstrated that solar wind alone can induce the information of nanophase iron [*Planet. Sci. J.* **7** 147].
 - Computational Modeling of Materials for Space Exploration Applications:
 - Developed a kinetic Monte Carlo code using the Geant4 simulation framework to model the accumulation of charge in dielectric dust grains, called [g4chargeit](#) (under review in *J. Comput. Phys.*).
 - Simulated the optimal boron distribution in polyethylene shielding composites using Geant4 for incorporation into radiation protection equipment [*APL Materials* **11**, 101104 (2023)].
- 2018-2020  **Postbaccalaureate Researcher in Space Division, Los Alamos National Laboratory.**
- Simulated response of solid-state detectors using Monte Carlo code called SRIM/TRIM and compared to on-orbit satellite measurements from national security instruments (unpublished).
 - Developed a Bayesian model of ion spectra from HOPE aboard the NASA Van Allen Probes using SRIM/TRIM, demonstrating excellent agreement with on-orbit data [*JGR: Space Physics*, **126** (2021)].
- 2014-2018  **Highest Honors Undergraduate Thesis in Atomic Physics, Smith College.**
- Measured lowest singlet state of beryllium-9, achieving the highest precision to date [*Phys. Rev. Lett.*, **89** (2018)].
 - Performed numerical analysis and modeling of quantum states using optical Bloch equations.
- 2017-2018  **Research Fellow in Solar Physics, Smithsonian Astrophysical Observatory.**
- Summer 2017  **NSF Research Experience in Solar Physics, Harvard-Smithsonian Center for Astrophysics.**
- Summer 2016  **DOE Science Internship in Physics Division (pRad), Los Alamos National Laboratory.**

Publications

Under Review

- 1 Funsten, H. O., Dors, E. E., Fernandes, P. A., Harper, R. W., Ritzau, S. M., Skoug, R. M., Steinberg, J. T. & **Vira, A. D.**, Exploiting the Physics of Ion Energy Loss in Solid State Detectors for Composition Measurement of Space Plasmas, *Journal of Geophysical Research: Space Physics* (2026).
- 2 Gandhi, K. P., **Vira, A. D.**, Farrell, W. M., Simonov, N., Romero-Calvo, A., Orlando, T. M., First, P. N. & Jiang, Z., g4chargeit: Geant4-based kinetic Monte Carlo simulations of charging in dielectric materials, *Journal of Computational Physics* (2026). [doi:10.2139/ssrn.6352017](https://doi.org/10.2139/ssrn.6352017)
- 3 Huang, Z., **Vira, A. D.**, Trivedi, R. S., Jiang, Z., First, P. N., Hirabayashi, M., Jones, B. M. & Orlando, T. M., Solar Wind-induced Oxygen Vacancies Nucleate Nanophase Iron in Lunar Regolith, *AGU Advances* (2026).

Published

- 4 Trivedi, R. S., **Vira, A. D.**, Jones, B. M., Burgess, K. D., Huang, Z., Liu, H., Rane, P., Tian, M., Hirabayashi, M., Orlando, T. M., Jiang, Z. & First, P. N., Creation of Lunar-Like Rims in Ilmenite using Synthetic Solar Wind, *The Planetary Science Journal* (2026). [doi:10.3847/PSJ/ae6074](https://doi.org/10.3847/PSJ/ae6074) [R.S.T and A.D.V contributed equally]
- 5 **Vira, A. D.**, Burgess, K. D., First, E. C., Tian, M., Eames, K. M., Trivedi, R. S., Dotson, G. K., Kim, D. M., Farr, T. P., Lisabeth, H., Tamura, N., Livernois, E. R., Jones, B. M., Orlando, T. M., Jiang, Z. & First, P. N., Trivalent Titanium in High-Titanium Lunar Ilmenite, *Nature Communications* **17** 2712 (2026). [doi:10.1038/s41467-026-69770-w](https://doi.org/10.1038/s41467-026-69770-w)
- 6 Kim, C., Rathi, S., Zhang, N., Seth, A., Simonov, N. V., Rutherford, A., Chen, L., Zhou, H., Peng, C., Xu, M., Xie, W., **Vira, A. D.**, Tian, M., Ozerov, M., Kimchi, I., Mourigal, M., Smirnov, D. & Jiang, Z., Sharp spectroscopic fingerprints of disorder in an incompressible magnetic state, *Nature Communications* **17** 661 (2025). [doi:10.1038/s41467-025-67394-0](https://doi.org/10.1038/s41467-025-67394-0)
- 7 Schaible, M. J., Dotson, G. K., Trivedi, R., **Vira, A. D.** & Hand, K. P., Solar wind sputtering of secondary ions from water-ice-covered regolith analogs, *The Planetary Science Journal* **6** 219 (2025). [doi:10.3847/PSJ/adfc4f](https://doi.org/10.3847/PSJ/adfc4f)
- 8 **Vira, A. D.**, Mone, E. M., Ryan, E. A., Connolly, P. T., Smith, K., Roecker, C. D., Mesick, K. E., Orlando, T. M., Jiang, Z. & First, P. N., Designing a boron nitride polyethylene composite for shielding neutrons, *APL Materials* **11** (10): 101104 (2023). [doi:10.1063/5.0163377](https://doi.org/10.1063/5.0163377)
- 9 Samra, J. E., Marquez, V., Cheimets, P., DeLuca, E. E., Golub, L., Hannigan, J. W., Madsen, C. A., **Vira, A. D.** & Adams, A., The Airborne Infrared Spectrometer: Development, Characterization, and the 2017 August 21 Eclipse Observation, *The Astronomical Journal* **164** 39 (2022). [doi:10.3847/1538-3881/ac7218](https://doi.org/10.3847/1538-3881/ac7218)
- 10 **Vira, A. D.**, Larsen, B. A., Skoug, R. M. & Fernandes, P. A., Bayesian Model for HOPE Mass Spectrometers on Van Allen Probes, *Journal of Geophysical Research: Space Physics* **126** e2020JA028862 (2021). [doi:10.1029/2020JA028862](https://doi.org/10.1029/2020JA028862)
- 11 Cook, E. C., **Vira, A. D.** & Williams, W. D., Resonant two-photon spectroscopy of the $2s3d\ ^1D_2$ level of neutral ^9Be , *Physical Review A* **101** 042503 (2020). [doi:10.1103/PhysRevA.101.042503](https://doi.org/10.1103/PhysRevA.101.042503)
- 12 **Vira, A. D.**, Fernandes, P. A., Skoug, R. M., Funsten, H. O. & Reisenfeld, D. B., Understanding Mass Resolution of Foil-Based Time-of-Flight Mass Spectrometry, *Journal of Geophysical Research: Space Physics* **125** e2020JA027971 (2020). [doi:10.1029/2020JA027971](https://doi.org/10.1029/2020JA027971)
- 13 **Vira, A. D.**, Fernandes, P. A., Funsten, H. O., Morley, S. K., Yamaguchi, H., Liu, F. & Moody, N. A., Angular scattering of protons through ultrathin graphene foils: Application for time-of-flight instrumentation, *Review of Scientific Instruments* **91** 033302 (2020). [doi:10.1063/1.5134768](https://doi.org/10.1063/1.5134768)

- 14 Judge, P., Berkey, B., Boll, A., Bryans, P., Burkepile, J., Cheimets, P., DeLuca, E., De Toma, G., Gibson, K., Golub, L., Hannigan, J., Madsen, C., Marquez, V., Richards, A., Samra, J., Sewell, S., Tomczyk, S. & **Vira, A. D.**, Solar Eclipse Observations from the Ground and Air from 0.31 to 5.5 Microns, *Solar Physics* **294** 166 (2019).
[doi:10.1007/s11207-019-1550-3](https://doi.org/10.1007/s11207-019-1550-3)
- 15 Cook, E. C., **Vira, A. D.**, Patterson, C., Livernois, E. & Williams, W. D., Testing Quantum Electrodynamics in the Lowest Singlet State of Neutral Beryllium-9, *Physical Review Letters* **121** 053001 (2018).
[doi:10.1103/PhysRevLett.121.053001](https://doi.org/10.1103/PhysRevLett.121.053001)
- 16 Patterson, C., **Vira, A. D.**, Herd, M. T., Hawkins, W. B. & Williams, W. D., Calibrating an ultra-low expansion cavity for high precision spectroscopy from 630 THz to 685 THz using molecular tellurium lines, *Review of Scientific Instruments* **89** 033107 (2018). [doi:10.1063/1.5008290](https://doi.org/10.1063/1.5008290) [C.P. and A.D.V contributed equally]
- 17 **Vira, A. D.**, Samra, J., Cheimets, P., DeLuca, E., Fedeler, S., Guth, G. & Marquez, V., Image stabilization for Airborne Infrared Spectrometer, *Infrared Remote Sensing and Instrumentation XXVI* **10765** (2018).
[doi:10.1117/12.2319890](https://doi.org/10.1117/12.2319890) [not peer-reviewed]

Grants

- | | |
|-------------|---|
| 2023 - 2028 | CLEVER: Center for Lunar Environment and Volatile Exploration Research
NASA Solar System Exploration Research Virtual Institute (SSERVI)
Contributed to proposal writing and funded as a Ph.D. Student, Total: █████
PI: Prof. Thomas M. Orlando, Deputy PI: Prof. Frances Rivera-Hernández |
| Spring 2025 | Co-location Fellowship, “Advancing our understanding of lunar petrology”
Center for Space Technology and Research (CSTAR), Georgia Institute of Technology
Wrote proposal and funded as a Ph.D. Student, Total: █████
PI: Prof. Phillip N. First, Collaborator: Dr. Katherine D. Burgess |
| Fall 2024 | Seed Funding, “Support for investigations of a lunar mineral”
Center for Space Technology and Research (CSTAR), Georgia Institute of Technology
Funded as a Ph.D. Student, Total: █████, PI: Prof. Phillip N. First |
| 2021-2024 | Seed Funding, “Materials development for additive manufacture of radiation sensors”
NASA CAN, Funded as a Graduate Student, Total: █████, PI: Prof. Phillip N. First |
| 2017-2022 | REVEALS: Radiation Effects on Volatiles & Exploration of Asteroids and Lunar Surfaces
NASA Solar System Exploration Research Virtual Institute (SSERVI)
Funded as a Graduate Student, Total: █████, PI: Prof. T. M. Orlando |

Presentations

Invited Seminars

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| 04/2025 | ● Planetary Sample Science Seminar [virtual]
“Nanoscale characterization of Apollo lunar samples”, Orlando, T. M. & Vira, A. D. |
| 03/2024 | ● University of Georgia, Center for Simulation Physics [Athens, GA]
“Computational Perspective on Material Interactions with Lunar Radiation”, Vira, A. D. |
| 09/2023 | ● Los Alamos National Laboratory, Space Science and Applications [Los Alamos, NM]
“Designing Boron Nitride Polyethylene Composites for Shielding Neutrons”, Vira, A. D. |
| 12/2022 | ● Smith College, Physics Department [Northampton, MA]
“Material Solutions for Radiation Protection in Space Exploration”, Vira, A. D. |

Conferences (Oral)

- 07/2024 ● **NASA Exploration Science Forum** [St. Louis, MO]
“*Role of Near-Surface Vesicles in Lunar Water Formation*”, **Vira, A. D.**, Trivedi, R. S., Rane, P., Schaible, M. J., Orlando, T. M., Jiang, Z. & First, P. N.
- 12/2023 ● **Geant4 Space Users Workshop** [Pasadena, CA]
“*Designing Boron Nitride Polyethylene Composites for Shielding Neutrons*”, **Vira, A. D.**, Ryan, E. A., Mone, E. M., Connolly, P. T., Smith, K., Roecker, C. D., Mesick, K. E., Orlando, T. M., Jiang, Z. & First, P. N.
- 07/2023 ● **NASA Exploration Science Forum** [College Park, MD]
“*Designing Boron Nitride Polyethylene Composites for Shielding Neutrons*”, **Vira, A. D.**, Ryan, E. A., Mone, E. M., Connolly, P. T., Smith, K., Roecker, C. D., Mesick, K. E., Orlando, T. M., Jiang, Z. & First, P. N.
- 03/2022 ● **American Physical Society March Meeting** [Chicago, IL]
“*Effective g-factor and phase-coherent transport in InAsSb/InSb double quantum wells*”, **Vira, A. D.**, Zhao, T., Zhang, L. Z., First, P. N., Pan, W., Ermolaev, M., Kipshidze, G., Suchalkin, S. & Jiang, Z.
- 07/2019 ● **Ion Composition in the Sun-Earth System** [Durango, CO]
“*Observations of Oxygen Abundance Enhancements in the Inner Magnetosphere*”, **Vira, A. D.**, Fernandes, P. A., Skoug, R. M. S., Thomsen, M. F., Larsen, B. A. L., Reeves, G. & Funsten, H.
- 12/2019 ● **American Geophysical Union** [San Francisco, CA]
“*Model of Solid-State Detectors for Space Plasma Spectroscopy*”, **Vira, A. D.**, Funsten, H. O., Fernandes, P. A., Skoug, R. M., Greco, R., Steinberg, J. T. & Larsen, B.
- 08/2018 ● **International Society for Optics and Photonics Conference** [San Diego, CA]
“*Image Stabilization for Airborne Infrared Spectrometer*”, **Vira, A. D.**, Samra, J., Cheimets, P., DeLuca, E. & Marquez, V.

Conferences (Poster)

- 03/2025 ● **56th Lunar and Planetary Science Conference** [Woodlands, TX]
“*Uncovering the Mysteries Hidden in Apollo 17 Rocks*”, **Vira, A. D.**, Burgess, K. D., Kim, D., Eames, K. M., Trivedi, R. S., Tian, M., Orlando, T. M., Jiang, Z. & First, P. N.
- 07/2022 ● **NASA Exploration Science Forum** [Boulder, CO]
“*Radiation Shielding and Dosimetry: Simulations and Experiments*”, **Vira, A. D.**, Alandmatouq, F., Mone, E. M., Connolly, P. T., Ryan, E. A., Smith, K., Roecker, C. D., Mesick, K. E., Mukhopadhyayand, S., Orlando, T. M., Jiang, Z. & First, P. N.
- 11/2022 ● **Lunar Surface Innovation Consortium Fall Meeting** [virtual]
“*Radiation Protection: Polymer-Based Shielding Composites*”, **Vira, A. D.**, Ryan, E. A., Mone, E. M., Connolly, P. T., Smith, K., Roecker, C. D., Mesick, K. E., Orlando, T. M., Jiang, Z. & First, P. N.
- 12/2018 ● **American Geophysical Union** [Washington, DC]
“*Van Allen/HOPE: Oxygen Abundance Enhancements in the Inner Magnetosphere*”, **Vira, A. D.**, Fernandes, P. A., Skoug, R. M. S., Thomsen, M. F., Larsen, B. A. L., Reeves, G. & Funsten, H.
- 01/2017 ● **Optics and Photonics Winter School and Workshop** [Tucson, AZ]
“*Calibrating an Ultra-Low Expansion Cavity for High Precision Spectroscopy*”, Patterson, C., **Vira, A. D.**, Hawkins, W. B. & Raven, W. D.
- 06/2017 ● **APS Division of Atomic, Molecular, and Optical Physics** [Sacramento, CA]
“*Testing Quantum Electrodynamics in the Lowest Singlet State of Be-9*”, **Vira, A. D.**, Patterson, C., Hawkins, W. B. & Raven, W. D.
- 08/2017 ● **American Geophysical Union** [New Orleans, LA]
“*Characterization of Airborne Infrared Spectrometer for 2017 Solar Eclipse*”, **Vira, A. D.**, Samra, J., Cheimets, P., DeLuca, E., Fedeler, S., Guth, G. & Marquez, V.

Teaching

Spring 2024 ■ **Co-Instructor, Graduate Computational Physics, Georgia Institute of Technology.**

- Worked with Prof. John H. Wise to modify syllabus, organize topics, and design homework assignments.
- Developed course material and delivered lectures on the following topics: Monte Carlo and Molecular Dynamics, HPC capabilities, and radiation transport.

2023–2024 ■ **Graduate Teaching Fellow, Georgia Institute of Technology.**

- Led institute-wide TA training sessions through the Center for Teaching and Learning.
- Conducted classroom observations for CIRTLL students.

2022–2023 ■ **Teaching Assistant, Introductory Physics I, Georgia Institute of Technology.**

2015–2017 ■ **Teaching Assistant, Undergraduate Electronics, Smith College.**

Mentoring

Graduate Students [2]

2024–2026 ● **Roshan Trivedi**, *Georgia Tech* (advised on ilmenite irradiation project).

2023–2024 ● **Benyuan Liu**, *Georgia Tech* (co-advised on HPC SLURM management).

Undergraduate Students [10]

2023–2026 ● **Kush Gandhi**, *Georgia Tech* (advised on Geant4 to develop g4chargeit);
Starting Ph.D. at Duke University (Fall 2026), First-authored publication in *J. Comput. Phys.*
Interned with collaborators at Los Alamos National Laboratory (Summer 2024).

2024–2025 ● **Keyes Eames**, *Georgia Tech* (co-advised on microscopy data analysis using ML);
Now Ph.D. student at University of California, Santa Barbara.

● **Dean Kim**, *Georgia Tech* (co-advised on 4D-STEM data analysis);
Now at IBM.

Summer 2024 ● **Pranav Rane**, *Haverford College* (co-advised on electron microscopy, REU intern);
Now Ph.D. student at California Institute of Technology.

Summer 2023 ● **John Le**, *Colorado College* (co-advised on experimental projects, REU intern);
Now Ph.D. student at Rice University.

Spring 2023 ● **Shahana Lahiri**, *Georgia Tech* (advised on Geant4 post-processing).

Summer 2022 ● **Grant Mayberry**, *University of Tulsa* (co-advised on graphene simulations, REU intern);
Now Ph.D. student at Vanderbilt University.

2021–2022 ● **Elizabeth Mone**, *Georgia Tech* (advised on Geant4, co-authored publication);
Now Ph.D. student at Northwestern University.

● **Nikolai Simonov**, *Georgia Tech* (co-advised on autoCAD projects).
Continued as Ph.D. student at Georgia Tech.

Fall 2021 ● **Patrick Connolly**, *Georgia Tech* (co-advised on MCNP simulations).

High School Students [3]

Summer 2024 ● **Gianmarco Pelino**, *Atlanta International School* (advised on XRF analysis).

Summer 2023 ● **Brent Shi**, *Atlanta International School* (advised on Geant4 crystal incorporation).

Summer 2022 ● **Marco Bertolini**, *Atlanta International School* (advised on Geant4 autoCAD compatibility).

Outreach

- May 2026 ● **CLEVER Workforce Development Summer Program**, Georgia Institute of Technology.
- 2022–2024 ● **Mentored High School Students**, Summer Internship, Atlanta International School.
- 2019–2020 ● **Founded Asian Pacific Islander ERG**, Los Alamos National Laboratory.
- Spring 2018 ● **Science Enrichment Educator**, Jackson Street Elementary School.

Awards

Fellowships

- 2024–2025 ● **Graduate Teaching Fellow**, Center for Teaching and Learning, Georgia Tech, Total: █████.
- Fall 2022 ● **Bonnie B. and Charles K. Rice Jr. Fellowship Award**, Georgia Tech, Total: █████.
- Spring 2022 ● **College of Science Student Travel Grant**, Georgia Tech. Total: █████.
- **Amelio Endowment Graduate Student Travel Grant**, Georgia Tech, Total: █████.
- 2020–2024 ● **Georgia Tech Institute Fellowship**, Georgia Tech, Total: █████.
- **Georgia Tech President's Fellowship**, Georgia Tech, Total: █████.

Honors

- 12/2022 ● **Thank-a-Teacher Note and Certificate**, Georgia Tech.
- 09/2020 ● **Spot Award**, *Initiative or creativity in addressing a critical need or difficult problem*, LANL.
- 06/2019 ● **Spot Award**, *Recognized for Outstanding Contributions to ZPS Instrument Modelling*, LANL.
- 08/2018 ● **Instruments Research Excellence Award**, MKS Instruments Research Excellence Award.
- 05/2018 ● **Highest Honors in Physics**, Smith College.
- **Exceptional Achievement and Departmental Service Award**, Physics, Smith College.

Press

- 06/2026 ● **Georgia Tech story of laboratory creation of lunar rocks**,
<https://news.research.gatech.edu/2026/06/10/georgia-tech-scientists-create-moon-rock-lab>.
- 03/2026 ● **New study of trivalent Ti in lunar ilmenite published in Nat. Comm.**,
[Brief in The Conversation](#) & [Press Release from Georgia Tech](#).
- 09/2023 ● **Announcement of Graduate Teaching Fellows**,
<https://ctl.gatech.edu/2023-2024-graduate-teaching-fellows-cohort/>.
- 04/2021 ● **Bayesian model highlighted in New Mexico Consortium website**,
<https://newmexicoconsortium.org/nmc-scientists-publish-journal-geophysical-research/>.

Affiliations

- 2020–2026 ● **Sigma Xi**, Georgia Institute of Technology.
- 2018–2020 ● **American Geophysical Union**, Los Alamos National Laboratory.