COLIN D. HAMILL

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Education

PhD **Purdue University**, Planetary Science (Expected Graduation) 2024
Thesis: Characterizing the light scattering properties of exoplanet cloud analogs through laboratory and modeling endeavors

BS **Towson University**, Physics, Astrophysics Concentration 2020
University Honors Scholar
Cum Laude

Research Experience

Graduate Research Assistant 2020 - Present
Purdue University, Alexandria Johnson, PhD

- Design and test a new lab apparatus to measure light scattering from particles.
- Characterize light scattering and polarizing properties of irregular cloud particles in the lab to better understand the radiative properties of exoplanet atmospheres.
- Make significant contributions to an open-source radiative transfer model to simulate reflected light from exoplanets.

Intern / Temporary On-Call Employee 2019 - 2020
Applied Physics Laboratory, Nancy Chabot, PhD

- Investigated the evolution and implications of volatile deposits in Mercury's polar craters using data from the MESSENGER mission.
- Created and analyzed geochemical properties of metal samples in the Meteorite Lab using a high-temperature furnace and a scanning electron microscope.

Undergraduate Research Assistant 2017 - 2019
Towson University, Jennifer Scott, PhD

- Researched properties of the circumgalactic medium using quasar spectra and photometric data from the Sloan Digital Sky Survey.

Policy Experience

Graduate Representative, Federal Relations Subcommittee 2022 - Present
American Astronomical Society's Division for Planetary Sciences

Policy Classes, Purdue University 2022 - Present
Environmental Policy Graduate Seminar (POL 623: Spring 2024)
Environmental Politics and Public Policy (POL 523: Fall 2022)

Attendee, Summer Policy Colloquium in Washington D.C. 2022
American Meteorological Society

Teaching Experience

Teaching Assistant, Purdue University 2020 - 2022
- Introduction to Atmospheric Science (EAPS 117: Fall 2022)
- Planet Earth (EAPS 100: Summer 2022, Spring 2022, Spring 2021)
- Fossil Fuels, Energy, and Society (EAPS 375: Summer 2021)
- Introduction to Atmospheric Observations and Measurements (EAPS 227: Fall 2020)
- Science of the Atmosphere (EAPS 225: Fall 2020)

Learning Assistant and Grader, Towson University 2018 - 2020
- Stars, Galaxies, and the Early Universe (ASTR 181: Spring 2020, Fall 2019)
- The Sky and the Solar System (ASTR 161: Spring 2019)
- Astrophysical Techniques (ASTR 303: Fall 2018)

Honors and Awards

Purdue University Departmental Outstanding Presentation Awards (2) 2022 - 2024
Electromagnetic Light Scattering Conference Graduate Travel Support Award 2023
Purdue University Departmental Graduate Student Conference Support Award 2022
Purdue University Departmental One-Minute Research Blitz Presentation Award 2022
NSF Full Funding for AMS Summer Policy Colloquium Attendance 2022
Purdue University *InnovatED* Cover Story Award 2022
Purdue University Graduate Student International Travel Grant 2021
Purdue University Ross-Lynn Research Scholars Grant 2021
Towson University Departmental Senior Rubendall Award 2020
Towson University Departmental Eddie L. Loh Undergraduate Physics Scholarship 2019
Towson University Undergraduate Travel Research Award 2019
Maryland Space Grant Consortium Scholarship 2017 - 2020
Towson University Dean's List 2017 - 2020
Towson University Honors College Scholarship 2016 - 2020
Towson University Provost Scholarship 2016 - 2020
Towson University Top Ten Percent Scholarship 2016 - 2020
Loch Raven High School James T. Smith Scholarship 2016

Mentorship

Research Mentor: Rowan Nag, Undergraduate, Purdue University 2023 - Present
Research Mentor: Emma Miller, Undergraduate, Purdue University 2022 - 2023

Leadership & Service

President: Departmental Graduate Student Association (GSA) 2023 - 2024
Reviewer: Journal of Applied Meteorology and Climatology 2023
Executive Secretary: NASA Review Panels (2) 2021 - 2022
Senator: Purdue Graduate Student Government (PGSG) 2021 - 2022
Executive Board: Towson University Society of Physics Students (SPS) 2019 - 2020

Outreach

Outreach Coordinator: Towson University Society of Physics Students 2019 - 2020
Volunteer: Towson University Society of Physics Students 2017 - 2019

Refereed Publications

[8] **Hamill, C.D.**, Johnson, A.V., Lodge, M., Gao, P., Nag, R., Batalha, N. (2024), "The Impacts of Cuboid Particle Scattering on Reflected Light Phase Curves: Insights from Laboratory Data and Theory." *Astrophysical Journal*, in prep.

[7] **Hamill, C.D.**, Johnson, A.V., Batalha, N., Nag, R., Gao, P. (2024), "Reflected Light Phase Curves with PICASO: A Kepler-7b Case Study." *Astrophysical Journal*, in review.

[6] **Hamill, C.D.**, Johnson, A.V., Gao, P. (2024), "Light Scattering Measurements of KCl Particles as an Exoplanet Cloud Analog." *Planetary Science Journal*, doi: 10.3847/PSJ/ad6569. Accepted.

[5] Glantzberg, A.K., Chabot, N.L., Barker, M.K., Mazarico, E.M., Siegler, M.A., Martinez Camacho, J.M., **Hamill, C.D.**, Rivera-Valentín, E.G., Meyer, H., Bertone, S., Deutsch, A.N. (2023), "Investigating the Stability and Distribution of Surface Ice in Mercury's Northernmost Craters." *Planetary Science Journal*, 4, 6. doi: 10.3847/PSJ/acd68d.

[4] Bertone S., Mazarico E.M., Barker M.K., Siegler M.A., Martinez Camacho J.M., **Hamill C.D.**, Glantzberg A.K., Chabot N.L. (2022), "Highly Resolved Topography and Illumination at Mercury's South Pole from MESSENGER MDIS-NAC." *Planetary Science Journal*, 4, 2. doi: 10.3847/PSJ/acaddb.

[3] Barker M.K., Chabot N.L., Mazarico E.M., Siegler M.A., Martinez Camacho J.M., **Hamill C.D.**, Bertone S. (2022), "New Constraints on the Volatile Deposit in Mercury's North Polar Crater, Prokofiev." *Planetary Science Journal*, 3, 188. doi: 10.3847/PSJ/ac7d5a.

[2] Scott J.E., Shoemaker E.S., and **Hamill C.D.** (2021), "Identifying Circumgalactic Medium Absorption in QSO Spectra: A Bayesian Approach." *Astrophysical Journal*, 923, 44. doi: 10.3847/1538-4357/ac2954.

[1] **Hamill C.D.**, Chabot N.L., Mazarico E., Siegler M.A., Barker M.K., and Martinez Camacho J. (2020), "New Illumination and Temperature Constraints of Mercury's Volatile Polar Deposits." *Planetary Science Journal*, 1, 57. doi: 10.3847/PSJ/abb1c2.

Technical Non-refereed Publications

[1] Deutsch A.N., **et al.** (2021), "Science Opportunities Offered by Mercury's Ice-Bearing Polar Deposits." *Planetary Science and Astrobiology Decadal Survey 2023-2032 white paper*.

Popular Science Publications

[1] **Hamill C.D.** (2022), "Head in the Clouds: Examining Clouds to Better Understand Exoplanet Atmospheres." *InnovatED (Purdue University magazine – cover story).*

Conference Abstracts

'*' = Presenting author that is not lead author

[17] Chabot N.L., **Hamill C.D.**, Mazarico, E.M., Barker, M., Martinez-Camacho, J.M., Siegler, M.A., Bertone, S. (2024), "Using Permanently Shadowed Regions to Constrain the Origin of Mercury's Volatile Polar Deposits", Mercury 2024, Kyoto, Japan.

[16] Shread A.E, Chabot N.L., **Hamill C.D.**, Ash R.D., and Corrigan C.M. (2024), "The crystallization of iron meteorites and the effect of troilite on trace element chemistry". 55th Lunar and Planetary Science Conference, Houston, TX.

[15] **Hamill C.D.** and Johnson A.V. (2023), "Light scattering and polarization of warm sub-Neptune cloud analogs in the laboratory." 55th Division for Planetary Sciences, San Antonio, TX.

[14] Johnson A.V., ***Hamill C.D.**, and Walker K. (2023), "Light scattering and polarization of particles in the laboratory." Blue Sky 2023: Building bridges between Earth and planetary aerosols and clouds, Pasadena CA.

[13] **Hamill C.D.** and Johnson A.V. (2023), "Phase Function and Degree of Linear Polarization Measurements for KCl Particles as an Exoplanet Cloud Analog". Electromagnetic Light Scattering Conference, Almuñécar Spain.

[12] Glantzberg A.K., Chabot N.L., **Hamill C.D.**, Barker M.K., Mazarico E.M., Siegler M.A., Martinez Camacho J.M., Bertone S., Deutsch A.N., Rivera-Valentiń E.G., Meyer H. (2022). "Investigating the Distribution of Surface Ice in Mercury's Northernmost Craters." 1st Workshop of Ices in the Solar System, Montreal CA.

[11] **Hamill C.D.** and Johnson A.V. (2022), "Experimental Scattering Measurements of KCl Particles as an Exoplanet Cloud Analog." American Geophysical Union, Chicago IL.

[10] Bertone S., Mazarico E., Barker M.K., Siegler M.A., Martinez Camacho J., **Hamill C.D.**, Chabot N.L. (2022), "New Topography, Illumination, and Thermal Models of Mercury's South Pole from MESSENGER NDIS-NAC." American Geophysical Union, Chicago IL.

[9] Chabot N.L., Mazarico E.M., Siegler M.A., Barker M.K., Bertone S., **Hamill C.D.**, Martinez Camacho J.M., Glantzberg A.K. (2022), "Topography, Illumination, and Thermal Models of Mercury's Polar Deposits." Mercury 2022, Orléans, France.

[8] Glantzberg A.K., Chabot N.L., **Hamill C.D.**, Barker M.K., Mazarico E.M., Siegler M.A., Martinez Camacho J.M., Bertone S., Deutsch A.N. (2022), "Investigating the Distribution of Surface Ice in Mercury's Northernmost Craters." Mercury 2022, Orléans, France.

[7] Bertone S., Mazarico E., Barker M.K., Siegler M.A., Martinez Camacho J., **Hamill C.D.**, Chabot N.L. (2022), "A New Topography Model of Mercury's South Pole from MESSENGER MDIS-NAC." 53rd Lunar and Planetary Science Conference, Houston TX.

[6] Barker M.K., Chabot N.L., Mazarico E.M., Siegler M.A., Martinez Camacho J., **Hamill C.D.**, Bertone S. (2022), "New Constraints on the Volatile Deposit in Mercury's North Polar Crater, Prokofiev." 53rd Lunar and Planetary Science Conference, Houston TX.

[5] **Hamill C.D.** and Johnson A.V. (2021), "Characterizing Super-Earth and Mini-Neptune Light Scattering via Experimental Phase Curves." Abstract 305.03, 53rd Division for Planetary Sciences, Online. (Oral Presentation – Virtual)

[4] **Hamill C.D.**, Chabot N.L., Mazarico E., Siegler M.A., and Barker M.K. (2020), "New Temperature Constraints of Mercury's Volatile Polar Deposits." Abstract 1009, 51st Lunar and Planetary Science Conference, Houston TX. (Oral Presentation – Cancelled due to COVID-19)

[3] **Hamill C.D.** and Scott J.E. (2019), "Absorption Characteristics of Ions in the Circumgalactic Medium." iPoster ID: 377.01, 233rd American Astronomical Society Meeting, Seattle WA. (Poster Presentation)

[2] Conway M., **Hamill C.D.**, Apala E., and Scott J.E. (2018), "Galaxy Groups in HST/COS-SDSS Fields." ID: 375.04, 231st American Astronomical Society Meeting, Washington DC. (Poster Presentation)

[1] **Hamill C.D.**, Conway M., Apala E., and Scott J.E. (2018), "Properties of CGM Absorbing Galaxies." iPoster ID: 258.11, 231st American Astronomical Society Meeting, Washington DC. (Poster Presentation)

Other Presentations

[14] **Oral Presentation,** "Reflected Light Phase Curves with PICASO: A Kepler-7b Case Study." Emerging Researchers in Exoplanet Science (ERES), Cornell University, Department of Astronomy, July 2024.

[13] **Oral Presentation,** "Light Scattering Measurements of Exoplanet Cloud Analogs." Emerging Researchers in Exoplanet Science (ERES), Yale University, Department of Astronomy, June 2023.

[12] **Oral Presentation,** "Experimental Scattering Measurements of KCl Particles as an Exoplanet Cloud Analog." Great Lakes Exoplanet Area Meeting (GLEAM), Ohio State University, Department of Astronomy, November 2022.

[11] **Oral Presentation**, "Experimental Scattering Measurements of KCl Particles as an Exoplanet Cloud Analog." Storm Snacks, Purdue University, Department of Earth, Atmospheric, and Planetary Sciences, October 2022.

[10] **Oral Presentation,** "The Johnson Cloud Lab." James Webb Space Telescope: First Light, Purdue University, Department of Physics and Astronomy, July 2022.

[9] **Oral Presentation (Virtual),** "Characterizing the Light Scattering of Temperate Exoplanet Clouds." Graduate Student Expo: Purdue University, Department of Earth, Atmospheric, and Planetary Sciences, February 2022.

[8] **Oral Presentation (Virtual),** "New Illumination and Temperature Constraints of Mercury's Volatile Polar Deposits." MExAG (Mercury Exploration Assessment Group), February 2021.

[7] **Oral Presentation (Virtual),** "New Illumination and Temperature Constraints of Mercury's Volatile Polar Deposits." Crater Café: Purdue University, Department of Earth, Atmospheric, and Planetary Sciences, October 2020.

[6] **Oral Presentation (Virtual),** "New Temperature Constraints of Mercury's Volatile Polar Deposits." Friends of Lunar and Inner Solar System Volatiles, May 2020.

[5] **Poster Presentation**, "Lab Made Meteorites and Their Implications for Solar System Formation." Towson's Celebration of Scholarship and Learning, Towson MD, March 2020.

[4] **Oral Presentation**, "New Temperature Constraints of Mercury's Volatile Polar Deposits." Towson's Department of Physics, Astronomy, and Geosciences Colloquium, Towson MD, November 2019.

[3] **Poster Presentation**, "Investigations of Mercury's Ice-Bearing Polar Craters: Ensor." Towson's Celebration of Scholarship and Learning, Towson MD, September 2019.

[2] **Poster Presentation**, "Absorption Characteristics of Ions in the Circumgalactic Medium." Towson's Research and Creative Inquiry Forum, Towson MD, April 2019.

[1] **Poster Presentation**, "Properties of CGM Absorbing Galaxies." Towson's Research and Creative Inquiry Forum, Towson MD, April 2018.

Professional Affiliations

Purdue University Graduate Student Association	2020 - Present
American Astronomical Society	2018 - Present
Sigma Pi Sigma Physics Honors Society	2019 - 2020
Towson University Society of Physics Students	2016 - 2020

Technical Skills

Programming: Python, MATLAB, Unix, Laboratory Virtual Instrument Engineering Workbench (LabVIEW), Microsoft Excel, Vi/Vim, United States Geological Survey Integrated Software for Imagers and Spectrometers (USGS ISIS3)

Laboratory: OBIS optical lasers, photomultiplier detectors, electro-optic modulators, waveform generators, oscilloscopes, scanning electron microscopes, oxygen-acetylene torches, wet saws, high temperature furnaces, metal sample preservation and polishing