Conor Hayes

Curriculum Vitae

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Education

2022–Present **Ph.D. Physics and Astronomy**, *York University*, Toronto, Ontario.
Advisor: John E. Moores
Expected graduation: 2026
–Member of the Planetary Volatiles Laboratory
–Member of York's Mars Science Laboratory/Curiosity Rover operations team

2020–2022 **M.Sc. Physics and Astronomy**, *York University*, Toronto, Ontario.
Advisor: John E. Moores
–Member of the Planetary Volatiles Laboratory
–Member of York's Mars Science Laboratory/Curiosity Rover operations team
–**Thesis:** *One Star Shines on Many Worlds: Exploring Extraterrestrial Water Through Observations of Scattered Light on the Moon and Mars*

2016–2020 **B.S. Astronomy and Astrophysics**, *The Ohio State University*, Columbus, Ohio.
Advisors: Johnny P. Greco & Paul Martini
–Research Distinction in Astronomy and Astrophysics
–Completed the Politics, Society, and Law Scholars Program
–Vice President of the Ohio State Astronomical Society during the 2019-20 academic year
–**Thesis:** *Spectroscopic Confirmation of Four Ultra-Diffuse Galaxy Candidates in Group Environments*

Research Experience

2020–Present **Graduate Research Assistant**, *York University*, Toronto, Ontario.
–Examined the effect of small-scale topographic features on the temperature distribution of permanently-shadowed regions at the lunar poles
–Updated Gale Crater cloud opacity measurements to cover the full five Martian years of the MSL mission, uncovering and correcting several errors with the simplified radiative transfer model used in previous papers.

2018–2020 **Undergraduate Research Assistant**, *The Ohio State University*, Columbus, Ohio.
–Conducted an analysis of potentially isolated "red and dead" low surface brightness dwarf galaxies using spectral data from the Multi-Object Double Spectrograph on the Large Binocular Telescope.

Teaching Experience

2020–Present **Graduate Teaching Assistant**, *York University*, Toronto, Ontario.
–NATS 1570 (Exploring the Solar System)
–NATS 1740 (Astronomy)
–NATS 1880 (Life Beyond Earth)
–PHYS 1070 (Fundamentals of Astronomy)
–PHYS 1800 (Engineering Mechanics)
–PHYS 1801 (Electricity, Magnetism, and Optics for Engineers)
–PHYS 2070 (Galaxies and the Universe)
–PHYS 4170 (Observational and Theoretical Cosmology)

2019–2020 **Undergraduate Instructional Assistant**, *The Ohio State University*, Columbus, Ohio.
–ASTRON 1141 (Life in the Universe)

Publications

1. **Hayes, C.W.**, Schuerger, A.C., & Moores, J.E. (2025). NIR–NUV Observations of Ice Deposition on Planetary Regolith Simulants. *JGR:Planets* (submitted).

2. Henley, T.L.J., Schmidt, M.E., Lewis, K.L., & 11 others **(5th)** (2025). Surface Dust Coverages on Rock Targets in Gale Crater: Influence of Seasonal Wind Variability, Elevation and Proximity to Aeolian Sand Fields. *JGR: Planets* 130(7):e2023JE008184. 10.1029/2023JE008184.

3. Moores, J.E., Kloos, J.L., Bischof, G.A., & 2 others **(4th)** (2025). A Microbial Survival Model for the Permanently Shadowed Regions of the Moon shows long-term survival of terrestrial microbial contamination. *Astrobiology* 25(6):391-394. 10.1089/ast.2024.0165.

4. Innanen, A.C., **Hayes, C.W.**, Koch-Nichol, B.E., & 1 other (2024). Four Mars Years of ACB Phase Function Observations from the Mars Science Laboratory Show Low Interannual and Diurnal Variability and Suggest Irregular Water-Ice Crystal Geometry. *Icarus* 429:116437. 10.1016/j.icarus.2024.116437.

5. Bischof, G., Guzewich, S.D., Moores, J.E., & 4 others **(5th)** (2024). Dust Dynamics in Gale Crater Observed through 3663 Sols of the Mars Science Laboratory Mission. *JGR: Planets* 129(10):e2024JE008349. 10.1029/2024JE008349

6. **Hayes, C.W.**, Minton, D.A., Kloos, J.L., & 1 other (2024). Topography-Enhanced Ultra-Cold Trapping at the LCROSS Impact Site. *JGR: Planets* 129(7):e2023JE007925. 10.1029/2023JE007925

7. Innanen, A.C., Cooper, B.A., **Hayes, C.W.**, & 4 others (2024). Three years of ACB Phase Function Observations from the Mars Science Laboratory: Interannual and Diurnal Variability and Constraints on Ice Crystal Habit. *The Planetary Science Journal* 5(3):72. 10.3847/PSJ/ad2990

8. **Hayes, C.W.**, Kloos, J.L., Innanen, A.C., & 3 others (2024). Five Mars Years of Cloud Observations at Gale Crater: Opacities, Variability, and Ice Crystal Habits. *The Planetary Science Journal*. 5(2):51. 10.3847/PSJ/ad2202

Presentations & Conferences

1. **Hayes, C.W.** & Moores, J.E. (September 2025). Characterizing the Importance of Desorption Activation Energies on Delivery Rates of Volatiles to the Lunar Cold Traps. *EPSC-DPS Joint Meeting 2025*. Helsinki, Finland.

2. Innanen, A.C., Tornabene, L., **Hayes, C.W.** & 1 other. (September 2025). Examining Cloud Properties at Gale Crater with MSL and TGO/CaSSIS [Poster]. *EPSC-DPS Joint Meeting 2025*. Helsinki, Finland.

3. Moores, J.E., Bischof, G., Axelrod, K., & 6 others **(6th)** (September 2025). At the altitude where it happens: science goals for exploring the martian boundary layer with rotorcraft. *EPSC-DPS Joint Meeting 2025*. Helsinki, Finland.

4. **Hayes, C.W.** & Moores, J.E. (March 2025). Incorporating Molecular Recombination into Ballistic Transport Models of Lunar Water [Poster]. *56th Lunar and Planetary Science Conference*. Houston, Texas.

5. **Hayes, C.W.**, Schuerger, A.C., & Moores, J.E. (March 2025). NIR–NUV Observations of Ice Deposition on Planetary Regolith Simulants [Poster]. *56th Lunar and Planetary Science Conference*. Houston, Texas.

6. Moores, J.E., Kloos, J.L., Bischof, G., & 2 others **(4th)** (March 2025). A Microbial Survival Model for the Permanently Shadowed Regions of the Moon Shows Long-Term Survival of Terrestrial Microbial Forward Contamination [Poster]. *56th Lunar and Planetary Science Conference*. Houston, Texas.

7. Bischof, G., Guzewich, S.D., Moores, J.E., & 5 others **(6th)** (July 2024). 3663 Sols of Line-of-Sight Dust Extinction in Gale Crater with Applications to Jezero Crater and Beyond [Poster]. *10th International Conference on Mars*. Pasadena, California.

8. **Hayes, C.W.**, Kloos, J.L., Innanen, A.I., & 3 others (July 2024). Six Mars Years of Gale Crater Cloud Opacity Measurements [Poster]. *10th International Conference on Mars*. Pasadena, California.

9. **Hayes, C.W.**, Innanen, A.I., Lemmon, M.T., & 2 others (July 2024). Aphelion Cloud Belt Opacities Over Jezero Crater Through the First 1000 Sols of the Mars 2020 Mission [Poster]. *10th International Conference on Mars*. Pasadena, California.

10. Innanen, A.I., Cooper, B.A., **Hayes, C.W.**, & 4 others (July 2024). Three Years of ACB Phase Function Observations from the Mars Science Laboratory: Interannual and Diurnal Variability and Constraints on Ice Crystal Habit [Poster]. *10th International Conference on Mars*. Pasadena, California.

11. Bischof, G., Guzewich, S.D., Lemmon, M.T., & 3 others **(4th)** (March 2024). Dust Dynamics in Gale Crater Observed Using the Line-of-Sight Extinctions through 3663 Sols of the Mars Science Laboratory Mission. *55th Lunar and Planetary Science Conference*. Houston, Texas.

12. **Hayes, C.W.** & Moores, J.E. (March 2024). Interplanetary Volatile Transfer in the Pluto-Charon System [Poster]. *55th Lunar and Planetary Science Conference*. Houston, Texas.

13. **Hayes, C.W.**, Minton, D.A., Kloos, J.L., & 1 other (March 2024). Topography-Enhanced Ultra-Cold Trapping at the LCROSS Impact Site [Poster]. *55th Lunar and Planetary Science Conference*. Houston, Texas.

14. Innanen, A.C., Cooper, B.A., **Hayes, C.W.** & 4 others (March 2024). Three Years of ACB Phase Function Observations from the Mars Science Laboratory: Interannual and Diurnal Variability and Constraints on Ice Crystal Habit. *55th Lunar and Planetary Science Conference*. Houston, Texas.

15. **Hayes, C.W.**, Kloos, J.L., Innanen, A.C., & 3 others (March 2023). Five Mars Years of Gale Crater Cloud Opacity Measurements. *54th Lunar and Planetary Science Conference*. Houston, Texas.

16. **Hayes, C.W.**, Minton, D.A., Kloos, J.L., & 1 other (March 2023). Exploring the Effect of Small-Scale Topography on Surficial Temperatures at the LCROSS Impact Site [Poster]. *54th Lunar and Planetary Science Conference*. Houston, Texas.

17. Guzewich, S.D., Martinez, G., Innanen, A.C., & 15 others **(16th)** (March 2023). 10 Years of Environmental Science in Gale Crater. *54th Lunar and Planetary Science Conference*. Houston, Texas.

18. **Hayes, C.W.**, Kloos, J.L., & Moores, J.E. (October 2022). Modeling the Influence of Small-Scale Topography on Surficial Temperatures at the LCROSS Impact Site. *54th Annual Meeting of the Division for Planetary Sciences*. London, Ontario.

19. **Hayes, C.W.**, Kloos, J.L., Campbell, C.L. & 3 others (October 2022). Determining the Scattering Phase Function of Martian ACB Clouds from MSL Observations. *TEPS Conference 2022*. Lonton, Ontario.

20. **Hayes, C.W.** (July 2022). Modeling the Influence of Small-Scale Topography on Surficial Temperatures at the LCROSS Impact Site. *13th Annual Lunar and Small Bodies Graduate Forum*. Virtual.

21. **Hayes, C.W.**, Kloos, J.L., & Moores, J.E. (June 2022). Five Martian Years of MSL Gale Crater Cloud Opacity Measurements: Determining a Scattering Phase Function for the Aphelion Cloud Belt [Poster]. *7th Mars Atmosphere Modelling and Observations Conference*. Paris, France.

22. Campbell, C.L., Kloos, J.L., Smith, C.L., & 4 others **(5th)** (June 2022). Wind Direction Record of Aerosols Observed by the Mars Science Laboratory. *7th Mars Atmosphere Modelling and Observations Conference*. Paris, France.

23. **Hayes, C.W.**, Kloos, J.L., & Moores, J.E. (November 2021). Small-Scale Topography and the Temperature Distribution of Permanently-Shadowed Regions on the Moon [Poster]. *GAC-MAC 2021*. London, Ontario.

24. Moores, J.E., Campbell, C.L, Innanen, A.C., & 9 others **(6th)**. (November 2021). Studying the Martian Atmosphere above Gale Crater with Cameras. *GAC-MAC 2021*. London, Ontario.

25. **Hayes, C.W.** (June 2021). Small-Scale Topography and the Temperature Distribution of Permanently-Shadowed Regions on the Moon. *2021 PAGE Graduate Conference*. Virtual.

Awards & Honours

2023 **Royal Canadian Institute for Science Communication Certificate Program Award**, ($1,000).

2022 **Technologies for Exo-Planetary Science**, *Fellowship*, ($9,000).

Community Service & Outreach

May 2023 **Public Talk**, *Royal Astronomical Society of Canada (Toronto Centre)*, Curiosity's Got its Head in the Clouds: Eleven Years of Cloud Observations from Gale Crater Mars, Richmond Hill, Ontario.

September 2023 **Astronomer in Residence**, *Killarney Provincial Park Observatory*, Killarney, Ontario.

May 2023 **Public Talk**, *Royal Astronomical Society of Canada (Toronto Centre)*, Water, Water Everywhere? A History of the Hunt for Lunar Water from Harold Urey to Artemis and Beyond, Toronto, Ontario.

2023–Present **Contributor**, *Mars Science Laboratory Mission Updates Blog*.

December 2022 **Public Talk**, *York Observatory Teletube*, Five Mars Years of Curiosity Rover Cloud Observations, Toronto, Ontario.

2020–Present **Observatory Assistant**, *Allan I. Carswell Observatory*, Toronto, Ontario.

2020–Present **Co-Host**, *York Universe*.

2019–2020 **Vice President**, *Ohio State Astronomical Society*.

Affiliations & Membership

2022–Present **Division for Planetary Sciences**, *Member*.

2020–Present **Mars Science Laboratory Operations Team**, *Environmental Science Theme Lead & Keeper of the Plan*.