Charmi Bhatt

PhD candidate, Department of Physics and Astronomy, The University of Western Ontario, Canada

cbhatt7@uwo.ca | linkedin.com/in/charmi-bhatt | charmibhatt.com

Education

PhD Astronomy (Collaborative Specialization in Planetary Science) Jan 2023 - Dec 2026 (expected)
The University of Western Ontario, Canada
Thesis: *"Uncovering chemical pathways in evolved stars with JWST"*
Advisor: Prof. Jan Cami

MSc Astronomy (Collaborative Specialization in Planetary Science) Sep 2021 - Dec 2022
The University of Western Ontario, Canada
Thesis: *"Line Profile Simulations of diffuse interstellar bands"*
Advisor: Prof. Jan Cami

BSc Physics Aug 2018 - Jun 2021
Swarrnim Startup and Innovation University, India

Professional Experience

Graduate Researcher: Sep 2021 - present

During my MSc and PhD, I have led and contributed to several different research projects, acquiring skills described below:

- Observational: JWST IFU spectral cube analysis, imaging, proposal development, pipeline optimization for Image reduction; VLT/UVES high-resolution optical spectroscopy; cross-facility comparisons (JWST, HST, ALMA)
- Technical: Molecular spectral modelling; spatially-resolved infrared spectroscopy; multi-component spectral decomposition (atomic lines, molecular bands, dust continuum, background subtraction); cross-calibration of JWST imaging and IFU observations; Python package development for spectroscopic analysis.
- Collaborations: Co-investigator on the ESSENcE (Evolved StarS and their Nebulae in the JWST Era) program, an international consortium of ∼30 experts on planetary nebulae and related objects. This role has provided experience in leading monthly research update meetings and synthesizing feedback across teams.
- Coursework: Spectroscopy, Astrophysical Disks, Star Formation, Galaxies, Stellar Structure, Molecular symmetry and spectroscopy, Astro Machine Learning and Astrochemistry.

Teaching Assistant | The University of Western Ontario, Canada Sep 2021-Present

- Courses: Astrophysics of Interstellar Space, Galaxies, Physics II, Calculus for Engineers and Linear Algebra. I was responsible for conducting tutorials and help sessions, and for grading assignments and exams.

Outreach Assistant *(Part-time, 2-6 hrs per week)* Nov 2021- Dec 2022, May 2025- present
Outreach Coordinator *(Part-time, 4-10 hrs per week)* Jan 2023-April 2025
Cronyn Observatory, The University of Western Ontario, Canada

- Led a team of five Outreach Assistants to execute educational outreach programs for school groups and clubs.
- Designed and manage observatory's website and social media channels, increasing online engagement
- Develop and deliver interactive astronomy presentations and hands-on demonstrations
- Co-organize public astronomy events, including Science Rendezvous and special observatory events.

Publications

First Author: ——————————————————————————————

1. **Bhatt C.**, Cao S.W., Cami J., Clark N., Ehrenfreund P., Peeters E., Matsuura M., Sloan G.C., Dinerstein H.L., Kavanagh P., Volk K., Aleman I., Barlow M.J., Justtanont K., Kraemer K.E., Kastner J.H., Kemper F., Monteiro H., Sahai R., Sterling N.C., Walsh J.R., Waters L.B.F.M., Zijlstra A. Detection of CO_2 ice in the planetary nebula NGC 6302. A&A Letters.
   My role: Trained an undergraduate student in modelling mid-IR CO_2 gas-phase features; led interpretation of the CO_2 ice profile, writing, and publication process.

2. **Bhatt, C.**, Cami J., Peeters E., Clark N., Moraga Baez P., Volk K., Sloan G.C., Kastner J.H., Dinerstein H.L., Matsuura M., Balick B., Kraemer K.E., Justtanont K., Jones O., Sahai R., Aleman I., Barlow M.J., Bernard-Salas J., Blommaert J., Hirano N., Kavanagh P., Kemper F., Lagadec E., Laming J.M., Molster F., Monteiro H., Richards A.M.S., Sterling N.C., Torki M., van Hoof P.A.M., Walsh J.R., Waters L.B.F.M., Wesson R., Wilson F., Wright N.J., Zijlstra A.A. Detection of CH_3^+ in the O-rich planetary nebula NGC 6302. *ApJ, 2025, 995, 67*
   My role: I led the data analysis, interpretation of results, writing and publication process.

3. **Bhatt C.**, Cami J., Sarre P.J., Linnartz H., Cox N.L.J., Farhang A., Smoker J., MacIsaac H., Fan H., Ebenbichler A., Khandelwal H., Romanec A., Elyajouri M., Ehrenfreund P., Foing B.H., Monreal-Ibero A., Barco G.M., van Loon J.Th. The EDIBLES Survey IX: Simulations of the λ6614 DIB Profile Variations: A Surprising Connection with CH^+. *ACS Earth Space Chem., 2025, 9, 227*
   My role: I led the development of the model, fitting the model to observations, interpretation, writing and publication process.

Co-Author: ——————————————————————————————

1. Van Schuylenbergh S., Cami J., Peeters E., Giese M.M., **Bhatt C.**, Van De Putte D., Tielens A.G.G.M., Barlow M.J., Bernard-Salas J., Candian A., Changala P.B., Cox N.L.J., Dinerstein H.L., Esposito V.J., García-Hernández D.A., Gómez-Muñoz M.A., Justtanont K., Kraemer K.E., Lagadec E., Manchado A., Monreal Ibero A., Sahai R., Sidhu A., Sloan G.C., Sterling N.C., Walsh J.R., Wesson R., Whitman J.C., Zijlstra A. Survival of Polycyclic Aromatic Hydrocarbons in the ionized environment of Tc 1. *Submitted to ApJ*
   My role: Contributed feedback and discussion during weekly team meetings throughout the project.

2. Giese M.M., Esposito V.J., Van Schuylenbergh S., Cami J., Peeters E., **Bhatt C.**, Van De Putte D., Tielens A.G.G.M., Barlow M.J., Bernard-Salas J., Candian A., Changala B., Cox N.L.J., Dinerstein H.L., García-Hernández D.A., Gómez-Muñoz M.A., Justtanont K., Kraemer K.E., Lagadec E., Manchado A., Monreal Ibero A., Sahai R., Sidhu A., Sloan G.C., Sterling N.C., Walsh J.R., Wesson R., Whitman J.C., Zijlstra A. Detection of C_{60} Combination Bands in the Near-IR Spectrum of Tc 1. *ApJL, 1004, L32*
   My role: Contributed feedback and discussion during weekly team meetings throughout the project.

3. Matsuura M., Volk K., Kavanagh P., Balick B., Wesson R., Zijlstra A.A., Dinerstein H.L., Peeters E., Sterling N.C., Cami J., Barlow M.J., Kastner J., Walsh J.R., Waters L.B.F.M., Hirano N., Aleman I., Bernard-Salas J., **Bhatt C.**, Blommaert J., Clark N., Jones O., Justtanont K., Kemper F., Kraemer K.E., Lagadec E., Laming J.M., Molster F.J., Moraga Baez P., Monteiro H., Richards A.M.S., Sahai R., Sloan G.C., Torki M., van Hoof P.A.M., Wright N.J., Wilson F., Csukai A. The JWST/MIRI view of the planetary nebula NGC 6302 - I. A UV-irradiated torus and a hot bubble triggering PAH formation. *MNRAS, 2025, 542, 1287*
   My role: I contributed to the monthly discussion meetings and provided feedback on the manuscript draft.

4. Ebenbichler A., Ončák M., Przybilla N., Hrodmarsson H.R., Smoker J.V., Lallement R., Farhang A., **Bhatt C.**, Cami J., Cordiner M., Ehrenfreund P., Cox N.L.J., van Loon J.Th., Foing B. The EDIBLES survey: X. The 6196 Å diffuse interstellar band: Identification of side DIBs as an indication of a small carrier molecule. *A&A, 2025, 695, A212*
   My role: I provided feedback on the manuscript draft and assisted in addressing the referee's comments.

Observing Proposals

Summary: I contributed to 22 JWST proposals (5 in Cycle 3, 6 in Cycle 4, and 11 in Cycle 5) through exposure time calculations, APT file preparation, making figures, and proposal editing. Successful proposals are listed below:

• **Co-I - 26.1 hours - James Webb Space telescope** 2026
Revealing Unexpected Carbon Chemistry in the Oxygen-Rich Ejecta of a Dying Star.
• **Co-I - 32.2 hours - James Webb Space telescope** 2026
Testing Fullerene Physics in the HII Regions of C60-rich planetary nebulae
• **Co-I - 13.7 hours - James Webb Space telescope** 2025
Probing the chemical evolution of the carriers of the Aromatic Infrared Band emission.
• **Co-I - 22.3 hours - James Webb Space telescope** 2024
Fullerenes in Tc 1: a quantitative study of the interaction of large molecules with their radiative environment.
• **Co-I - 15.9 hours - James Webb Space telescope** 2024
The chemistry of complex hydrocarbons in ejecta from evolved objects

Presentations

- **Title: Detection of CH_3^+ in O-rich planetary nebulae**
  Asymmetrical Post-main-sequence Nebulae 9, Granada, Spain Poster Sep 2025

- **Title: Line Profile Simulation of λ 6614 diffuse interstellar band**
  Space Day, The University of Western Ontario, CanadaPoster May 2025
  Astrochemistry Summer school, Groningen, Netherlands Poster Aug 2024
  The annual meeting of the Canadian Astronomical Society, Toronto, Canada (Talk) June 2024
  EDIBLES Workshop, Leiden Observatory, Netherlands (Talk) Nov 2023
  International Astronomical Union symposium, Michigan, USAPoster July 2023

Science Communication and Outreach

Science Communication Intern *(Full time)* Sep – Nov 2019
Indian Institute of Science Education and Research, Pune, India

- Conducted interviews with professors, translating complex research into accessible content. YouTube
- Produced, narrated and animated science interview videos for broader outreach.

Astronomy Educator | Navars Edutech, India Aug 2020 – Sep 2021
Courses Taught:
- Astronomy for Juniors (Grades 1–4) – Developed lesson plans, conducted interactive lectures, and assessed student learning through quizzes and projects.
- Astronomy for Young Scientists (Grades 5–9) – Delivered lectures and hands-on activities to engage students in foundational astronomy concepts.
- Introduction to Exoplanets (Grades 5–12) – Designed and led a seven-day course, creating curriculum and instructional materials to explain complex astrophysical concepts through interactive methods.

Press, Media & Highlights:
Western News | "Western astrophysicists help decode chemistry behind cosmic butterfly's beauty" 2025
Inspiring Minds | "From Stardust to Life: Exploring Molecules in the Cosmos in the era of the JWST" 2025
Western News | "Cutting-edge Western science research highlights role of collaboration" 2024
CASCA | Graduate Student Highlight: "Meet Charmi Bhatt!" 2024
The Gazette | "Observatory event to celebrate International Day of Women and Girls in Science" 2023
CTV News | "The 'Worm Moon' over southern Ontario" 2023
CBC News | "Not a UFO, not a spy balloon: How to see SpaceX Starlink satellites over London" 2023

Training and Workshops

- ComSciCon Flagship – Science Communication Conference — July 2024
- ComSciConCAN – Canada's Science Communication Conference — Aug 2023
- Code/Astro Workshop, Caltech — June 2022
- Presentation Skills in Academia; IISER Pune — Oct 2019

Leadership

LOC & Website | Exploring the Aromatic Universe in the JWST era — June 2025 – present
The University of Western Ontario
- Designed and built the website; manage ongoing updates and content.

Treasurer for Graduate Council | Institute for Earth and Space Exploration — July 2022 – Aug 2024
The University of Western Ontario
- Managed and allocated financial resources to support professional development initiatives and community-building events

Faculty Meeting Representative | Department of Physics & Astronomy — July 2022 – Dec 2024
The University of Western Ontario
- Represented graduate students in faculty meetings and relayed key updates to the graduate students.

Co-organizer, Cosmic+ Career Connections Job Fair — May 2024
The University of Western Ontario
- Coordinated outreach efforts to secure participation from multiple space industry companies.

Co-organizer, ComSciConCAN 2024 — Sep – Dec 2023
- Contacted universities and institutions, successfully obtaining financial support for a national science communication conference for graduate students

Astronomy Triathlon Lead, Science Olympics — May 2023
The University of Western Ontario
- Led the astronomy competition for high school students at the Science Olympics.

References

- **Prof. Jan Cami**, jcami@uwo.ca,
  The University of Western Ontario, Canada
- **Dr. Greg C. Sloan**, gcsloan@stsci.edu,
  Space Telescope Science Institute, USA
- **Prof. Joel Kastner**, jhkpci@rit.edu,
  Rochester Institute of Technology, USA