Dr. Tim Hallatt

Theoretical Astrophysicist

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Academic Positions

Massachusetts Institute of Technology (MIT); MIT Kavli Institute for Astrophysics and Space Research — *Cambridge, Massachusetts*

Postdoctoral Associate — *Sept. 2024 - present*

- advisor: Dr. Sarah Millholland

Education

McGill University — *Montréal, Quebec*

PhD, Physics — *Sept. 2021 - July, 2024*

- advisor: Dr. Eve J. Lee
- thesis title: "On the Formation of Planets in the Milky Way's Thick Disk"
- topic: theoretical planet formation
- tools: `MESA` hydrodynamics/interior structure code, `REBOUND` dynamics code, `Python`, `Fortran`
- additional skills: machine learning with `scikit-learn`

McGill University — *Montréal, Quebec*

MSc, Physics — *Sept. 2019 - Sept. 2021*

- advisor: Dr. Eve J. Lee
- thesis title: "Leveraging Exoplanet Occurrence Rates to Test Planet Formation Theory"
- topic: theoretical planet formation

University of Western Ontario — *London, Ontario*

Hon. BSc, Physics — *Sept. 2015 - April, 2019*

- honours thesis advisor: Dr. Paul Wiegert
- thesis title:"The Dynamics of Interstellar Asteroids and Comets Within the Galaxy"
- topic: dynamics

Publications

Published

Hallatt, T., Lee, E. J., 2022. Sculpting the sub-Saturn Occurrence Rate via Atmospheric Mass Loss. Astrophysical Journal, vol. 924, no. 9. (link to paper)

Hallatt, T., Lee, E. J., 2020. Can Large-Scale Migration Explain the Giant Planet Occurrence Rate? Astrophysical Journal, vol. 904, no. 2. (link to paper)

Hallatt, T., Wiegert, P., 2020. The Dynamics of Interstellar Asteroids and Comets within the Galaxy: an Assessment of Local Candidate Source Regions for 1I/'Oumuamua and 2I/Borisov. Astronomical Journal, vol. 159, no. 4. (link to paper)

Cadieux, C., Plotnykov, M., Doyon, R., et al. (incl. **Hallatt, T.**), 2023. New Mass and Radius Constraints on the LHS 1140 Planets – LHS 1140 b is Either a Temperate Mini-Neptune or a Water World (accepted by Astrophysical Journal Letters; link to paper).

Submitted

Hallatt, T., Lee, E. J., 2024. On the Planet-Forming Environment of the Milky Way's Thick Disk. Submitted to ApJ (link to paper).

White Papers

Benneke, B., Cowan, N., Rowe, J. et al. (incl. **Hallatt, T.**), 2019. Exoplanet instrumentation in the 2020s: Canada's pathway towards searching for life on potentially Earth-like exoplanets. Canadian Long Range Plan for Astronomy and Astrophysics White Papers, LRP2020. Online at https://www.zenodo.org/communities/lrp2020, id.65. (link to paper)

Seminars & Presentations

September 2023. *On the Planet-Forming Environment of the Milky Way's Thick Disk*. Stars & Planets Seminar, Yale University, USA. (**Invited**)

July 2023. *On the Formation of Planets in the Milky Way's Thick Disk*. Oral presentation. Towards Other Earths III: the Planet-Star Connection, Insitituto de Astrofísica e Ciências do Espaço, Porto, Portugal

June 2023. *On the Formation of Planets in the Milky Way's Thick Disk*. Oral presentation. Emerging Researchers in Exoplanet Science, Yale University, USA.

May 2021. *Sculpting the sub-Saturn Occurrence Rate via Atmospheric Mass Loss*. Oral presentation. High Energy Exoplanets, European Space Agency XMM-Newton Workshop, Online.

November 2020. *Can Large-Scale Migration Explain the Giant Planet Occurrence Rate?*. Oral presentation. ExoDem Conference, Caltech, Online.

October 2020. *Can Large-Scale Migration Explain the Giant Planet Occurrence Rate?*. Oral presentation. Exocoffee, Max Planck Institute for Astronomy, Online.

August 2020. *The Dynamics of Interstellar Asteroids and Comets Within the Galaxy*. Oral presentation. Division of Dynamical Astronomers Meeting, Online. Link to presentation

June 2020. *The Dynamics of Interstellar Asteroids and Comets Within the Galaxy*. Poster presentation. American Astronomical Society meeting, Online.

Select Awards & Fellowships

2021	**Alexander Graham Bell Canada Graduate Scholarship-Doctoral**, NSERC	*$ 105,000*
2021	**Perseverance Scholarship**, McGill University	*$ 1200*
2021	**L. Trottier Science Accelerator fellowship**, McGill University	*$ 5000*
2020	**Alexander Graham Bell Canada Graduate Scholarship-Master's**, NSERC	*$ 17,500*
2020	**Technologies for Exoplanetary Science Fellowship**, NSERC	*$ 6500*
2019	**Donald R. Hay Prize (for best thesis)**, Physics & Astronomy Dept., University of Western Ontario	*$ 300*
2019	**Dr. Gérard Hébert Scholarship in Physics (for community service, academic excellence, research potential)**, Physics & Astronomy Dept., University of Western Ontario	*$ 1700*

Additional Research Experience

University of Tübingen; Institute for Theoretical Astrophysics *Tübingen, Germany*

ADVISOR: DR. ROLF KUIPER *May 2018 - Aug. 2018*

- radiation-hydrodynamics simulations of HII regions
- tools: `PLUTO` hydrodynamics code, `Makemake` & `Sedna` radiation transport and photoionization solvers

Media Citations & Interviews

Astronomy Magazine: Our Galaxy's Marvelous Rogues and Misfits

Scientific American: Mystery of Interstellar Visitor 'Oumuamua Gets Trickier

Nature: How Two Intruders From Interstellar Space are Upending Astronomy

Populär Astronomi: Interstellar comet Borisov is a well-known stranger

Service & Outreach

August, 2023	**McGill STEM summer camp**, Science Discussion/Q+A Group Leader	*McGill University*
2023	**Trottier Space Institute**, `arXiv` discussion organizer/leader	*McGill University*
2020-2022	**Trottier Space Institute**, Meeting With Speaker organizer/leader	*McGill University*
2021-2022	**McGill Graduate Association of Physics Students**, VP Academic	*McGill University*
2021-2022	**McGill Graduate Association of Physics Students mentorship program**, lead organizer	*McGill University*
2019-2022	**McGill Graduate Association of Physics Students mentorship program**, mentor	*McGill University*
2021-2022	**McGill Graduate Association of Physics Students**, Meeting with Speaker organizer/leader	*McGill University*
2019-2022	**McGill Hackathon**, mentor	*McGill University*
2022	**Vanderbilt Astronomy Club, public lecture.**, Online	*Vanderbilt University*
2021	**AstroMcGill public lecture. Our Galactic Neighbourhood: Insights From Exoplanets and Interstellar Objects**, Online	*McGill University*
2018-2019	**Physics and Astronomy Students' Association**, President	*University of Western Ontario*
2016-2019	**Physics and Astronomy Students' Association Help Center**, lead organizer/tutor	*University of Western Ontario*

Mentorship

summer, 2023	**Vincent Savignac**, Undergraduate; research mentorship on sub-Neptune core-envelope interaction	*McGill University*
2020-2021	**Didar Seghi**, Undergraduate; academic mentorship	*McGill University*
2019-2020	**Griffin Schwartz**, Undergraduate; academic mentorship	*McGill University*
2019-2020	**Harper Sewalls**, Undergraduate; academic mentorship	*McGill University*