# Peter Scherbak

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## Research Interests

I am focused on theoretical and computational astrophysics, especially involving stars and binary systems. Much of my research involves fluid dynamics, mass transfer, and radiative losses. Applications include the formation of gravitational wave sources, stellar mergers, common envelope evolution, tidal excitation of internal waves, and transient sources.

**Unified Astronomy Thesaurus terms:** Semi-detached binary stars — Common envelope binary stars — Hydrodynamical simulations

## Education

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|---|---|
| 2026 (expected) | **Ph.D., California Institute of Technology** Astrophysics<br>Advisor: Jim Fuller |
| 2023 | **M.S., California Institute of Technology** Astrophysics<br>Advisor: Jim Fuller |
| 2020 | **B.A, Cornell University** Physics<br>*summa cum laude*<br>**B.A, Cornell University** Astronomy<br>*summa cum laude* |

## Research Publications

1. P. Scherbak, W. Lu, and J. Fuller, "Radiatively-Cooled Mass Transfer: Disk Properties and L2 Outflows Across Mass Transfer Rates," (submitted) arXiv: 2510.24127
2. P. Scherbak, A. Polin, M. Kasliwal, et al., "Characterizing the Host Galaxies and Delay Times of Ca-rich Gap Transients vs 91bg-like SNe and Normal Type Ia SNe," (submitted), arXiv:2509.25577
3. P. Scherbak, W. Lu, and J. Fuller, "Rapid Binary Mass Transfer: Circumbinary Outflows and Angular Momentum Losses," *The Astrophysical Journal*, 990, 172 (2025)
4. P. Scherbak and J. Fuller, "Ultrashort-Period WD Binaries Are Not Undergoing Strong Tidal Heating," *The Astrophysical Journal*, 962, 185 (2024)
5. P. Scherbak and J. Fuller, "White Dwarf Binaries Suggest a Common Envelope Efficiency $\alpha \sim 1/3$," *Monthly Notices of the Royal Astronomical Society*, 518, 3966 (2023)

# Recent talks and presentations

## Conference talks

1. "Rapid binary mass transfer: Outflows and AM losses through L2"
   41st Liége International Astrophysical Colloquium: The Eventful Life of Massive Star Multiples, University of Liége, Belgium, 2024
2. "White dwarf binaries suggest a common envelope efficiency $\alpha \sim 1/3$"
   White Dwarfs from Physics to Astrophysics, KITP, UCSB, CA, 2022

## Seminars and collaboration talks

3. "Rapid Binary Mass Transfer: Circumbinary Outflows and Angular Momentum Losses across Mass Transfer Rates"
   MIT Monday afternoon talk, 2025
4. "Rapid binary mass transfer: Circumbinary outflows and angular momentum losses"
   Princeton University paper discussion, 2025
5. "Rapid binary mass transfer: Circumbinary outflows and angular momentum losses"
   Carnegie Observatories tea talk, Pasadena CA, 2025
6. "Simulations of rapid mass transfer including radiative losses"
   University of California Berkeley transients group meeting, 2025
7. "Host galaxies and delay times of Ca-rich gap transients vs 91-bg like SNe and Type Ia SNe"
   Supernova working group, Cornell University and Caltech (virtual presentation), 2025
8. "Rapid binary mass transfer: Outflows and AM losses through L2"
   ZTF Theory Network Meeting, Santa Margarita, CA, 2024
9. "Double WD binaries as probes of common envelope evolution and tidal physics"
   ZTF Theory Network Meeting, Santa Margarita, CA, 2023
10. "The stability of mass transfer"
    ARC (Astrophysics, Relativity, and Cosmology) seminar, Caltech, 2022
11. “Creation and Confinement of a Rubidium BEC in Preparation for Ultracold NaRb Formation” - QURIP presentation, Princeton Unversity, 2019

# Skills

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| Coding | Python, C, C++, Java, Fortran 90, Bash, LaTeX |
| Software | PLUTO hydrodynamics code, MESA stellar evolutionary code, `PROSPECTOR`, `dynesty`, SLURM, MPI (OpenMPI), SAOImage Ds9, Git/GitHub |
| Misc. | Basic operation of a dilution refrigerator, alignment of laser optics, CCD analysis and data extraction |

## Teaching and Research Experience

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|---|---|
| 2022 | Teaching assistant, Physics of the Interstellar Medium, Caltech |
| 2021 | Teaching assistant, Cosmology, Caltech |
| 2020-2025 | Graduate research assistant, Caltech |
| 2019 | Undergraduate researcher, IBM Research Center, Yorktown Heights - Quantum Computing |
| | Undergraduate researcher, Princeton University, Ultracold Quantum Gases Lab |
| 2018-2020 | Undergraduate researcher, Cornell, Radio Astronomy Group - Fast Radio Bursts |

## Awards and Honors

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| 2025 | PI on NSF ACCESS Allocation PHY250215 (1,500,000 core-hours) |
| 2024-2025 | Asset Manager on NSF ACCESS Allocation PHY240274 (500,000 core-hours) |
| | Asset Manager on NSF ACCESS Allocation PHY240109 (250,000 core-hours) |
| 2020 | Yervant Terzian Undergraduate Scholarship |
| 2019 | Phi Beta Kappa inductee |
| 2016-2020 | Cornell University Dean's List |
| 2016 | National Merit Scholar |