

Mike Y. M. Lau

mike.lau@h-its.org
https://themikelau.github.io/

Heidelberg Institute for Theoretical Studies (HITS)
Centre for Astronomy (ZAH), Heidelberg University

Timeline

- 09/23 – **Heidelberg Institute for Theoretical Studies**
09/23–08/25: Croucher Research Fellow. 09/25–Present: Postdoctoral researcher at Astronomisches Rechen-Institut, Centre for Astronomy of Heidelberg University.
- 09/19 – 03/23 **Monash University (PhD)**
Dissertation: *Interactions in Stellar Binaries*, supervised by Prof. Ilya Mandel, Prof. Daniel J. Price, and Dr. Ryosuke Hirai
- 01 – 06/22 **Flatiron Institute CCA (Research Analyst)**
Center for Computational Astrophysics Pre-Doctoral Program, supervised by Dr. Matteo Cantiello and Dr. Adam Jermyn
- 10/15 – 07/19 **The University of Oxford (MMathPhys)**
Master of Mathematical and Theoretical Physics with First Class in Parts A, B, & C
Dissertation: *Detecting Double Neutron Stars with LISA*, supervised by Prof. Ilya Mandel and Prof. Philipp Podsiadlowski

Publications

Published/accepted works (6 first-author, 2 second-author)

22. Wang, C., **Lau, M.**, Li, X., Langer, N., de Mink, S. et al., 2026, *Thermal-timescale accretion does not always yield critical rotation in mass gainers*, accepted for publication in A&A, arXiv:2601.08508
21. Bermúdez-Bustamante, L., De Marco, O., Siess, L., Price, D., González-Bolívar, M. et al. (inc. **Lau, M.**), 2025, *Dust formation during the interaction of binary stars by common envelope, Planetary Nebulae (IAU S384) A Universal Toolbox in the Era of Precision Astrophysics, Proceedings of the IAU Symposia and Colloquia*
20. **Lau, M.**, Hirai, R., Price, D., Mandel, I., Bate, M., 2025, *Common envelopes in massive stars: III. The obstructive role of radiation transport in envelope ejection*, A&A, 699
19. Mandel, I., Riley, J., Boesky, A., Brcek, A., Hirai, R. et al. (inc. **Lau, M.**), 2025, *Rapid stellar and binary population synthesis with COMPAS: methods paper II*, ApJS, 280, 1
18. Vetter, M., Röpke, F., Schneider, F., Pakmor, R., Ohlmann, S. et al. (inc. **Lau, M.**), 2025, *Magnetically driven outflows in the 3D common envelope evolution of massive stars*, A&A, 698
17. Siess, L., Bermúdez-Bustamante, L., De Marco, O., Price, D., González-Bolívar, M. et al. (inc. **Lau, M.**), 2024, *Dusty Common Envelope Evolution*, Galaxies, 12
16. Schneider, F., **Lau, M.**, Röpke, F., 2025, *Stellar mergers and common-envelope evolution*, *Encyclopedia of Astrophysics - 1st Edition*, Elsevier
15. Vetter, M., Röpke, F., Schneider, F., Pakmor, R., Ohlmann, S. et al. (inc. **Lau, M.**), 2024, *From spherical stars to disk-like structures: 3D common-envelope evolution of massive binaries beyond inspiral*, A&A, 691
14. Bermúdez-Bustamante, L., De Marco, O., Siess, L., Price, D., González-Bolívar, M. et al. (inc. **Lau, M.**), 2024, *Dust formation in common envelope binary interactions - II: 3D simulations with self-consistent dust formation*, MNRAS, 533, 1
13. **Lau, M.**, Hirai, R., Mandel, I., Tout, C., 2024, *Expansion of Accreting Main-sequence Stars during Rapid Mass Transfer*, ApJL, 966, 1
12. Amaro-Seoane, P., Andrews, J., Arca Sedda, M., Askar, A., Baghi, Q. et al. (inc. **Lau, M.**), 2023, *Astrophysics with the Laser Interferometer Space Antenna*, *Living Reviews in Relativity*, 26, 1
11. Renzo, M., Zapartas, E., Justham, S., Breivik, K., **Lau, M.** et al., 2023, *Rejuvenated Accretors Have Less Bound Envelopes: Impact of Roche Lobe Overflow on Subsequent Common Envelope Events*, ApJL, 942, 2
10. González-Bolívar, M., De Marco, O., **Lau, M.**, Hirai, R., Price, D., 2022, *Common envelope binary interaction simulations between a thermally pulsating AGB star and a low mass companion*, MNRAS, 517, 3
9. **Lau, M.**, Hirai, R., Price, D., Mandel, I., 2022, *Common envelopes in massive stars II: The distinct roles of hydrogen and helium recombination*, MNRAS, 516, 4
8. **Lau, M.**, Cantiello, M., Jermyn, A., MacLeod, M., Mandel, I. et al., 2025, *Hot Jupiter engulfment by an early red giant in 3D hydrodynamics*, A&A, 694
7. **Lau, M.**, Hirai, R., González-Bolívar, M., Price, D., De Marco, O. et al., 2022, *Common envelopes in massive stars: towards the role of radiation pressure and recombination energy in ejecting red supergiant envelopes*, MNRAS, 512, 4

6. Riley, J., Agrawal, P., Barrett, J., Boyett, K., Broekgaarden, F. et al. (inc. **Lau, M.**), 2022, *Rapid Stellar and Binary Population Synthesis with COMPAS*, *ApJS*, 258, 2
5. Compas, T., Riley, J., Agrawal, P., Barrett, J., Boyett, K. et al. (inc. **Lau, M.**), 2022, *COMPAS: A rapid binary population synthesis suite*, *The Journal of Open Source Software*, 7, 69
4. Ackley, K., Adya, V., Agrawal, P., Altin, P., Ashton, G. et al. (inc. **Lau, M.**), 2020, *Neutron Star Extreme Matter Observatory: A kilohertz-band gravitational-wave detector in the global network*, *Publications of the Astronomical Society of Australia*, 37
3. **Lau, M.**, Mandel, I., Vigna-Gómez, A., Neijssel, C., Stevenson, S. et al., 2020, *Detecting double neutron stars with LISA*, *MNRAS*, 492, 3

Submitted works

2. Bernard, Y., David-Cléris, T., Price, D., **Lau, M.**, 2026, *Momentum-conserving self-gravity in the phantom smoothed particle hydrodynamics code. Parallel dual tree traversal for the symmetric fast multipole method*, submitted to *A&A*, [arXiv:2602.05804](https://arxiv.org/abs/2602.05804)
1. Heller, M., Schneider, F., Henneco, J., Bronner, V., **Lau, M.**, 2025, *1D stellar mergers: entropy sorting and PyMMAMS*, submitted, [arXiv:2512.14669](https://arxiv.org/abs/2512.14669)

Selected talks (* = invited)

12/25	XIX Winter Workshop on Stellar Astrophysics 2025	<i>HITS, Heidelberg</i>
11/25	Hong Kong Laureate Forum	<i>Hong Kong</i>
09/25	*Astronomy seminar	<i>Tsung-Dao Lee Institute</i>
08/25	*Binary Stars in a New Era	<i>Lijiang</i>
06/25	*European Astronomical Society Annual Meeting (invited review)	<i>Cork</i>
06/25	*2nd European Phantom code family users workshop	<i>IPAG, Grenoble</i>
12/24	*Astrophysics seminar	<i>Chinese University of Hong Kong</i>
07/24	41st Liège International Astrophysical Colloquium: The eventful life of massive star multiples (best linguistics invention)	<i>University of Liège</i>
02/24	*Joint Franco-Australian 5th Phantom and MCFOST Users Workshop	<i>Monash University, remote</i>
12/23	*Astrophysics seminar	<i>Chinese University of Hong Kong</i>
03/23	*Colloquium	<i>ICRAR-Curtin, Perth</i>
02/23	Phantom users workshop 2023 (LOC)	<i>Monash University</i>
01/23	SESTAS meeting	<i>MPA, Garching</i>
01/23	Common envelope group meeting	<i>HITS, Heidelberg</i>
12/22	*Gravitational Wave Physics and Astronomy Workshop	<i>Melbourne</i>
06/22	CCA Predoctoral Program Symposium	<i>CCA, Flatiron Institute</i>
06/22	Physics and Astrophysics of Common Envelope	<i>Los Alamos National Laboratory</i>
03/22	CCA Stars & Compact Objects Group Meeting	<i>CCA, Flatiron Institute</i>
12/21	OzGrav Data/Astro Telecon	<i>Virtual</i>
09/21	Common Envelope Physics and Outcomes 2021	<i>Virtual</i>
07/21	ASA Annual Meeting 2021	<i>University of Melbourne</i>
07/21	EAS Annual Meeting 2021	<i>Leiden, virtual</i>
02/21	*LISA Workshop	<i>University of Auckland, remote</i>
08/20	The 13th International LISA Symposium	<i>University of Auckland, remote</i>
02/20	ANITA workshop and school 2020	<i>UNSW, Canberra</i>
01/20	Gravitational Waves Group Meeting	<i>Cardiff University</i>
01/20	Astrophysics Seminar	<i>University of Birmingham</i>
12/19	2019 Stars in Melbourne	<i>Monash University</i>
11/19	2019 OzGrav Annual Retreat	<i>Lorne, Melbourne</i>
11/19	OzGrav Data/Astro Telecon	<i>Virtual</i>

Grants & awards

24	Mollie Holman Doctoral Medal for Science (shortlisted)	<i>Monash University</i>
04/23	Croucher Research Fellowship	<i>Croucher Foundation</i>
03/23	Humboldt Research Fellowship (declined for Croucher)	<i>Alexander von Humboldt Foundation</i>
01/23	Postgraduate publication award	<i>Monash University</i>

12/22	Max Planck Institute for Astrophysics Fellowship (declined for Croucher)	<i>Max Planck Institute for Astrophysics</i>
Q3/4 21	Lead CI for NCI Astronomy Program computing grant (670 kSU)	<i>AAL Astronomy Supercomputer</i>
Q1/2 21	Lead CI for NCI Astronomy Program computing grant (544 kSU)	<i>AAL Astronomy Supercomputer</i>
19 – 22	J. L. William International PhD Scholarship	<i>Monash University</i>
19 – 23	Research Training Program (RTP) Stipend	<i>Monash University</i>
19 – 23	Monash International Tuition Scholarship	<i>Monash University</i>
07/19	Schools Prize	<i>St Edmund Hall, University of Oxford</i>
17, 18	Open Scholarship	<i>St Edmund Hall, University of Oxford</i>
16	Open Exhibition	<i>St Edmund Hall, University of Oxford</i>
08/15	Hong Kong Scholarship for Excellence	<i>Hong Kong Government</i>

Teaching & supervision

24 –	PhD co-supervision of Ana Lourdes (Macquarie University)
23 –	Project co-supervision for PhD and Master’s students at Heidelberg Institute for Theoretical Studies
11 – 12/21	Co-supervisor for summer Honours student at Monash University
02 – 06/21	TA for <i>ASP3051 Relativity and Cosmology</i>
08 – 11/20	Tutor for <i>ASP3162 Computational Astrophysics and the Extreme Universe</i> under the Monash University Indigenous Academic Enhancement Program
08 – 11/20	IAEP tutor for <i>ASP3012 Stars and Galaxies</i>
08 – 09/20	Tutor for <i>MCD1180: Introductory Physics</i> under the Monash Indigenous Access Program
04 – 06/20	IAEP tutor for <i>ASP3051 Relativity and Cosmology</i>
04 – 06/20	IAEP tutor for <i>MAT9004 Mathematical Foundations for Data Science</i>
02 – 06/20	TA for <i>ASP1010: Earth to Cosmos—Introductory Astronomy</i>

Academic service & outreach

- Referee for *The Astrophysical Journal* (Letters and Main Journal), *Monthly Notices of the Royal Astronomical Society*, *Astronomy and Astrophysics*, and *The Open Journal of Astrophysics*
- Reviewer for JWST Director’s Discretionary Time
- Reviewer for National Science Centre Poland

02/23	Local organising committee for the 2023 Phantom Users Workshop
11/22	OzGrav Outreach Superstar Award
10/19 – 08/23	Organiser for weekly Whiteboard Seminars at Monash University
09/22	World Science Festival, Ipswich, Queensland
07/21	Dark Science holiday programme, Casey Tech School (Berwick)
07/21	Black Hole Sunday, Twisted Science Centre, Echuca, Victoria
04/21	OzGrav Interactive tech showcase, Bendigo Discovery Science and Technology Centre
12/19	Monash Minimizer Faire, Monash University
18	Organiser for St Edmund Hall Physics Journal Club
08/17 – 19	Academic and Scholarship Mentor at Project Access HK: Mentorship for talented, underprivileged students in Hong Kong

Software contributions

- Software development: COMPAS (rapid binary population synthesis), PHANTOM (smoothed particle hydrodynamics)
- Programming languages: Python, Fortran, MATLAB, C++