Mike Y. M. Lau

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

Heidelberg Institute for Theoretical Studies
OzGrav: The ARC Centre of Excellence for Gravitational Wave Discovery

Research experience

09/23 – **Croucher Research Fellow, Heidelberg Institute for Theoretical Studies**

01 – 06/22 **Center for Computational Astrophysics (CCA), Flatiron Institute**
Research Analyst as part of the CCA Pre-Doctoral Program, supervised by Dr. Matteo Cantiello and Dr. Adam Jermyn

Education

09/19 – 03/23 **PhD, Monash University**
Dissertation: *Interactions in Stellar Binaries*, supervised by Prof. Ilya Mandel, Prof. Daniel J. Price, and Dr. Ryosuke Hirai

10/15 – 07/19 **MMathPhys, The University of Oxford**
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

Refereed publications (*=key publication)

13. Bermúdez-Bustamante, L. C., De Marco, O., Siess, L., Price, D. J., González-Bolívar, M., **Lau, M. Y. M.**, Mu, C., Hirai, R., Danilovich, T., Kasliwal, M. M. *Dust formation in common envelope binary interactions – II: 3D simulations with self-consistent dust formation. MNRAS*, 533, 1, p.464-481 (2024).
12. ***Lau, M. Y. M.**, Hirai, R., Mandel, I., Tout, C. A., *Expansion of accreting main-sequence stars during rapid mass transfer. ApJ Letters*, 966, 1, L7 (2024).
11. González-Bolívar, M., De Marco, O., **Lau, M. Y. M.**, Hirai, R., Price, D. J. *Common envelope binary interaction simulations between a thermally-pulsating AGB star and a low mass companion. MNRAS*, 517, 3, p.3181-3199 (2022).
10. ***Lau, M. Y. M.**, Hirai, R., Price, D. J., Mandel, I. *Common envelopes in massive stars II: The distinct roles of hydrogen and helium recombination. MNRAS*, 516, 4, p.4669-4678 (2022).
9. Renzo, M., Zapartas, E., Justham, S., Breivik, K., **Lau, M. Y. M.**, Farmer, R. J., Cantiello, M., Metzger, B. D. *Rejuvenated accretors have less bound envelopes: Impact of Roche lobe overflow on subsequent common envelope events. ApJ Letters*, 942, 2, id.L32 (2023).
8. ***Lau, M. Y. M.**, Hirai, R., González-Bolívar, M., Price, D. J., De Marco, O., Mandel, I. *Common envelopes in massive stars: Towards the role of radiation pressure and recombination energy in ejecting red supergiant envelopes. MNRAS*, 512, 4, p.5462-5480 (2022).
7. Amaro-Seoane, P., et al. (including **Lau, M. Y. M.**). *Astrophysics with the Laser Interferometer Space Antenna. Living Reviews in Relativity*, Volume 26, Issue 1, article id.2.
6. Team COMPAS: Riley, J., et al. (including **Lau, M. Y. M.**). *Rapid stellar and binary population synthesis with COMPAS. ApJ Supplement*, 258, 2, id.34, p.34 (2022).
5. Team COMPAS: Riley, J., et al. (including **Lau, M. Y. M.**). *COMPAS: A rapid binary population synthesis suite. Journal of Open Source Software*, 7, 69, id.3838 (2022).
4. Ackley, K., et al. (including **Lau, M. Y. M.**). *Neutron Star Extreme Matter Observatory: A kilohertz-band gravitational-wave detector in the global network. Publications of the Astronomical Society of Australia*, 37, id.e047 (2020).
3. **Lau, M. Y. M.**, Mandel, I., Vigna-Gómez, A., Neijssel, C. J., Stevenson, S., Sesana, A. *Detecting Double Neutron Stars with LISA. MNRAS*, 492, 3, p.3061-3072 (2020).

Submitted works

2. Bermúdez-Bustamante, L. C., De Marco, O., Siess, L., Price, D. J., González-Bolívar, M., **Lau, M. Y. M.**, Mu, C., Hirai, R., Danilovich, T., Kasliwal, M. M. *Dust formation during the interaction of binary stars by common envelope. Proceedings IAU Symposium No. 384* (2024, *arXiv:2407.07414*).
1. ***Lau, M. Y. M.**, Cantiello, M., Jermyn, A. S., MacLeod, M., Mandel, I., Price, D. J. *Hot Jupiter engulfment by a red giant in 3D hydrodynamics.* Submitted to *MNRAS* (2022, *arXiv:2210.15848*).

Selected talks

07/24	41st Liège International Astrophysical Colloquium: The eventful life of massive star multiples (best linguistics invention)	*University of Liège*
02/24	Joint Franco-Australian 5th Phantom and MCFOST Users Workshop (**invited**)	*Monash University, remote*
12/23	Astrophysics seminar	*The Chinese University of Hong Kong*
03/23	Colloquium	*ICRAR-Curtin, Perth*
02/23	Phantom users workshop 2023 (LOC)	*Monash University*
01/23	SESTAS meeting	*MPA, Garching*
01/23	Common envelope group meeting	*HITS, Heidelberg*
12/22	Gravitational Wave Physics and Astronomy Workshop (GWPAW, **invited**)	*Melbourne*
06/22	CCA Predoctoral Program Symposium	*CCA, Flatiron Institute*
06/22	Physics and Astrophysics of Common Envelope	*Los Alamos National Laboratory*
03/22	CCA Stars & Compact Objects Group Meeting	*CCA, Flatiron Institute*
12/21	OzGrav Data/Astro Telecon	*Virtual*
09/21	Common Envelope Physics and Outcomes 2021	*Virtual*
07/21	ASA Annual Meeting 2021	*University of Melbourne*
07/21	EAS Annual Meeting 2021	*Leiden, virtual*
02/21	LISA Workshop (**invited**)	*University of Auckland, remote*
08/20	The 13th International LISA Symposium	*University of Auckland, remote*
02/20	ANITA workshop and school 2020	*UNSW, Canberra*
01/20	Gravitational Waves Group Meeting	*Cardiff University*
01/20	Astrophysics Seminar	*University of Birmingham*
12/19	2019 Stars in Melbourne	*Monash University*
11/19	2019 OzGrav Annual Retreat	*Lorne, Melbourne*
11/19	OzGrav Data/Astro Telecon	*Virtual*

Grants & awards

04/23	Croucher Research Fellowship	*Croucher Foundation*
03/23	Humboldt Research Fellowship (declined for Croucher)	*Alexander von Humboldt Foundation*
01/23	Postgraduate publication award	*Monash University*
12/22	Max Planck Institute for Astrophysics Fellowship (declined for Croucher)	*Max Planck Institute for Astrophysics*
Q3/4 21	Lead CI for NCI Astronomy Program computing grant (670 kSU)	*AAL Astronomy Supercomputer*
Q1/2 21	Lead CI for NCI Astronomy Program computing grant (544 kSU)	*AAL Astronomy Supercomputer*
19 – 22	J. L. William International PhD Scholarship	*Monash University*
19 – 23	Research Training Program (RTP) Stipend	*Monash University*
19 – 23	Monash International Tuition Scholarship	*Monash University*
07/19	Schools Prize	*St Edmund Hall, University of Oxford*
17, 18	Open Scholarship	*St Edmund Hall, University of Oxford*
16	Open Exhibition	*St Edmund Hall, University of Oxford*
08/15	Hong Kong Scholarship for Excellence (tuition)	*Hong Kong Government*

Teaching & supervision

11 – 12/21	Co-supervisor for summer undergraduate student at Monash University
02 – 06/21	TA for *ASP3051 Relativity and Cosmology*
08 – 11/20	Tutor for *ASP3162 Computational Astrophysics and the Extreme Universe* under the Monash University Indigenous Academic Enhancement Program
08 – 11/20	IAEP tutor for *ASP3012 Stars and Galaxies*
08 – 09/20	Tutor for *MCD1180: Introductory Physics* under the Monash Indigenous Access Program
04 – 06/20	IAEP tutor for *ASP3051 Relativity and Cosmology*
04 – 06/20	IAEP tutor for *MAT9004 Mathematical Foundations for Data Science*
02 – 06/20	TA for *ASP1010: Earth to Cosmos—Introductory Astronomy*

Academic service & outreach

02/23	Local organising committee for 2023 Phantom Users Workshop
11/22	OzGrav Outreach Superstar Award
	Reviewer for MNRAS, ApJ Letters, and A&A
10/19 – 08/23	Organised weekly Whiteboard Sessions 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 Minimaker Faire, Monash University
18	Organised 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

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