# 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

*Published by a peer-reviewed journal* (\*=key publication)

12. **\*Lau, M. Y. M.**, Hirai, R., Mandel, I., Tout, C. A., *Expansion of accreting main-sequence stars during rapid mass transfer. ApJ Letters* (in press, 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 to a peer-reviewed journal*

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 in common envelope binary interactions – II: 3D simulations with self-consistent dust formation.* Submitted to *MNRAS* (2024; *arXiv:2401.03644*).

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

| | | |
|---|---|---|
| 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* |
| 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