

# Ryosuke Hirai

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## Curriculum Vitae

### Personal Information

Name Ryosuke Hirai (平井 遼介)  
Nationality Japanese  
Gender Male  
Date of Birth 12th August, 1989  
Email ryosuke.hirai@monash.edu

### Research Interests

2012– Binary stars and supernovae  
2015– Efficient numerical schemes for difference equations  
2018– Stellar mergers  
2020– X-ray binaries

### Education

2014–2017 **Doctor of Science**, *Waseda University*, Advanced Research Institute of Science and Engineering.  
2012–2014 **Master of Science**, *Waseda University*, Advanced Research Institute of Science and Engineering.  
2008–2012 **Bachelor of Engineering**, *Waseda University*, School of Advanced Science and Engineering.

### Research Experience

2019.12– **Research Fellow**, at *School of Physics and Astronomy*, Monash University.  
2017–2019 **JSPS Overseas Research Fellow**, at *Department of Physics*, University of Oxford.  
2017.4–10 **JSPS Research Fellow (PD)**, at *Advanced Research Institute of Science and Engineering*, Waseda University.  
2016–2017 **JSPS Research Fellow (DC2)**, at *Advanced Research Institute of Science and Engineering*, Waseda University.

### Teaching Experience

2020.7–10 **Teaching Assistant**, *PHS1022 (Waves and Quantum Physics)*, Monash University.  
2020.9– **Co-supervisor**, *PhD student*, Monash University.

2014–2017 **Teaching Assistant**, *Introductory Physics*, Waseda University.

## Grants

- 2018 **Hayakawa Satio Fund, Astronomical Society of Japan**, ~210000 JPY.  
2016–2017 **JSPS Research Fellow (DC2), Fellowship + Grant**, 1200000+1100000 JPY.  
2015 **Research Grant for Young Scientists, Early Bird Program from Waseda Research Institute for Science and Engineering**, 400000 JPY.

## Languages

Japanese **Mothertongue**

English **Fluent**

*Spent 8.5 years of childhood in England*

## Service

- 2022– **Referee**, *The Astrophysical Journal*.  
2021– **Referee**, *The Astrophysical Journal Letters*.  
2021– **Referee**, *Publications of the Astronomical Society of Australia*.  
2021– **Program Chair**, *ARC Centre of Excellence for Gravitational Wave Discovery (OzGrav)*, *Relativistic Astrophysics program*.  
2021– **Referee**, *Galaxies*.  
2020– **Seminar/Colloquia organiser**, *Monash University*.  
2020– **Referee**, *Publications of the Astronomical Society of Japan*.  
2019– **Referee**, *Monthly Notices of the Royal Astronomical Society*.  
2018–2019 **SPI-MAX seminar series organiser**, *University of Oxford*.  
2015–2017 **Seminar organiser**, *Waseda University*.

## Membership

- 2016– **Rironkon (Theoretical astrophysics society of Japan)**.  
2015– **Astronomical Society of Japan**.

## Publications

### First Author

- [9] **Conditions for accretion disc formation and observability of wind-accreting X-ray binaries**  
Ryosuke Hirai, Ilya Mandel  
*Publications of the Astronomical Society of Australia*, Volume 38, article id. e056 (2021)
- [8] **Simulating the formation of  $\eta$  Carinae's surrounding nebula through unstable triple evolution and stellar merger-induced eruption**  
Ryosuke Hirai, Philipp Podsiadlowski, Stanley Owocki, Fabian R. N. Schneider, Nathan Smith  
*Monthly Notices of the Royal Astronomical Society*, Volume 503, Issue 3, pp.4276–4296 (2021)

- [7] **Formation pathway for lonely stripped-envelope supernova progenitors: implications for Cassiopeia A**  
Ryosuke Hirai, Toshiki Sato, Philipp Podsiadlowski, Alejandro Vigna-Gómez, Ilya Mandel  
*Monthly Notices of the Royal Astronomical Society*, Volume 499, Issue 1, pp.1154-1171 (2020)
- [6] **Comprehensive study of ejecta-companion interaction for core-collapse supernovae in massive binaries**  
Ryosuke Hirai, Philipp Podsiadlowski, Shoichi Yamada  
*The Astrophysical Journal*, Volume 864, Issue 2, article id. 119, 17 pp. (2018)
- [5] **The Origin of the Possible Massive Black Hole in the Progenitor System of iPTF13bvn**  
Ryosuke Hirai  
*Monthly Notices of the Royal Astronomical Society: Letters*, Volume 469, Issue 1, p.L94-L98 (2017)
- [4] **Formation Scenario of the Progenitor of iPTF13bvn Revisited**  
Ryosuke Hirai  
*Monthly Notices of the Royal Astronomical Society*, Volume 466, Issue 4, p.3775-3783 (2017)
- [3] **Hyperbolic Self-Gravity Solver for Large Scale Hydrodynamical Simulations**  
Ryosuke Hirai, Hiroki Nagakura, Hirotada Okawa, Kotaro Fujisawa  
*Physical Review D*, Volume 93, Issue 8, article id.083006 (2016)
- [2] **Possible Signatures of Ejecta-Companion Interaction in iPTF 13bvn**  
Ryosuke Hirai, Shoichi Yamada  
*The Astrophysical Journal*, Volume 805, Issue 2, article id. 170, 7 pp. (2015)
- [1] **The Outcome of Supernovae in Massive Binaries; Removed Mass, and its Separation Dependence**  
Ryosuke Hirai, Hidetomo Sawai, Shoichi Yamada  
*The Astrophysical Journal*, Volume 792, Issue 1, article id. 66, 15 pp. (2014)

#### Co-Author

- [14] **An environmental analysis of the Type Ib SN 2019yvr and the possible presence of an inflated binary companion**  
 Ning-Chen Sun, Justyn R. Maund, Paul A. Crowther, Ryosuke Hirai, Amir Kashapov, Ji-Feng Liu, Liang-Duan Liu, Emmanouil Zapartas  
*Monthly Notices of the Royal Astronomical Society*, Volume 510, Issue 3, pp.3701-3715 (2022)
- [13] **Common envelopes in massive stars: Towards the role of radiation pressure and recombination energy in ejecting red supergiant envelopes**  
 Mike Y. M. Lau, Ryosuke Hirai, Miguel González-Bolívar, Daniel J. Price, Orsola De Marco, Ilya Mandel  
*Monthly Notices of the Royal Astronomical Society*, in press (2022)

- [12] **Rapid Stellar and Binary Population Synthesis with COMPAS**  
Team COMPAS (including [Ryosuke Hirai](#))  
*The Astrophysical Journal Supplement Series*, Volume 258, Issue 2, id.34, 30 pp. (2022)
- [11] **Stellar Core-Merger-Induced Collapse: New Formation Pathways for Black Holes, Thorne-Żytkow objects, Magnetars and Superluminous Supernovae**  
Iminhaji Ablimit, Philipp Podsiadlowski, [Ryosuke Hirai](#), James Wicker  
accepted for publication in *Monthly Notices of the Royal Astronomical Society*
- [10] **Supernova explosions in active galactic nuclear discs**  
Evgeni Grishin, Alexey Bobrick, [Ryosuke Hirai](#), Ilya Mandel, Hagai B. Perets  
*Monthly Notices of the Royal Astronomical Society*, Volume 507, Issue 1, pp.156-174 (2021)
- [9] **The observability of inflated companion stars after supernovae in massive binaries**  
Misa Ogata, [Ryosuke Hirai](#), Kotaro Hijikawa  
*Monthly Notices of the Royal Astronomical Society*, Volume 505, Issue 2, pp.2485-2499 (2021)
- [8] **Wind Mass-loss Rates of Stripped Stars Inferred from Cygnus X-1**  
Coenraad J. Neijssel, Serena Vinciguerra, Alejandro Vigna-Gómez, [Ryosuke Hirai](#), James C. A. Miller-Jones, Arash Bahramian, Thomas J. Maccarone, Ilya Mandel  
*The Astrophysical Journal*, Volume 908, Issue 2, id.118, 9 pp. (2021)
- [7] **Neutron Star Extreme Matter Observatory: A kilohertz-band gravitational-wave detector in the global network**  
Ackley et al. (including [Ryosuke Hirai](#))  
*Publications of the Astronomical Society of Australia*, Volume 37, article id. e047 (2020)
- [6] **The sensitivity of presupernova neutrinos to stellar evolution models**  
Chinami Kato, [Ryosuke Hirai](#), Hiroki Nagakura  
*Monthly Notices of the Royal Astronomical Society*, Volume 496, Issue 3, pp.3961-3972 (2020)
- [5] **A Subsolar Metallicity Progenitor for Cassiopeia A, the Remnant of a Type IIb Supernova**  
Toshiki Sato, Takashi Yoshida, Hideyuki Umeda, Shigehiro Nagataki, Masaomi Ono, Keiichi Maeda, [Ryosuke Hirai](#), John P. Hughes, Brian J. Williams, Yoshitomo Maeda  
*The Astrophysical Journal*, Volume 893, Issue 1, id.49, 9 pp. (2020)
- [4] **Origins of Type Ibn SNe 2006jc/2015G in interacting binaries and implications for pre-SN eruptions**  
Ning-Chen Sun, Jusytn R. Maund, [Ryosuke Hirai](#), Paul A. Crowther, Philipp Podsiadlowski  
*Monthly Notices of the Royal Astronomical Society*, Volume 491, Issue 4, p.6000-6019 (2020)
- [3] **Hydrodynamical simulations and similarity relations for eruptive mass loss from massive stars**  
Stanley P. Owocki, [Ryosuke Hirai](#), Philipp Podsiadlowski, Fabian R. N. Schneider  
*Monthly Notices of the Royal Astronomical Society*, Volume 485, Issue 1, p.988-1000 (2019)

- [2] **The W4 method: a new multi-dimensional root-finding scheme for nonlinear systems of equations**

Hirotsada Okawa, Kotaro Fujisawa, Yu Yamamoto, [Ryosuke Hirai](#), Nobutoshi Yasutake, Hiroki Nagakura, Shoichi Yamada  
arXiv:1809.04495

- [1] **Formation pathway of Population III coalescing binary black holes through stable mass transfer**

Kohei Inayoshi, [Ryosuke Hirai](#), Tomoya Kinugawa, Kenta Hotokezaka  
*Monthly Notices of the Royal Astronomical Society*, Volume 468, Issue 4, p.5020-5032 (2017)

#### Other Articles

- [1] **水素欠乏超新星の親星の起源(The Origin of the Progenitors of Stripped-Envelope Supernovae)**

平井 遼介 (Ryosuke Hirai)  
天文月報(*The Astronomical Herald*), Volume 111, Issue 9, p.580-588 (2018)