

# Tyrone E. Woods

**Citizenship** Canadian  
**Languages** English (*fluent*), French (*proficient*)  
**Research interests** Interacting stars, formation of gravitational wave sources, quasars, interstellar medium, supernovae  
**Publication stats** 23 refereed publications (10 first-author, 8 second-author), 426 citations, h-index 12

## Research Positions

2018– **Prize Research Fellow**, University of Birmingham Birmingham, GBR  
• Independent research fellowship at the Institute for Gravitational Wave Astronomy

2015–18 **Research Fellow**, Monash University Melbourne, AUS  
• Postdoctoral research fellowship in cosmic explosions hosted by Prof. Alexander Heger

## Education

2011–15 **PhD Physics**, Max Planck Institute for Astrophysics / Ludwig Maximilian University of Munich Garching, DEU  
• Primary Supervisor: Prof. Marat Gilfanov  
• Thesis: “Emission line diagnostics of the progenitors of type Ia supernovae”  
• Honours: Graduated *magna cum laude*

2009–11 **MSc Physics**, University of Alberta Edmonton, CAN  
• Supervisor: Prof. Natalia Ivanova  
• Thesis: “Selected topics in the evolution of binary stars”  
• Societies: Graduate Physics Student Association (*elected student representative 2009–11*)

2005–09 **BSc Honours Astrophysics**, University of Alberta Edmonton, CAN

## Awards

Approximate monetary value of prizes, scholarships, grants, and observing time awarded over the past 5 years = **\$449,000**

## Selected Prizes, Scholarships, & Grants

2018 **Lorentz Center Workshop Grant** to support “Observational Signatures of SN Ia Progenitors III” Leiden, NLD  
2017 **JINA-CEE Workshop Grant** to support “Titans of the Early Universe” East Lansing, USA  
2014 **Rudolf Kippenhahn Prize** for best student publication 2013, Max Planck Institute for Astrophysics Garching, DEU  
2011 **Profiling Alberta’s Graduate Students Award** to support research travel, University of Alberta Edmonton, CAN  
2009 **NSERC USRA** to support a 16-week research term at Athabasca University (*also awarded in '07, '08*) Edmonton, CAN

## Successful Observing Proposals

2019	<b>Gemini (North) Telescope</b>	Co-I	ID: GN-2019A-FT-203	1.5 hours
2018	<b>Australian National University 2.3m Telescope</b>	Co-I	ID: 4180034	5 nights
2017	<b>Australian National University 2.3m Telescope</b>	Co-I	ID: 2170118	5 nights
2017	<b>XMM-Newton</b>	Co-I	ID: 080346	52 ksec
2015	<b>Magellan (Baade) Telescope</b>	Co-I	ID: CN2015B-100	1 night
2013	<b>Gemini (North) Telescope</b>	Co-I	ID: GN-2013B-Q-92	8 hours

## Teaching Experience

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- 2016–18 **Instructor**, Monash University **In-class**
- “The Interstellar Medium” – 4th-year undergraduate course, developed then taught 2 years in a row 36 hours
  - “Computational Astrophysics: High Energy Unit” – week-long unit of 3rd-year undergraduate course 6 hours
  - “Intro to Scientific Computing: LaTeX” – half-day session of 4th-year undergraduate workshop (x3) 9 hours
- 2009–11 **Teaching Assistant**, University of Alberta
- “Particles & Waves / Fluids, Fields, & Radiation” – lab component of 1st-year undergraduate course 144 hours

## Supervisory Experience

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- 2017–18 **Adelle Goodwin**<sup>1</sup>, Monash University – PhD project on low-mass X-ray binaries
- 2017 **Jake King**, Monash University – 3rd-year undergraduate research project on He II nebulae in M33
- 2016 **Kieran Hirsh**, Monash University – undergraduate summer research project on He II emission nebulae
- currently a PhD student in Astrophysics at University of Lyon
- 2013–15 **Hailiang Chen**<sup>2</sup>, Max Planck Institute for Astrophysics – PhD project on populations of accreting WD binaries
- published 3 first-author journal articles under my co-supervision
  - currently a postdoctoral researcher at Yunnan Astronomical Observatory
- 2011 **David McBean**<sup>3</sup>, University of Alberta – 4th-year undergraduate research project on X-ray binaries

<sup>1</sup> co-supervisors: D. Galloway, A. Heger | <sup>2</sup> co-supervisors: L. Yungelson, M. Gilfanov, Z. Han | <sup>3</sup> co-supervisor: N. Ivanova

## Professional Service

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- 2015– **Expert Reviewer**
- Invited to referee for several academic journals including *Monthly Notices of the Royal Astronomical Society* (main journal and *Letters*), *Physical Review D*, *The Astrophysical Journal*, *Publications of the Astronomical Society of Australia*, as well as the Czech Science Foundation
- Conference Organizer** (*co-chair*)
- 2018 • “Observational Signatures of Type Ia Supernova Progenitors III” – Leiden, the Netherlands
- 2017 • “Titans of the Early Universe: The Origin of the First Supermassive Black Holes” – Prato, Italy
- 2011 • “Second Annual Symposium for Graduate Physics Research at the University of Alberta” – Edmonton, Canada
- 2016–17 **Seminar Coordinator**, Monash Centre for Astrophysics, Monash University
- Organized the seminar visits of 50 guest lecturers from Australia and abroad

## Professional Memberships

- 2011– **Canadian Astronomical Society (CASCA)**      2015– **Astronomical Society of Australia (ASA)**

## Outreach Activities

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- 2019 **Public Lecturer**, University of Birmingham – Presented a public-level talk on supernovae to 200+ attendees
- 2017 **Interviewee**, University of Alberta – Discussed black holes and careers in science for an online astronomy course
- 2016–17 **Guest Expert**, John Monash Science School – Spoke to and helped evaluate 10th grade science students
- 2016 **Public Lecturer**, Monash Centre for Astrophysics – Presented a public-level talk on Tycho’s Supernova
- 2011 **Panellist**, Grandview Heights School – Answered 8th grade students’ questions about space and astronomy

## Presentations

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18 invited talks, 18 contributed talks, 5 poster presentations at institutes and conferences spanning 12 countries, 4 continents

### Selected Invited Talks

01.05.2019	<b>Queen's University Belfast ARC Seminar</b>	Belfast, GBR
11.10.2018	<b>Institute of Cosmology and Gravitation (ICG Portsmouth) Colloquium</b>	Portsmouth, GBR
18.07.2018	<b>University of Melbourne Astrophysics Colloquium</b>	Melbourne, AUS
15.02.2018	<b>Research Institute in Astrophysics and Planetology (IRAP) Seminar</b>	Toulouse, FRA
07.12.2017	<b>Canadian Institute for Theoretical Astrophysics (CITA) Seminar</b>	Toronto, CAN
21.11.2017	<b>Titans of the Early Universe</b> ( <i>international conference</i> )	Prato, ITA
13.02.2017	<b>Australian National University (ANU) RSAA Colloquium</b>	Canberra, AUS
14.06.2016	<b>National Observatory of Athens IAASARS Seminar</b>	Athens, GRC
24.09.2014	<b>Harvard-Smithsonian Center for Astrophysics (CfA) HEAD Lunch Talk</b>	Cambridge, USA
17.07.2014	<b>Quenching and Quiescence</b> ( <i>international conference</i> )	Heidelberg, DEU

### Press Coverage

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28.09.2017	<b>Tycho's supernova challenges theories on what makes stars explode</b> <a href="https://iflscience.com/space/tychos-supernova-challenges-theories-on-what-makes-stars-explode/">https://iflscience.com/space/tychos-supernova-challenges-theories-on-what-makes-stars-explode/</a>	Stephen Luntz <b>IFLScience</b>
27.09.2017	<b>A famous supernova's mysteries are still unraveling hundreds of years later</b> <a href="https://gizmodo.com/a-famous-supernovas-mysteries-are-still-unraveling-hund-1818816208">https://gizmodo.com/a-famous-supernovas-mysteries-are-still-unraveling-hund-1818816208</a>	Ryan F. Mandelbaum <b>Gizmodo</b>
26.09.2017	<b>Progenitor for Tycho's supernova was not hot and luminous</b> <a href="https://phys.org/news/2017-09-progenitor-tycho-supernova-hot-luminous.html">https://phys.org/news/2017-09-progenitor-tycho-supernova-hot-luminous.html</a>	Max Planck Society <b>Phys.org</b>
16.06.2017	<b>Maxing out the mass of early stars</b> <a href="https://aasnova.org/2017/06/16/maxing-out-the-mass-of-early-stars/">https://aasnova.org/2017/06/16/maxing-out-the-mass-of-early-stars/</a>	Susanna Kohler <b>AAS Nova</b>

### Recent Highlighted Publications *(see Publication List for more)*

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**Woods, T. E.**, Agarwal, B., Bromm, V., Bunker, A., Chen, K.-J., Chon, S., ... Yoshida, N. (in press). Titans of the early Universe: The Prato statement on the origin of the first supermassive black holes. *Publications of the Astronomical Society of Australia*. arXiv:1810.12310

**Woods, T. E.**, Ghavamian, P., Badenes, C., & Gilfanov, M. (2017). No hot and luminous progenitor for Tycho's supernova. *Nature Astronomy*, 1, 800–804. doi:10.1038/s41550-017-0263-5

**Woods, T. E.**, Heger, A., Whalen, D. J., Haemmerlé, L., & Klessen, R. S. (2017). On the maximum mass of accreting primordial supermassive stars. *The Astrophysical Journal Letters*, 842, L6. doi:10.3847/2041-8213/aa7412

### References

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<b>Marat Gilfanov</b> Professor	Max Planck Institute for Astrophysics Karl-Schwarzschild-Strasse 1, 85748, Garching, Germany	Ph: +49 89 30000 2227 gilfanov [at] mpa-garching.mpg.de
<b>Alexander Heger</b> Professor	Monash Centre for Astrophysics, School of Physics and Astronomy Monash University, Victoria, 3800, Australia	Ph: +61 3 9905 4478 alexander.heger [at] monash.edu
<b>Dan Maoz</b> Director	Wise Observatory Tel Aviv University, 69978, Tel Aviv, Israel	Ph: +972 3 640 8538 maoz [at] astro.tau.ac.il

# Publications

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**23** refereed publications in **8** journals incl. Nat. Astron. | ADS citation count = **426**, h-index = **12** | \* co-supervised student

## Invited Review Articles

1. **Woods, T. E.**, Agarwal, B., Bromm, V., Bunker, A., Chen, K.-J., Chon, S., ... Yoshida, N. (in press). Titans of the early Universe: The Prato statement on the origin of the first supermassive black holes. *Publications of the Astronomical Society of Australia*. arXiv:1810.12310

## Journal Articles

23. Surace, M., Zackrisson, E., Whalen, D. J., Hartwig, T., Glover, S. C. O., **Woods, T. E.**, & Heger, A. (submitted). *On the detection of supermassive primordial stars. II. Blue supergiants*. Manuscript submitted for publication (03/2019). arXiv:1904.01507
22. Casey, A. R., Ho, A. Y. Q., Ness, M., Rix, H.-W., Angelou, G. C., Hekker, S., Tout, C. A., Lattanzio, J. C., Karakas, A. I., **Woods, T. E.**, Price-Whelan, A. M., & Schlaufman, K. C. (submitted). *Tidal interactions between binary stars drives lithium production in low-mass red giants*. Manuscript submitted for publication (02/2019). arXiv:1902.04102
21. Chen, H.-L.\* , **Woods, T. E.**, Yungelson, L. R., Gilfanov, M., Piersanti, L., & Han, Z. (submitted). *Comprehensive models of novae at metallicity  $Z = 0.02$  and  $Z = 10^{-4}$* . Manuscript submitted for publication (12/2018).
20. Kuuttila, J., Gilfanov, M., Seitenzahl, I. R., **Woods, T. E.**, & Vogt, F. P. A. (2019). Excluding supersoft X-ray sources as progenitors for four Type Ia supernovae in the Large Magellanic Cloud. *Monthly Notices of the Royal Astronomical Society*, *484*, 1317–1324. doi:10.1093/mnras/stz065
19. Graur, O., & **Woods, T. E.** (2019). Progenitor constraints on the Type Ia supernova SN 2014J from *Hubble Space Telescope* H  $\beta$  and [O III] observations. *Monthly Notices of the Royal Astronomical Society: Letters*, *484*, L79–L84. doi:10.1093/mnrasl/slz005
18. Surace, M., Whalen, D. J., Hartwig, T., Zackrisson, E., Glover, S. C. O., Patrick, S., **Woods, T. E.**, Heger, A., & Haemmerlé, L. (2018). On the detection of supermassive primordial stars. *The Astrophysical Journal Letters*, *869*, L39. doi:10.3847/2041-8213/aaf80d
17. **Woods, T. E.**, Ghavamian, P., Badenes, C., & Gilfanov, M. (2018). Balmer-dominated shocks exclude hot progenitors for many Type Ia supernovae. *The Astrophysical Journal*, *863*, 120. doi:10.3847/1538-4357/aad1ee
16. Haemmerlé, L., **Woods, T. E.**, Klessen, R. S., Heger, A., & Whalen, D. J. (2018). The evolution of supermassive Population III stars. *Monthly Notices of the Royal Astronomical Society*, *474*, 2757–2773. doi:10.1093/mnras/stx2919
15. Haemmerlé, L., **Woods, T. E.**, Klessen, R. S., Heger, A., & Whalen, D. J. (2018). On the rotation of supermassive stars. *The Astrophysical Journal Letters*, *853*, L3. doi:10.3847/2041-8213/aaa462
14. **Woods, T. E.**, Ghavamian, P., Badenes, C., & Gilfanov, M. (2017). No hot and luminous progenitor for Tycho's supernova. *Nature Astronomy*, *1*, 800–804. doi:10.1038/s41550-017-0263-5
13. **Woods, T. E.**, Heger, A., Whalen, D. J., Haemmerlé, L., & Klessen, R. S. (2017). On the maximum mass of accreting primordial supermassive stars. *The Astrophysical Journal Letters*, *842*, L6. doi:10.3847/2041-8213/aa7412

12. Johansson, J., **Woods, T. E.**, Gilfanov, M., Sarzi, M., Chen, Y.-M., & Oh, K. (2016). Diffuse gas in retired galaxies: nebular emission templates and constraints on the sources of ionization. *Monthly Notices of the Royal Astronomical Society*, *461*, 4505–4516. doi:10.1093/mnras/stw1668
11. Chen, H.-L.\*, **Woods, T. E.**, Yungelson, L. R., Gilfanov, M., & Han, Z. (2016). Modelling nova populations in galaxies. *Monthly Notices of the Royal Astronomical Society*, *458*, 2916–2927. doi:10.1093/mnras/stw458
10. **Woods, T. E.**, & Gilfanov, M. (2016). Where are all of the nebulae ionized by supersoft X-ray sources? *Monthly Notices of the Royal Astronomical Society*, *455*, 1770–1781. doi:10.1093/mnras/stv2423
9. Chen, H.-L.\*, **Woods, T. E.**, Yungelson, L. R., Gilfanov, M., & Han, Z. (2015). Population synthesis of accreting white dwarfs – II. X-ray and UV emission. *Monthly Notices of the Royal Astronomical Society*, *453*, 3024–3034. doi:10.1093/mnras/stv1865
8. Chen, H.-L.\*, **Woods, T. E.**, Yungelson, L. R., Gilfanov, M., & Han, Z. (2014). Next generation population synthesis of accreting white dwarfs – I. Hybrid calculations using BSE + MESA. *Monthly Notices of the Royal Astronomical Society*, *445*, 1912–1923. doi:10.1093/mnras/stu1884
7. Nielsen, M. T. B., Gilfanov, M., Bogdán, Á., **Woods, T. E.**, & Nelemans, G. (2014). Upper limits on the luminosity of the progenitor of Type Ia supernova SN 2014J. *Monthly Notices of the Royal Astronomical Society*, *442*, 3400–3406. doi:10.1093/mnras/stu913
6. Johansson, J., **Woods, T. E.**, Gilfanov, M., Sarzi, M., Chen, Y.-M., & Oh, K. (2014). Diffuse gas in galaxies sheds new light on the origin of Type Ia supernovae. *Monthly Notices of the Royal Astronomical Society*, *442*, 1079–1089. doi:10.1093/mnras/stu907
5. **Woods, T. E.**, & Gilfanov, M. (2014). Emission-line diagnostics to constrain high-temperature populations in early-type galaxies. *Monthly Notices of the Royal Astronomical Society*, *439*, 2351–2363. doi:10.1093/mnras/stu072
4. **Woods, T. E.**, & Gilfanov, M. (2013). He II recombination lines as a test of the nature of SN Ia progenitors in elliptical galaxies. *Monthly Notices of the Royal Astronomical Society*, *432*, 1640–1650. doi:10.1093/mnras/stt586
3. **Woods, T. E.**, Ivanova, N., van der Sluys, M. V., & Chaichenets, S. (2012). On the formation of double white dwarfs through stable mass transfer and a common envelope. *The Astrophysical Journal*, *744*, 12. doi:10.1088/0004-637X/744/1/12
2. **Woods, T. E.**, & Ivanova, N. (2011). Can we trust models for adiabatic mass loss? *The Astrophysical Journal Letters*, *739*, L48. doi:10.1088/2041-8205/739/2/L48
1. Ivanova, N., Chaichenets, S., Fregeau, J., Heinke, C. O., Lombardi, J. C., Jr., & **Woods, T. E.** (2010). Formation of black hole X-ray binaries in globular clusters. *The Astrophysical Journal*, *717*, 948–957. doi:10.1088/0004-637X/717/2/948

## White Papers

1. in 't Zand, J. J. M., Bozzo, E., Qu, J.-L., Li, X.-D., Amati, L., ... **Woods, T. E.**, ... Zingale, M. (2019). Observatory science with eXTP. *Science China Physics, Mechanics & Astronomy*, *62*, 29506. doi:10.1007/s11433-017-9186-1

## Refereed Conference Proceedings

1. **Woods, T. E.**, & Gilfanov, M. (2014). UV emission lines in passively evolving galaxies can reveal the progenitors of type Ia supernovae. *Astrophysics and Space Science*, *354*, 69–74. doi:10.1007/s10509-014-2070-0