NRC Herzberg Astronomy and Astrophysics Research Centre
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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	29 refereed publications (11 first-author, 9 second-author), 556 citations, h-index 15

Research Positions

2019– **Plaskett Fellow**, National Research Council Canada — Victoria, CAN
- Research Associate at the Herzberg Astronomy and Astrophysics Research Centre

2018–19 **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 with Prof. Alexander Heger

Education

2011–15 **PhD Physics**, Max Planck Institute for Astrophysics / Ludwig Maximilian University of Munich — Munich, 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, grants, and observing time awarded over the past 5 years = **$637,000***

Selected Prizes & Grants

2018 **Workshop Grant**, Lorentz Center, support for “Observational Signatures of SN Ia Progenitors III” — Leiden, NLD
2017 **Workshop Grant**, JINA-CEE, support for “Titans of the Early Universe” — East Lansing, USA
2014 **Rudolf Kippenhahn Prize**, Max Planck Institute for Astrophysics, best student publication 2013 — Garching, DEU

Successful Observing Proposals

2019	**Gemini (South) Telescope**	P-I	ID: GS-2020A-Q-301	4.1 hours
2019	**Gemini (North) Telescope**	Co-I	ID: GN-2019A-FT-203	1.5 hours
2018	**Australian National University 2.3m Telescope**	Co-I	ID: 4180034	5 nights
2017	**Australian National University 2.3m Telescope**	Co-I	ID: 2170118	5 nights

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(Successful Observing Proposals — continued from previous page)

2016	**XMM-Newton**	Co-I	ID: 080346	52 ksec
2015	**Magellan (Baade) Telescope**	Co-I	ID: CN2015B-100	1 night
2013	**Gemini (North) Telescope**	Co-I	ID: GN-2013B-Q-92	8 hours

Teaching Experience

2016–18 **Instructor**, Monash University **In-class**

- "The Interstellar Medium" – 4th-year undergraduate course, developed then taught 2 years in a row 36 hours
- "High Energy Astrophysics: Radiative Transfer" – week-long unit of 3rd-year undergraduate course 6 hours
- "Intro to Scientific Computing: LaTeX" – half-day session of 4th-year undergraduate workshop (×3) 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

2017– **Adelle Goodwin**, Monash University – co-supervised PhD thesis on low-mass X-ray binaries

2017 **Jake King**, Monash University – 3rd-year undergraduate research project on He II nebulae in M33

- currently a senior computer forensic analyst at Deloitte Australia

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**, Max Planck Institute for Astrophysics – co-supervised PhD thesis on accreting white dwarf binaries

- published 3 first-author journal articles under my co-supervision
- currently a research scientist at Yunnan Astronomical Observatory

2011 **David McBean**, University of Alberta – co-supervised 4th-year undergraduate research project on X-ray binaries

- currently a geophysicist at Tetra Tech

Professional Service

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*, and the Czech Science Foundation

Conference Organizer *(co-chair)*

2020 • "Black Hole Formation, Accretion, and Outflows through Cosmic Time" – Aspen, USA
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

2020 **Public Lecturer**, Royal Astronomical Society of Canada (Victoria) – Presented a public-level talk on supernovae
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

Presentations

23 *invited talks,* ***18*** *contributed talks,* ***6*** *poster presentations at institutes and conferences spanning* ***12*** *countries,* ***4*** *continents*

Invited Talks

10.02.2020	**Getting Ready to Descend the Slippery Slope of Multimessenger Cosmological Black Holes Data** *(international conference)*	Sexten, ITA
29.01.2020	**National Research Council (NRC) Herzberg DRAO Seminar**	Penticton, CAN
22.10.2019	**National Research Council (NRC) Herzberg DAO Astronomy Colloquium**	Victoria, CAN
23.08.2019	**University of Alberta Astro Seminar**	Edmonton, CAN
10.06.2019	**University of Athens Summer School on Radiative Processes**	Athens, GRC
01.05.2019	**Queen's University Belfast ARC Seminar**	Belfast, GBR
07.11.2018	**University of Birmingham ASR Seminar**	Birmingham, GBR
11.10.2018	**Institute of Cosmology and Gravitation (ICG Portsmouth) Colloquium**	Portsmouth, GBR
18.07.2018	**University of Melbourne Astrophysics Colloquium**	Melbourne, AUS
15.02.2018	**Research Institute in Astrophysics and Planetology (IRAP) Seminar**	Toulouse, FRA
07.12.2017	**Canadian Institute for Theoretical Astrophysics (CITA) Seminar**	Toronto, CAN
01.12.2017	**Max Planck Institute for Astrophysics (MPA) High Energy Seminar**	Garching, DEU
21.11.2017	**Titans of the Early Universe** *(international conference)*	Prato, ITA
13.02.2017	**Australian National University (ANU) RSAA Colloquium**	Canberra, AUS
15.06.2016	**University of Athens Astrophysics Seminar**	Athens, GRC
14.06.2016	**National Observatory of Athens IAASARS Seminar**	Athens, GRC
08.09.2015	**Monash Centre for Astrophysics (MoCA) Seminar**	Melbourne, AUS
26.01.2015	**Max Planck Institute for Astrophysics (MPA) Institute Seminar**	Garching, DEU
24.09.2014	**Harvard-Smithsonian Center for Astrophysics (CfA) HEAD Lunch Talk**	Cambridge, USA
11.09.2014	**University of Alberta Astro Seminar**	Edmonton, CAN
17.07.2014	**Quenching and Quiescence** *(international conference)*	Heidelberg, DEU
22.03.2013	**Max Planck Institute for Astrophysics (MPA) High Energy Seminar**	Garching, DEU
09.12.2011	**Max Planck Institute for Astrophysics (MPA) High Energy Seminar**	Garching, DEU

Press Coverage

28.09.2017	**Tycho's supernova challenges theories on what makes stars explode** https://iflscience.com/space/tychos-supernova-challenges-theories-on-what-makes-stars-explode/	Stephen Luntz ***IFLScience***
27.09.2017	**A famous supernova's mysteries are still unraveling hundreds of years later** https://gizmodo.com/a-famous-supernovas-mysteries-are-still-unraveling-hund-1818816208	Ryan F. Mandelbaum ***Gizmodo***
16.06.2017	**Maxing out the mass of early stars** https://aasnova.org/2017/06/16/maxing-out-the-mass-of-early-stars/	Susanna Kohler ***AAS Nova***

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Publications

***29** refereed publications (**11** first-author, **9** second-author) | **556** citations, h-index **15** (NASA/ADS) | * co-supervised student*

Invited Review Articles

1. **Woods, T. E.**, Agarwal, B., Bromm, V., Bunker, A., Chen, K.-J., Chon, S., … Yoshida, N. (2019). Titans of the early Universe: The Prato statement on the origin of the first supermassive black holes. *Publications of the Astronomical Society of Australia, 36*, E027. doi:10.1017/pasa.2019.14

Journal Articles

Submitted

28. Roebber, E., Buscicchio, R., Vecchio, A., Moore, C. J., Klein, A., Korol, V., … **Woods, T. E.** (2020). *Milky Way satellites shining bright in gravitational waves*. Manuscript submitted for publication. arXiv:2002.10465

27. Goodwin, A. J.*, & **Woods, T. E.** (2020). *The binary evolution of SAX J1808.4–3658: Implications of an evolved donor star*. Manuscript submitted for publication. arXiv:2003.02970

Accepted

26. **Woods, T. E.**, Heger, A., & Haemmerlé, L. (in press). On monolithic supermassive stars. *Monthly Notices of the Royal Astronomical Society*. doi:10.1093/mnras/staa763

25. Howitt, G., Stevenson, S., Vigna-Gómez, A., Justham, S., Ivanova, N., **Woods, T. E.**, … Mandel, I. (2020). Luminous red novae: Population models and future prospects. *Monthly Notices of the Royal Astronomical Society, 492*, 3229–3240. doi:10.1093/mnras/stz3542

24. Haemmerlé, L., Meynet, G., Mayer, L., Klessen, R. S., **Woods, T. E.**, & Heger, A. (2019). Maximally accreting supermassive stars: A fundamental limit imposed by hydrostatic equilibrium. *Astronomy & Astrophysics, 632*, L2. doi:10.1051/0004-6361/201936716

23. Chen, H.-L., **Woods, T. E.**, Yungelson, L. R., Piersanti, L., Gilfanov, M., & Han, Z. (2019). Comprehensive models of novae at metallicity Z = 0.02 and Z = 10^{-4}. *Monthly Notices of the Royal Astronomical Society, 490*, 1678–1692. doi:10.1093/mnras/stz2644

22. Surace, M., Zackrisson, E., Whalen, D. J., Hartwig, T., Glover, S. C. O., **Woods, T. E.**, & Heger, A. (2019). On the detection of supermassive primordial stars – II. Blue supergiants. *Monthly Notices of the Royal Astronomical Society, 488*, 3995–4003. doi:10.1093/mnras/stz1956

21. Casey, A. R., Ho, A. Y. Q., Ness, M., Hogg, D. W., Rix, H.-W., … **Woods, T. E.**, … Schlaufman, K. C. (2019). Tidal interactions between binary stars can drive lithium production in low-mass red giants. *The Astrophysical Journal, 880*, 125. doi:10.3847/1538-4357/ab27bf

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 β 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., … **Woods, T. E.**, … 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 *(★ = refereed)*

7. Ngo, H., Kirk, H., Brown, T., **Woods, T. E.**, Eadie, G., Lawler, S., & Spencer, L. (2019). Opportunities and outcomes for postdocs in Canada. *Canadian Long Range Plan 2020*, W064. arXiv:1911.10320
6. Man, A., Abraham, R., Alexandroff, R., Carlberg, R., Chapman, S., Damjanov, I., … **Woods, T. E.** (2019). Characterizing galaxies in the early Universe. *Canadian Long Range Plan 2020*, W060.
5. Spekkens, K., Chiang, C., Kothes, R., Rosolowsky, E., Rupen, M., … **Woods, T.**, Wulf, D. (2019). Canada and the SKA from 2020–2030. *Canadian Long Range Plan 2020*, W046. arXiv:1911.03250
4. Fernandez, R., Bovy, J., Chen, A., Cumming, A., Côté, B., Davids, B., … **Woods, T. E.** (2019). The cosmic origin and evolution of the elements. *Canadian Long Range Plan 2020*, W041. arXiv:1910.09712
3. **Woods, T. E.**, Alexandroff, R. M., Ellison, S. L., Ferrarese, L., Gallagher, S. C., Gallo, L., … Willott, C. (2019). Revealing the origin and cosmic evolution of supermassive black holes. *Canadian Long Range Plan 2020*, W034. arXiv:1910.06346
2. Hénault-Brunet, V., Bahramian, A., Côté, P., Eadie, G., Haggard, D., Harris, B., … **Woods, T. E.** (2019). Star clusters near and far. *Canadian Long Range Plan 2020*, W024.
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

Conference Proceedings *(★ = refereed)*

3. ★ **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
2. **Woods, T. E.**, Ivanova, N., van der Sluys, M., & Chaichenets, S. (2011). On the formation of double white dwarfs: Reevaluating how we parametrise the common envelope phase. *ASP Conference Series, 447*, 127–132. arXiv:1108.0681
1. **Woods, T. E.**, Ivanova, N., van der Sluys, M., & Chaichenets, S. (2010). The formation of low-mass double white dwarfs through an initial phase of stable non-conservative mass transfer. *AIP Conference Proceedings, 1314*, 24–25. doi:10.1063/1.3536378