

Richard H D Townsend — Curriculum Vitae

Professional Preparation

- University of Oxford; B. A. Physics; 1st Class Honors, 1994
- University College London; Ph. D. Astronomy; 1994 – 1997
 - Thesis: ‘Non-radial Pulsations in Early-Type Stars’ (Advisor: Prof. Ian Howarth)
 - Awarded UCL Harrie Massie prize for best Astronomy/Astrophysics PhD thesis
 - Awarded Royal Astronomical Society Blackwell Prize for best Astronomy/Astrophysics PhD thesis

Appointments

- Fluno-Bascom Chair, Department of Astronomy, University of Wisconsin-Madison; 2020 –
- Professor, Department of Astronomy, University of Wisconsin-Madison; 2020 –
- Associate Professor, Department of Astronomy, University of Wisconsin-Madison; 2014 – 2020
- Assistant Professor, Department of Astronomy, University of Wisconsin-Madison; 2008 – 2014
- Associate Scientist, Bartol Research Institute, University of Delaware; 2006 – 2008
- Research Associate, Bartol Research Institute, University of Delaware; 2004 – 2006
- Limited Term Researcher, Bartol Research Institute, University of Delaware; 2003 – 2004
- Postdoctoral Research Fellow, University College London; 1998 – 2003
- Research Fellow, Reuters Limited, London; 1998
- Physics Teacher, Tuna Secondary Technical School, Ghana; 1997 – 1998

Recent Awards

- NASA Astrophysics Theory Program : *Cardiology for Heavy- weights: Deciphering the Tidally Excited Oscillations of Intermediate & High-Mass Stars*; PI R Townsend
- NSF Astronomy and Astrophysics Grants Program : *Here be Dragons: Mapping the Instabilities of Massive Stars*; PI R Townsend
- NSF Software Infrastructure for Sustained Innovation Program : *SI2-SSI: Modules for Experiments in Stellar Astrophysics*; PI R Townsend
- NSF Software Infrastructure for Sustained Innovation Program : *SI2-SSE: Modules for Experiments in Stellar Astrophysics*; PI R Townsend
- NASA/NSF Theory & Computational Astrophysics Networks (TCAN) Program : *The SPIDER Network: Supernova Progenitor, Internal Dynamics and Evolution Research*; PI R Townsend

Software & Infrastructure Development

- Leading UW-Madison’s participation in the *Modules for Experiments in Stellar Astrophysics* (MESA) project, a multi-institutional open source software project. MESA is used a world-wide community of scientists (around 900, as of 2019) to simulate the internal structure and evolution of astrophysical objects from gas-giant planets to white dwarfs to supermassive stars. I serve on the MESA Administrative Council, which establishes the science roadmap for the project and oversees all MESA-related education and community engagement activ-

ities, and on the MESA Technical Council, which guides the technical development of the software.

- Creating and further developing the open-source *GYRE* stellar oscillation code. Since its release in 2013, *GYRE* has quickly established itself as the state-of-the-art tool for asteroseismic analyses of oscillating stars, and has been adopted by other research groups to yield over 100 scientific publications.

Institutional Service

- Serving on the Organizing Committees of the IAU Working Groups on *Massive Stars* and *Active OB Stars* (vice chair).
- Serving on/chairing time allocation committees for the *Hubble Space Telescope* and *Chandra X-Ray Observatory*.
- Serving/chairing grant review panels for NASA.
- Serving as referee on numerous journal papers.
- Serving on the Scientific Organizing Committees for the *IAU Symposia* 272, 307 and 329 conferences.

Academic Service

- Advising graduate students within the UW Department of Astronomy: Brittin Borland (MSc '12), Nick Hill (PhD '15), Chris Bard (PhD '16), Jacqueline Goldstein (PhD in progress), Aaron Lopez (PhD in progress)
- Creating the new Astronomy 103 Online class, built around bespoke multimedia products that include virtual observatory lectures, *2-Minute Universe* mini-lectures, and the *At Play in the Cosmos* computer game (developed by GEAR Learning with my consultative input).
- Chairing the UW Department of Astronomy, and serving on and/or chairing the computing, web, admissions, colloquium, undergraduate, awards and prelims committees.
- Serving as the faculty senator for the UW Department of Astronomy.
- Serving on the UW Advanced Computing Infrastructure committee.

Recent Publications

1. Townsend R. H. D., 2020: ‘Improved asymptotic expressions for the eigenvalues of Laplace’s tidal equations’, *MNRAS*, **497**, 2670
2. Goldstein J., Townsend R. H. D., 2020: ‘The Contour Method: a new approach to finding modes of non-adiabatic stellar pulsations’, *ApJ*, **899**, 116
3. Goldstein J., Townsend R. H. D., Zweibel E. G., 2019: ‘The Tayler Instability in the Anelastic Approximation’, *ApJ*, **881**, 66
4. Paxton B., Smolec R., Schwab J., Gaudy A., Bildsten L., Cantiello M., Dotter A., Farmer R., Goldberg J. A., Jermyn A. S., Kanbur S. M., Marchant P., Thoul A., Townsend, R. H. D., Wolf W., Zhang M., Timmes, F. X., 2019: ‘Modules for Experiments in Stellar Astrophysics (MESA): Pulsating Variable Stars, Rotation, Convective Boundaries, and Energy Conservation’, *ApJS*, **243**, 10
5. Timmes F. X., Townsend R. H. D., Bauer E. B., Thoul Anne., Fields C. E., Wolf W. M., 2018, *ApJL*, **867**, 30
6. Van Reeth T., Mombarg J. S. G., Mathis S., Tkachenko A., Fuller J., Bowman D. M., Buysschaert B., Johnston C., García Hernández A., Goldstein J.; Townsend R. H. D., Aerts

- C., 2018: ‘Sensitivity of gravito-inertial modes to differential rotation in intermediate-mass main-sequence stars’, *A&A*, **618**, 24
7. Townsend R. H. D., Goldstein J., Zweibel E., 2018: ‘Angular momentum transport by heat-driven g-modes in slowly pulsating B stars’, *MNRAS*, **475**, 879
 8. Wolf W. M., Townsend R. H. D., Bildsten L., 2018: ‘Nonradial Pulsations in Post-outburst Novae’, *ApJ*, **855**, 127
 9. Paxton B., Schwab J., Bauer E. B., Bildsten L., Blinnikov S., Duffell P., Farmer R., Goldberg J. A.; Marchant P., Sorokina E., Thoul A., Townsend R. H. D., Timmes F. X., 2018: ‘Modules for Experiments in Stellar Astrophysics (MESA): Convective Boundaries, Element Diffusion, and Massive Star Explosions’, *ApJS*, **234**, 34
 10. Owocki S. P., Townsend R. H. D., Quataert E., 2017: ‘Super-Eddington stellar winds: unifying radiative-enthalpy vs. flux-driven models’, *MNRAS*, in press
 11. Petit V., Keszthelyi Z., MacInnis R., Cohen D. H., Townsend R. H. D., Wade G.A., Thomas S. L., Owocki S. P., Puls J., ud-Doula A., 2017: ‘Magnetic massive stars as progenitors of ‘heavy’ stellar-mass black holes’, *MNRAS*, **466**, 1052
 12. Kurapati Sushma, Chandra Poonam, Wade Gregg, Cohen David H., David-Uraz Alexandre, Gagné Marc, Grunhut Jason, Oksala Mary E., Petit Veronique, Shultz Matt, Sundqvist Jon, Townsend Richard H. D., ud-Doula Asif, 2017: ‘A JVL A survey of the high-frequency radio emission of the massive magnetic B- and O-type stars’, *MNRAS*, **465**, 2160
 13. Owocki S. P., ud-Doula A., Sundqvist J. O., Petit V., Cohen D. H., Townsend R. H. D., 2016: ‘An analytic dynamical magnetosphere formalism for X-ray and optical emission from slowly rotating magnetic massive stars’, *MNRAS*, **462**, 3830
 14. Bard C., Townsend R. H. D., 2016: ‘Effect of a magnetic field on massive-star winds - I. Mass-loss and velocity for a dipole field’, *MNRAS*, **462**, 3672
 15. Moravejji E., Townsend R. H. D., Aerts C., Mathis S., 2016: ‘Sub-inertial Gravity Modes in the B8V Star KIC 7760680 Reveal Moderate Core Overshooting and Low Vertical Diffusive Mixing’, *ApJ*, **823**, 130
 16. Paxton B., Marchant P., Schwab J., Bauer E. B., Bildsten L., Cantiello M., Dessert L., Farmer R., Hu H., Langer N., Townsend R. H. D., Townsley D. M., Timmes F. X., 2015: ‘Modules for Experiments in Stellar Astrophysics (MESA): Binaries, Pulsations and Explosions’, *ApJS*, **220**, 1