

Simon J. Murphy

email: simon.murphy@sydney.edu.au; **website:** www.simonmurphy.info; **tel:** +61 426 890131

Research positions

2018- ARC DECRA Fellow
Sydney Institute for Astronomy (SfA), University of Sydney, NSW 2006, Australia
2013-2017 Post-doctoral researcher, SfA, University of Sydney, NSW 2006, Australia.

Education

2010-2013 PhD "[Investigating the A-type stars with Kepler data](#)", Univ. Central Lancashire, UK.
2007-2010 1st class BSc (Hons) Physics with Astrophysics, University of Manchester, UK.

Prizes and Awards

2018 Vice Chancellor's Award for Educational Innovation and Engagement, University of Sydney.
2018 Discovery Early Career Researcher Award (DECRA; A\$323,000)
2016 JSPS Overseas Researcher Fellowship, University of Tokyo, Jan-Apr 2016 (¥1.2 mil.)
2014 PhD thesis selected by Springer for publication in their "best of the best" theses series.
2013 RAS travel grant (£1250)
2012 Prize in "Experienced Presenter" category for oral presentation at UCLan's Graduate Research Conference (£100)
2011 Competitive research fellowship, Centro de Astrofisica da Universidade do Porto (€3000)
2011 Winner of "Best Poster" category at UCLan's graduate research conference (£100)
2010 STFC studentship for PhD (£13,500 per annum)
2010 Selina Bright scholarship for best exam results, University of Manchester (£300)
2007 Manchester Advantage Scholarship, University of Manchester (£5000 per annum)

Publication and citation statistics

- 20 refereed first-author publications (491 citations), incl. two in 2020
- 51 refereed co-authored publications (1350 citations)
- H-index of 15 for first-authored publications (m-index = 1.7)
- H-index of 24 over all publications (m-index = 2.4)
- HTML linked ADS libraries for [first author](#) and for [all](#) publications.
- [Second-author Nature paper](#) (2020 May), [co-authored Nature Astronomy paper](#) (2020 March).

Top 5 publications

My top 5 publications are selected based on breakthrough results, impact, and the insight they have brought to the field rather than citation count. Preference is also given to those research outputs for which I provided a large contribution.

1. *Finding binaries among Kepler pulsating stars from phase modulation of their pulsations*
S. J. Murphy, T. R. Bedding, H. Shibahashi, D. Kurtz & H. Kjeldsen (2014), MNRAS, 441, 2515.
Citations: 56; per year: 9.
An innovative method to reveal the binary companions to pulsating stars by use of the pulsations as 'clocks' that are accelerated in space by the binary orbit.

2. *Finding binaries from phase modulation of pulsating stars with Kepler: V. Orbital parameters, with eccentricity and mass-ratio distributions of 341 new binaries*
S. J. Murphy, M. Moe, D. W. Kurtz, T. R. Bedding, H. Shibahashi, H. M. J. Boffin (2018), MNRAS, 474, 4322. Citations: 38; per year: 19.
 Comprehensive statistical analysis of new orbits for a large number of binaries, parametrizing the distributions of orbital parameters and finding clear evidence for a transition mass in binary fraction as a function of primary mass.
3. *Super-Nyquist asteroseismology with the Kepler Space Telescope*
S. J. Murphy, H. Shibahashi & D. W. Kurtz (2013), MNRAS, 430, 2986. Citations: 77; per year: 11.
 Subtle but powerful method that allows the Nyquist aliases to be distinguished from real frequencies in pulsating stars observed by Kepler. Allows asteroseismology to be performed at frequencies higher than the nominal sampling rate, opening up thousands more targets to asteroseismic analysis.
4. *Asteroseismic measurement of surface-to-core rotation in a main sequence A star, KIC 11145123*
 D.W. Kurtz, H. Saio, M. Takata, H. Shibahashi, **S. J. Murphy**, T. Sekii (2014), MNRAS 444, 102
 Citations: 116; per year: 20
 First measurement of the core-to-surface rotation profile of a main-sequence star, discovering that the ‘angular momentum transport’ problem of red giants is also present on the main-sequence.
5. *A planet in an 840-d orbit around a Kepler main-sequence A star found from phase modulation of its pulsations*
S. J. Murphy, T. R. Bedding & H. Shibahashi (2016), ApJL, 827, L17. Citations: 23; per year: 6.
 First planet to be discovered via the pulsation-timing method. First planet in or near the habitable zone of an A-type star. First planet orbiting an A star to be found via the orbital motion.

Teaching

- 2018-present Designed a new OLE (open learning environment) unit in physics, *Astronomy: From Earth to Exoplanets*. Developed the course content and assessments. Runs each semester. I currently teach this course.
- 2016-2017 Designed learning modules, selected delivery methods and developed assessment tools for a massively open online course (MOOC) on [Data-Driven Astronomy](#) for The University of Sydney. Our development team was awarded the **Vice Chancellor’s award for Educational Innovation and Engagement** for this work. It has had 14,400 learners to date.
- 2010-2015 Various supervision roles in undergraduate lab and tutorials, typically 1 unit per semester.

Student Supervision

Graduate students (primary)	current, PhD: Daniel Hey, Filip Chatys
... (co-supervisor)	current, PhD: Yaguang Li current, MPhil: Margaret Streamer (ANU) 2020, PhD: Gang Li 2019, PhD: Doug Compton.
Senior Phys. Special Project	2018: Helena Lecoq, Nic Barbara 2015: Nicholas Ranson, Matt Winnel 2014: Isabel Colman, Alan Hotham, Matt Keen
Talented Student Programme	2019: Shuangshuang Feng, Will Giang, Connor Langford. 2018: Aiden Chen, Eloisa Perez-Bennets 2017: Oscar McMullin, Mingqian Chen. TSP showcase. 2016: Nic Barbara, Sarah Collison, Jess Hamley, Emily Kerrison 2015: Edric Wang 2014: Angus Johnson, Keri Liang
Summer Vacation Projects	2015-2016: Aleksa Sarai, Matt Winnel 2014-2015: Angus Johnson, Matt Keen
Visiting International Student	2018: Elham Ziaali (RIAAM, Iran) 2016: Yaguang Li (Beijing Normal, China) 2015: Nero Qilao Gu (Nanjing, China)

Invited lecture series, talks and seminars

- 2019 **Invited lecture series**, at “VIII La Plata International School: Pulsations Along Stellar Evolution” La Plata, Argentina. November 11-22.
- 2019 **Invited review talk**, “[Pulsating stars in binary systems](#),” Binaries in the Universe, Telč, Czech Republic. September 7-11.
- 2019 **Invited review talk**, “[Pulsating stars in binary systems](#),” Stars and their Variability from Space, Vienna, Austria. August 19-23.
- 2018 **Invited review talk**, “[Physics of pulsating stars in binaries](#),” Physics of Oscillating Stars, Banyuls, France. September 3-7.
- 2018 **Invited review talk**, “[Planets by pulsation timing](#),” Exoplanets Orbiting Hot Stars, Nashville, TN, USA. June 20-22.
- 2018 Seminar, “[An exciting haul of planetary, binary and triple systems from pulsation timing](#),”
- University of New South Wales (UNSW), Australia. October 8th.
 - Mullard Space Sciences Laboratory (MSSL), UCL, England. August 31st.
 - Warwick University, Coventry, England. August 24th.
 - KU Leuven, Belgium. August 22nd.
 - Appalachian State University, North Carolina, USA. June 14th.
 - Monash University, Melbourne, Australia. May 1st.
 - Macquarie University, Sydney, Australia. March 23rd.
- 2018 Seminar, “[How to use starquakes to find exoplanets](#)” Univ. of Northern Colorado, USA. Jan 23rd.
- 2017 Seminar, “[An exciting haul of planetary, binary and triple systems from pulsation timing](#),” Australian National University, Canberra, Australia. October 30th.
- 2016 Seminar, “[Astroseismic detection of planets and other companions to intermediate-mass stars](#),”
- Macquarie University, Sydney, Australia. November 18th.
 - University of Sydney, Sydney, Australia. November 11th.
 - AAO, Sydney, Australia. November 10th.
 - Max Planck Institute for Astronomy, Heidelberg, Germany. July 8th.
 - Argelander-Institut für Astronomy, Univ. of Bonn, Germany. June 30th.
 - University of Tokyo, Japan. March 29th.
 - Tohoku University, Sendai, Japan. February 29th.
- 2016 **Invited talk**, “[Astroseismology and Galactic Archaeology](#),” Galactic Archaeology Workshop, National Astronomical Observatory of Japan (NAOJ), Mitaka, Japan. March 22nd.
- 2015 **Invited review talk**, “[12 Months of Rapid Advances in our Knowledge of Main-Sequence A and F Stars](#),” KASC 8, Aarhus, Denmark. June 15th.
- 2015 Seminar, “[Finding Binaries Among Pulsating Stars](#),” Univ. of Tokyo, Japan. January 20th.
- 2014 Seminar, “[Finding Binaries Among Pulsating Stars](#),”
- Keele University, UK. June 13th.
 - Univ. Central Lancashire, Preston, UK. June 11th.
 - Aarhus University, Denmark. May 14th.
- 2014 Seminar, “[Beyond Transits \(the cool stuff you can do with Kepler data\)](#),” Australia National University, Canberra, Australia. March 19th.
- 2013 **Invited review talk**, “[Main sequence A-F pulsators](#),” KASC6, Sydney, Australia. June 27th.
- 2013 Seminar, “[Investigating the Intriguing A-type stars](#),”
- Polish Academy of Sciences, Warsaw, Poland. April 17th.
 - Univ. of Wroclaw, Poland. April 15th.
 - Univ. of Birmingham, UK. February 6th.
- 2012 Seminar, “[Pulsating A-type stars seen with Kepler](#),” Univ. of Porto, Portugal. November 14th.

A list of 11 contributed talks and 4 poster presentations, with titles, locations and dates, is available on request.

Community Outreach and Engagement

- 2020 Recorded Shirtloads of Science podcast ([ep. 186](#)) with Dr Karl Kruszelnicki, related to the Nature paper on Regular High-Frequency Pulsation Overtones in Young Stars.
- 2020 [Live ABC News interview](#) on the Tidally Trapped Pulsations (Nature Astronomy) paper. Reach of approximately 107,000 (iSentia; 39,000 live and 68,000 online). My opening explanation was praised for its clarity, precision and concision, and my style was described as relaxed and engaging. I also did telephone interviews with reporters for online publications. Meltwater reports 51 online stories in publications reaching a cumulative monthly audience of 85m people.
- 2020 Three regional ABC radio shows with Dr Karl Kruszelnicki, and guest on his Shirtloads of Science podcast ([ep. 181](#), 8300 downloads, with an extra 13,000 social media reach).
- 2017 Seven radio interviews and two nationally aired TV news interviews on the TRAPPIST-1 system. I was particularly pleased with the feedback on the clarity of my explanations, where I drew an analogy between the cool star and a smoldering campfire: the planets have to get close to stay warm!
- 2016 Three-minute television feature on Today, Tonight Adelaide, on Kepler's exoplanets. May 11th. My interview performance put me on the media contact list for astronomy news stories, hence all of the interviews for the TRAPPIST-1 story, above.
- 2014 "Visiting Astronomer" for four 1-hr talks at Bourne Grammar School, UK, July 3rd. I prepared separate presentations for classes of ~30 in different STEM subjects, to encourage high-school students to consider careers in STEM.
- 2013 Public talk, "Planets and Pulsations," Society for Popular Astronomy, 60th Anniversary Meeting, Preston, UK. May 11th. Feedback from the organizer was that it was the best talk of the meeting.
- 2012-3 Astrofest, London. 10-12 February 2012 and 8-10 February 2013.
- 2012 Presenter at Lancashire Science Festival, on behalf of the Institute of Physics, UK, 30th June.
- 2012-3 STEMNET ambassador at UCLan. My main contributions were astronomy presentations at primary-school level. I designed the activities and led them on the day. Feedback was overwhelmingly positively received and repeat performances were requested.

Leadership, Governance and Service

- Ongoing Reviewer for world-leading astronomical journals (e.g. MNRAS, ApJ, A&A, PASA).
- Ongoing First-aid officer, emergency warden and fire warden, School of Physics, Univ. of Sydney.
- Ongoing Fellow of the Royal Astronomical Society and the Astronomical Society of Australia.
- 2020 Organiser, Hunstead Distinguished Visitor Programme, U. Sydney March
- 2020 **Chair**, SOC & LOC, *Expanding the Science of TESS (TESS Ninja 3)*, U. Sydney February.
- 2019 **Chief Investigator**, LIEF grant SONG Australis, awarded \$159k by ARC.
- 2019 SOC, TASC5/KASC12 conference, MIT Boston, USA, 22-26 July 2019.
- 2018 **Chief Investigator**, LIEF grant Veloce Verde+Azzuro, awarded \$790k by ARC.
- 2018 **Chair**, SOC & LOC: *Planets in Peculiar Places*, Univ. of Sydney, April 5-6 2018.
- 2018 SOC: *Physics of Oscillating Stars*, Banyuls, France, September 2-7th 2018. 2017 **Chair**, Hunstead Lecture Series, School of Physics, Univ. of Sydney.
- 2017-2019 Member of the Physics Equity and Access Committee, School of Physics, Univ. Sydney.
- 2016 SOC: *Understanding the roles of rotation, pulsation and chemical peculiarities in the upper main sequence*, Lake District, UK. 2016 September.
- 2016-present Member of the TESS Asteroseismic Science Consortium (TASC) working groups on main-sequence pulsators and compact objects, contributing feasibility studies for detecting pulsations, binary stars, and selecting targets.
- 2015 Organiser and chair of SIfA's 'Morning Tea' (weekly departmental meeting).
- 2014 Invited external reviewer for MSc thesis, Univ. of Canterbury, New Zealand.
- 2013-2015 Actively involved in organising the Kepler Asteroseismic Science Consortium (KASC) working group on classical pulsators (formerly delta Scuti stars). Chair of the time-series analysis sub-group for classical pulsators.
- 2013 Organiser of UCLan's stellar astrophysics meetings.

Competitive Observing Time

I predominantly work with Kepler and TESS space-telescope data, which are public. These are supplemented with observations made with large ground-based optical telescopes, for which time is allocated based on merit in a way similar to research grants. Success rates vary, but for the largest telescopes, which are in highest demand and cost the most to run, success rates are below 20%. I've been awarded nearly \$400k of competitive telescope time: **[estimated value in AUD brackets]**

- 4 nights observing (conducted by co-investigators) on the 10-m Keck Telescope; **[\$300,000]**
- 2 half-nights of service-mode observations on the 8-m Subaru Telescope; **[\$46,000]**
- 17 nights observing on the ANU 2.3-m telescope at Siding Spring; **[\$25,000]**
- 6 nights on the 2.7-m Harlan J Smith Telescope at Macdonald Observatory; **[\$8000]**
- 4 nights observing on the 6 x 1-m CHARA array; **[\$4000]**
- 5 half-nights of service-mode observations on the 2.5-m Nordic Optical Telescope; **[\$3000]**
- 5 nights (40 hours) of service mode observations on the 1.2-m Mercator Telescope; **[\$3000]**
- 5 half-nights observing (conducted by co-investigator) on the 1.5-m Loiano Telescope; and **[\$1700]**
- 15 nights on the 32" telescope at Dark Sky Observatory. **[\$5100]**