

Stephen Taylor | Curriculum Vitae

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Professional Experience

California Institute of Technology <i>Caltech Postdoctoral Scholar (TAPIR group)</i> <i>Visiting scholar (TAPIR group)</i>	Pasadena, USA <i>2016–Present</i> <i>2014–2016</i>
NASA Jet Propulsion Laboratory <i>NASA Postdoctoral Fellow</i>	Pasadena, USA <i>2014–2016</i>
Institute of Astronomy, University of Cambridge <i>PhD candidate</i>	Cambridge, UK <i>2010–2014</i>

Education

Institute of Astronomy, University of Cambridge <i>PhD (Astronomy)</i> Advisor: Dr. Jonathan R. Gair; Thesis Title: <i>Exploring the cosmos with gravitational waves</i> Description: A new Bayesian hierarchical modelling scheme is introduced to use compact-binary gravitational-wave standard sirens to infer the mass-distribution of the binary population, the progenitor star-formation rate, and cosmological parameters. Advanced pulsar-timing array techniques are developed to map the nanohertz gravitational-wave sky through a parametrized overlap-reduction function, and large accelerations to the Bayesian inference of single supermassive black-hole binary searches are proposed.	Cambridge, UK <i>2010–2014</i>
University of Oxford <i>MPhys (1st Class), [ranked 1st in Jesus College, 4th across University]</i> Advisor: Prof. Steven Rawlings; Thesis Title: <i>The Cosmic Evolution Of Black-hole Accretion</i>	Oxford, UK <i>2006–2010</i>

Grants & Funding

“New Directions and New Opportunities for NANOGrav Astrophysics”: Awarded \$11k for a proposal on behalf of the Astrophysics Working Group of NANOGrav. Funding will ensure undergraduate/graduate students and outside experts can attend a sprint week in March 2017 to advance several key areas of interest, and to achieve rapid progress on collaboration projects.

Awards & Prizes

2015: International Pulsar Timing Array (IPTA) Steering Committee Prize — “Honourable Mention”
2015: Gravitational Wave International Committee (GWIC) Thesis Prize — “Honourable Mention”
2014: NASA Postdoctoral Fellowship (JPL)
2014: Royal Astronomical Society Travel Award — £750
2013: Royal Astronomical Society Travel Award — £700
2012–2014: Christ’s College (Cambridge) Travel Grants [various; total exceeds £1k]
2010: Science and Technology Facilities Council (STFC) — full PhD studentship award
2008: Examiner’s Prize, Oxford Physics Speaking Competition
2007: Oxford Physics department prize for laboratory work
2007–2010: Undergraduate Scholar of Jesus College, Oxford
2006–2010: Regularly awarded Oxford undergraduate departmental and college examination prizes

Teaching Experience

Jun–Aug 2016: Co-supervisor of Caltech summer undergraduate student

May 2016: Lecturer for Caltech’s TAPIR gravitational-wave class

Mar 2016: Co-organizer of student workshop at NANOGrav Spring meeting

Sep 2015: Lecturer for NANOGrav detection-group workshop at Caltech

Jun 2015: Lecturer at “CSI PTA” Aspen summer workshop

2011–2013: Supervisor for Cambridge Part II undergraduate students in RELATIVITY

2011: Prepared computing coursework for Cambridge Part II undergraduate students

Professional Service & Outreach

Reviewer for international journals.....

Monthly Notices of the Royal Astronomical Society (MNRAS), Physical Review D (PRD)

Conference organization.....

Oct 2016: Chair of SOC for NANOGrav Fall meeting at University of Illinois Urbana-Champaign

Mar 2016: SOC and LOC member for NANOGrav Spring meeting at Caltech

Mar 2016: Co-organizer of NANOGrav student workshop at Caltech

Mar 2014: SOC and LOC member for British Gravity meeting (BritGrav) at Cambridge, UK

Outreach.....

2016: Featured gravitational-wave expert at NASA’s “Ticket to Explore JPL” event

2013: Presentation at Cambridge’s Institute of Astronomy Open Day

2012–2014: Presentation to prospective students (Institute of Astronomy graduate interviews)

2012: Outreach talk at Institute of Astronomy public-observing evening

2011: Presentation at Cambridge’s Institute of Astronomy Open Day

Professional Affiliations

North American Nanohertz Observatory for Gravitational-waves (NANOGrav) [Full member] • **European Pulsar Timing Array (EPTA)** [Member] • **International Pulsar Timing Array (IPTA)** [Member] • **American Physical Society (DGRAV)** [Member] • **American Astronomical Society** [Member] • **Royal Astronomical Society** [Fellow]

Publications

• 22 **peer-reviewed publications (of which 8 are first-author)** with 317 citations, h-index 10.

• Metrics available at <https://scholar.google.com/citations?user=iN2djBMAAAAJ&hl=en>.

• 5 key publications are indicated below with preceding superscript numbers, in no specific order.

Submitted & In Preparation.....

S. R. Taylor, L. Lentati, S. Babak, P. Brem, J. R. Gair, A. Sesana, A. Vecchio. “*All correlations must die: Assessing the significance of a stochastic gravitational-wave signals in pulsar-timing arrays*”. Submitted to Physical Review D. arXiv:1606.09180.

S. R. Taylor, R. van Haasteren. “*Optimized anisotropic modelling of the nanohertz gravitational-wave sky with pulsar-timing arrays*”. (In Prep.)

S. R. Taylor, J. Simon, L. Sampson. “*Bayesian model emulation of stochastic gravitational-wave spectra for final-parsec probes with pulsar-timing arrays*”. (In Prep.)

Publications In Peer-reviewed International Journals.....

May 2016: G. Desvignes, R. N. Caballero, L. Lentati, [and 40 others, including **S. R. Taylor**]. “*High-precision timing of 42 millisecond pulsars with the European Pulsar Timing Array*”. MNRAS, 458:3341–3380.

May 2016: L. Lentati, R. M. Shannon, W. A. Coles, [and 80 others, including **S. R. Taylor**]. “*From spin noise to systematics: stochastic processes in the first International Pulsar Timing Array data release*”. MNRAS, 458:2161–2187.

May 2016 : J. P. W. Verbiest, L. Lentati, G. Hobbs, [and 89 others, including **S. R. Taylor**]. “*The International Pulsar Timing Array: First data release*”. MNRAS, 458:1267–1288.

Apr 2016 : Z. Arzoumanian, A. Brazier, S. Burke-Spolaor, [and 48 others, including **S. R. Taylor**]. “*The NANOGrav Nine-year Data Set: Limits on the Isotropic Stochastic Gravitational Wave Background*”. Astrophys. J., 821:13.

Apr 2016 : R. N. Caballero, K. J. Lee, L. Lentati, [and 36 others, including **S. R. Taylor**]. “*The noise properties of 42 millisecond pulsars from the European Pulsar Timing Array and their impact on gravitational-wave searches*”. MNRAS, 457:4421–4440.

¹Mar 2016 : **S. R. Taylor**, M. Vallisneri, J. A. Ellis, C. M. F. Mingarelli, T. J. W. Lazio, and R. van Haasteren. “*Are We There Yet? Time to Detection of Nanohertz Gravitational Waves Based on Pulsar-timing Array Limits*”. Astrophys. J. Lett, 819:L6.

Jan 2016 : **S. R. Taylor**, E. A. Huerta, J. R. Gair, and S. T. McWilliams. “*Detecting Eccentric Supermassive Black Hole Binaries with Pulsar Timing Arrays: Resolvable Source Strategies*”. Astrophys. J., 817:70.

Jan 2016 : S. Babak, A. Petiteau, A. Sesana, P. Brem, P. A. Rosado, **S. R. Taylor**, [and 30 others]. “*European Pulsar Timing Array limits on continuous gravitational waves from individual supermassive black hole binaries*”. MNRAS, 455:1665–1679.

Nov 2015 : J. R. Gair, J. D. Romano, and **S. R. Taylor**. “*Mapping gravitational-wave backgrounds of arbitrary polarisation using pulsar timing arrays*”. Phys. Rev. D, 92(10):102003.

²Nov 2015 : L. Lentati, **S. R. Taylor**, C. M. F. Mingarelli, [and 33 others]. “*European Pulsar Timing Array limits on an isotropic stochastic gravitational-wave background*”. MNRAS, 453:2576–2598.

Sep 2015 : E. A. Huerta, S. T. McWilliams, J. R. Gair, and **S. R. Taylor**. “*Detection of eccentric supermassive black hole binaries with pulsar timing arrays: Signal-to-noise ratio calculations*”. Phys. Rev. D, 92(6):063010.

Aug 2015 : J. D. Romano, **S. R. Taylor**, N. J. Cornish, J. Gair, C. M. F. Mingarelli, and R. van Haasteren. “*Phase-coherent mapping of gravitational-wave backgrounds using ground-based laser interferometers*”, Phys. Rev. D, 92(4):042003.

³Jul 2015: **S. R. Taylor**, C. M. F. Mingarelli, J. R. Gair, [and 32 others]. “*Limits on Anisotropy in the Nanohertz Stochastic Gravitational Wave Background*”. Phys.Rev. Lett, 115(4):041101.

Mar 2015: C. J. Moore, **S. R. Taylor**, and J. R. Gair. “*Estimating the sensitivity of pulsar timing arrays*”, Classical and Quantum Gravity, 32(5):055004.

Nov 2014: **S. R. Taylor**, J. Ellis, and J. Gair. “*Accelerated Bayesian model-selection and parameter-estimation in continuous gravitational-wave searches with pulsar-timing arrays*”. Phys. Rev. D, 90(10):104028.

Oct 2014: J. Gair, J. D. Romano, **S. R. Taylor**, and C. M. F. Mingarelli. “*Mapping gravitational-wave backgrounds using methods from CMB analysis: Application to pulsar timing arrays*”. Phys. Rev. D, 90(8):082001.

Aug 2014: R. M. Shannon, S. Chamberlin, N. J. Cornish, J. A. Ellis, C. M. F. Mingarelli, D. Perrodin, P. Rosado, A. Sesana, **S. R. Taylor**, [and 14 others]. “*Summary of Session C1: pulsar timing arrays*”. General Relativity and Gravitation, 46:1765.

⁴Oct 2013: **S. R. Taylor** and J. R. Gair. “*Searching for anisotropic gravitational-wave backgrounds*

using pulsar timing arrays". Phys. Rev. D, 88(8):084001.

May 2013: L. Lentati, P. Alexander, M. P. Hobson, **S. R. Taylor**, J. Gair, S. T. Balan, and R. van Haasteren. "*Hyper-efficient model-independent Bayesian method for the analysis of pulsar timing data*". Phys. Rev. D, 87(10):104021.

Feb 2013 : **S. R. Taylor**, J. R. Gair, and L. Lentati. "*Weighing the evidence for a gravitational-wave background in the first International Pulsar Timing Array data challenge*". Phys. Rev. D, 87(4):044035.

Jul 2012: **S. R. Taylor** and J. R. Gair. "*Cosmology with the lights off: Standard sirens in the Einstein Telescope era*". Phys. Rev. D, 86(2):023502.

⁵ Jan 2012: **S. R. Taylor**, J. R. Gair, and I. Mandel. "*Cosmology using advanced gravitational-wave detectors alone*". Phys. Rev. D, 85(2):023535.

Presentations

- 29 **oral presentations (of which 10 were invited), with 4 conference leadership roles.**
- Recent presentations are available to view at <https://speakerdeck.com/stevertaylor>.

Invited Talks.....

Jul 2016: *New horizons in gravitational-wave astronomy with pulsar-timing arrays*, Armagh Observatory seminar, Armagh, UK

Jul 2016: *Probing the final-parsec problem with pulsar-timing arrays*, Anton Pannekoek Instituut seminar, University of Amsterdam, Amsterdam, Netherlands

Jul 2016: *Probing the final-parsec problem with pulsar-timing arrays*, Radboud University astrophysics seminar, Radboud, Netherlands

Jun 2016: *Gravitational-wave data-analysis techniques for pulsar-timing arrays*, IPTA conference, Stellenbosch, South Africa

Mar 2016: *Sources of nanohertz gravitational-waves for pulsar-timing array searches*, NANOGrav student workshop, Caltech, Pasadena CA, USA

Dec 2015: *Prospects for near future detection and astrophysical inference with PTAs*, Gravitational-wave group seminar, University of Birmingham, UK

Dec 2015: *Prospects for near future detection and astrophysical inference with PTAs*, Statistics group seminar (School of Mathematics), University of Edinburgh, UK

Dec 2015: *Prospects for near future detection and astrophysical inference with PTAs*, CaJAGWR seminar, California Institute of Technology

May 2013: *Searching For Anisotropic Gravitational-wave Backgrounds Using Pulsar Timing Arrays*, Albert Einstein Institute (AEI) GW seminar, Hanover

Dec 2012: *Weighing the evidence for a gravitational-wave background*, Gravitational-wave group seminar, University of Birmingham, UK

Contributed Presentations.....

May 2016: *Carrying the physics of supermassive black-hole binary evolution into pulsar-timing array searches*, EPTA meeting, Bielefeld, Germany

Apr 2016: *Are we there yet? Time to detection of nanohertz gravitational waves*, American Physical Society meeting, Salt Lake City UT, USA

Mar 2016: *Carrying the physics of supermassive black-hole binary evolution into pulsar-timing array searches*, NANOGrav meeting, Caltech, Pasadena CA, USA

Oct 2015: *Are we there yet? Time to detection of nanohertz gravitational waves*, NANOGrav meeting, McGill University, Montreal, Canada

Jun 2015: *Eccentric supermassive black-hole binary signals in pulsar-timing data*, European Pulsar Timing Array meeting, Bonn, Germany

Apr 2015: *Eccentric supermassive black-hole binary signals in pulsar-timing data*, American Physical Society meeting, Baltimore MD, USA

Feb 2015: *Eccentric supermassive black-hole binary signals in pulsar-timing data*, NANOGrav meeting, Arecibo, Puerto Rico

Jan 2015: *Exploring the cosmos with gravitational waves*, American Astronomical Society meeting, Seattle WA, USA

Nov 2014: *EPTA constraints on gravitational-wave anisotropy*, European Pulsar Timing Array meeting, Cambridge, UK

Jun 2014: *EPTA and IPTA searches for gravitational-wave background anisotropy*, International Pulsar Timing Array meeting, Banff, Canada

May 2014: *EPTA limits on gravitational-wave anisotropy*, European Pulsar Timing Array meeting, Astron, Netherlands

Oct 2013: *The pulsar-term in PTA continuous-wave searches: a blessing and a curse*, European Pulsar Timing Array meeting, Pula, Sardinia

Jul 2013: *Probing anisotropy of the GW background with pulsar timing arrays*, 20th International Conference on General Relativity and Gravitation and 10th Amaldi Conference on Gravitational Waves, Warsaw

Jun 2013: *The first PTA search pipeline for anisotropy in the GW background*, International Pulsar Timing Array meeting, Krabi, Thailand

Apr 2013: *Searching For Anisotropic Gravitational-wave Backgrounds Using Pulsar Timing Arrays*, European Pulsar Timing Array meeting, l'Observatoire de Paris, Paris

Feb 2013: *Weighing the evidence for a gravitational-wave background*, Institute of Astronomy seminar, University of Cambridge

Nov 2012: *Weighing the evidence for a gravitational-wave background*, European Pulsar Timing Array meeting, Albert Einstein Institute (AEI), Potsdam, Germany

Jun 2012: *Milestones in Spacetime: Double Neutron-Star Binaries as Gravitational-Wave Standard Sirens*, Institute of Astronomy seminar, University of Cambridge, UK

Feb 2012: *Hubble without the Hubble: Cosmology using advanced gravitational-wave detectors alone*, Gravitational-Wave Meeting, Institut de Ciències de l'Espai, Barcelona, Spain

Posters.....

Aug 2015: *Galactic environment effects on gravitational wave signals in pulsar timing arrays*, Postdoc Research Day, NASA Jet Propulsion Laboratory

Aug 2012: *Cosmology without EM counterparts: Standard sirens in the advanced era and beyond*, Rattle and Shine, KITP Santa Barbara

Dec 2011: *Cosmology using advanced gravitational-wave detectors alone*, Graduate Student Conference 2011, Cavendish Laboratory, University of Cambridge

Computing Skills

OS: Linux/UNIX, Windows • **Programming:** C/C++, PYTHON, UNIX shell scripting, GPU programming (CUDA C, PyCUDA) • **Typography:** L^AT_EX, Bibtex, Microsoft Office, Pages, OpenOffice • **Scientific:** Mathematica, Matlab, PYTHON

References

Available upon request.