

Stephen Taylor | Curriculum Vitae

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Professional experience

NASA Jet Propulsion Laboratory <i>NASA Postdoctoral Fellow</i>	Pasadena, USA <i>2014–Present</i>
California Institute of Technology <i>Visting scholar (TAPIR group)</i>	Pasadena, USA <i>2014–Present</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>	Cambridge, UK <i>2010–2014</i>
University of Oxford <i>MPhys, First Class</i> Graduated 1 st in Jesus College, 4 th across University	Oxford, UK <i>2006–2010</i>

Doctoral Thesis

Title: *Exploring the cosmos with gravitational waves*

Supervisor: Dr. Jonathan R. Gair

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.

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

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 (and DGRAV): Member

American Astronomical Society: Member

Royal Astronomical Society: Fellow

Publications in international peer-reviewed 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.

Mar 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.

Nov 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.

Jul 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.

Oct 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.

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

Recent presentations

Invited talks.....

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

Apr 2016: *Sources of nanohertz gravitational-waves for pulsar-timing array searches*, NANOGrav student workshop, California Institute of Technology, Pasadena CA, USA

Contributed talks.....

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, California Institute of Technology, 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

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

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

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

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

Seminars.....

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), Hanover

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

Dec 2012: *Weighing the evidence for a gravitational-Wave background*, University of Birmingham

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

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

Computer skills

OS: Linux/Unix, Windows

Programming: C/C++, PYTHON, UNIX shell scripting, particle-swarm algorithms, Monte Carlo and nested sampling algorithms

Typography: L^AT_EX, Bibtex, Microsoft Office, Pages, OpenOffice

Scientific: Mathematica, Matlab, PYTHON

GPU Programming: CUDA C, PyCUDA

References

Available upon request.