

Niels Warburton

Royal Society - SFI University Research Fellow

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Academic Employment

- 09/2017-present **Royal Society - Science Foundation Ireland University Research Fellow**,
School of Mathematics and Statistics, University College Dublin, Ireland.
- 10/2016-09/2017 **Marie Curie IOF Postdoctoral Fellow: Incoming Phase**,
Complex and Adaptive Systems Laboratory, University College Dublin, Ireland.
- 10/2014-09/2016 **Marie Curie IOF Postdoctoral Fellow: Outgoing Phase**,
Kavli Institute for Astrophysics and Space Research, Massachusetts Institute of Technology, USA.
- 09/2012-09/2014 **Irish Research Council Postdoctoral Fellow**,
Complex and Adaptive Systems Laboratory, University College Dublin, Ireland.

Education

- 2008-2012 **Ph.D. in Mathematical Physics**, *University of Southampton, UK. Thesis title: Frequency domain approach to self-force calculations, Supervisor: Leor Barack.*
- 2004-2008 **MPhys. in Theoretical Physics**, *University of Leeds, UK. Masters project title: Classical dynamics of $O(3)$ sigma model solitons in non-Euclidean space, Supervisor: Martin Speight.*

Research Interests

General relativistic two-body problem and sources of gravitational waves
Black hole perturbation theory and the gravitational self-force
Geodesic motion in black hole spacetimes

Peer-Reviewed Publications

20. *High-order asymptotics for the Spin-Weighted Spheroidal Equation at large real frequency*
M. Casals, A. C. Ottewill, N. Warburton
[Proc. R. Soc. A 475:20180701](#), [arXiv:1810.00432](#)
19. *Fast Self-force Inspirals*
M. van de Meent, N. Warburton
[Class. Quant. Grav. 35:144003 \(2018\)](#), [arXiv:1802.05281](#)
18. *Accelerated motion and the self-force in Schwarzschild spacetime*
A. Heffernan, A. C. Ottewill, N. Warburton, B. Wardell, P. Diener
[Class. Quant. Grav. 35:194001 \(2018\)](#), [arXiv:1712.01098](#)
17. *Evolution of small-mass-ratio binaries with a spinning secondary*
N. Warburton, T. Osburn, C. R. Evans
[Phys. Rev. D 96:084057 \(2017\)](#), [arXiv:1708.03720](#)
16. *Inspiral into Gargantua*
S. E. Gralla, S. A. Hughes, N. Warburton
[Class. Quant. Grav. 33:155002 \(2016\)](#), [arXiv:1603.01221](#)

15. *Highly eccentric inspirals into a black hole*
T. Osburn, N. Warburton, C. R. Evans
[Phys. Rev. D 93:064024 \(2016\)](#), [arXiv:1511.01498](#)
14. *Particle on the Innermost Stable Circular Orbit of a Rapidly Spinning Black Hole*
S. E. Gralla, A. P. Porfyriadis, N. Warburton
[Phys. Rev. D 92, 064029 \(2015\)](#), [arXiv:1506.08496](#)
13. *Applying the effective-source approach to frequency-domain self-force calculations: Lorenz-gauge gravitational perturbations*
B. Wardell, N. Warburton
[Phys. Rev. D 92, 084019 \(2015\)](#), [arXiv:1505:07841](#)
12. *Octupolar invariants for compact binaries on quasi-circular orbits*
P. Nolan, C. Kavanagh, S. R. Dolan, A. C. Ottewill, N. Warburton, B. Wardell
[Phys. Rev. D 92:123008 \(2015\)](#), [arXiv:1505.04447](#)
11. *Comparison Between Self-Force and Post-Newtonian Dynamics: Beyond Circular Orbits*
S. Akcay, A. Le Tiec, L. Barack, N. Sago, N. Warburton
[Phys. Rev. D 91, 124014 \(2015\)](#), [arXiv:1503.01374](#)
10. *Self force on a scalar charge in Kerr spacetime: inclined circular orbits*
N. Warburton
[Phys. Rev. D 91, 024045 \(2015\)](#), [arXiv:1408.2885](#)
9. *Tidal invariants for compact binaries on quasi-circular orbits*
S. R. Dolan, P. Nolan, A. C. Ottewill, N. Warburton, B. Wardell
[Phys. Rev. D 91, 023009 \(2015\)](#), [arXiv:1406.4890](#)
8. *Gravitational Self-Force Correction to the Innermost Stable Circular Equatorial Orbit of a Kerr Black Hole*
S. Isoyama, L. Barack, S. R. Dolan, A. Le Tiec, H. Nakano, A. G. Shah, T. Tanaka, N. Warburton
[Phys. Rev. Lett. 113, 161101 \(2014\)](#), [arXiv:1404.6133](#)
7. *Gravitational self-torque and spin precession in compact binaries*
S. Dolan, N. Warburton, A. I. Harte, A. Le Tiec, B. Wardell, L. Barack
[Phys. Rev. D 89, 064011 \(2014\)](#), [arXiv:1312.0775](#)
6. *Applying the effective-source approach to frequency-domain self-force calculations*
N. Warburton, B. Wardell
[Phys. Rev. D 89, 044046 \(2014\)](#), [arXiv:1311.3104](#)
5. *Frequency-domain algorithm for the Lorenz-gauge gravitational self-force*
S. Akcay, N. Warburton, L. Barack
[Phys. Rev. D 88, 104009 \(2013\)](#), [arXiv:1308.5223](#)
4. *Isofrequency pairing of geodesic orbits in Kerr geometry*
N. Warburton, L. Barack, N. Sago
[Phys. Rev. D 87, 084012 \(2013\)](#), [arXiv:1301.3918](#)
3. *Evolution of inspiral orbits around a Schwarzschild black hole*
N. Warburton, S. Akcay, L. Barack, J. Gair, N. Sago
[Phys. Rev. D 85, 061501\(R\) \(2012\)](#), [arXiv:1111.6908](#)
2. *Self force on a scalar charge in Kerr spacetime: eccentric equatorial orbits*
N. Warburton, L. Barack
[Phys. Rev. D 83, 124038 \(2011\)](#), [arXiv:1103.0287](#)

1. *Self force on a scalar charge in Kerr spacetime: circular equatorial orbits*
N. Warburton, L. Barack
[Phys. Rev. D 81, 084039 \(2010\)](#), [arXiv:1003.1860](#)

Awards and Professional Service

- 2018-present Coordinator for the EMRI waveform Work Package of the LISA Consortium
- 2018-present Co-chair for the Waveform Working Group of the LISA Consortium
 - Jun. 2018 Co-organizer of the Dublin School on Gravitational Wave Source Modelling
 - Feb. 2016 Awarded Sociedade Brasileira de Física (SBF) and the American Physical Society (APS) travel grant for a collaborative research visit to Brazil (worth \$3000)
- 2014-present Referee for Physical Review Letters, Physical Review D, Classical and Quantum Gravity, General Relativity and Gravitation and Monthly Notices of the Royal Astronomical Society
 - July 2013 Co-organizer of the 16th Capra Meeting on Radiation Reaction at University College Dublin
 - Dec. 2011 Awarded Institute of Physics Research Student Conference Fund for travel to ICGC2011, Goa, India (award worth £250)
 - July 2011 Co-organizer of the 14th Capra Meeting on Radiation Reaction at the University of Southampton

Teaching and Mentoring Experience

- 2018-present Primary supervisor for three PhD students
 - 2015-2016 Mentor for a student as part of the Undergraduate Research Opportunities Program (UROP) at MIT (6 months)
 - 2014 Lectured a half-semester Master's level course at UCD entitled 'Case Studies in Simulation Science: motion and images in black hole spacetimes'
- 2012-2014 Assistant mentor to a PhD student.
- 2009-2012 Teaching in undergraduate mathematics workshops
- 2008-2012 Teaching in mathematics, physics and engineering undergraduate tutorials

Public Outreach

- Jun. 2018 Developed a virtual reality black hole simulation with two undergraduate students. This has since been used at various outreach events across the university.
- Apr. 2016 Invited to participate in a press conference at the APS April meeting leading to two popular science articles on [Space.com](#) and [ScienceNews.org](#)
- Apr. 2015 Outreach scientist for 'Science by the Pint' in Cambridge, MA, USA
- Oct. 2013 Gave a one-hour lecture to the UCD physics society entitled 'Gravitational wave astronomy: opening a new window on our universe'
- Oct. 2011 TEAtime lecture aimed at 16-17 year olds entitled 'Multi-messenger astronomy: seeing and hearing the universe as never before'
- Mar. 2011 TEAtime public lecture entitled 'Black Hole Mirrors and the Self-force' given as part of National Science and Engineering week (lecture attended by over 200 members of the public)
- June 2010 Assistant educator for the University of Southampton Spectrum of Science Roadshow exhibit at the Cheltenham Science Festival

Computer Skills

Programming C and C++ (with MPI and OpenMP), Matlab, Java
Computer Algebra Mathematica, Maple
Publishing \LaTeX