Oliver Long

Academic positions

Max Planck Institute for Gravitational Physics (Albert Einstein Institute) Potsdam

- Postdoctoral Researcher
  <div style="text-align:right">Nov 2022 – Present</div>

Modelling of hyperbolic orbits of binary black holes using Effective One-Body, Numerical Relativity and self-force methods.

University of Southampton

- Doctoral Prize Research Fellow
  <div style="text-align:right">Aug 2022 – Oct 2022</div>
- Doctoral Prize Senior Research Assistant
  <div style="text-align:right">Jun 2022 – Jul 2022</div>
- Research Assistant
  <div style="text-align:right">Jan 2022 – Mar 2022</div>

Modelling of hyperbolic orbits of binary black holes with back-reaction in the extreme-mass-ratio limit using perturbation theory focusing on calculating the scalar self-force correction to the scatter angle as well as calculating the scatter angle to first-order in the mass ratio.

Education

Ph.D. in Mathematical Sciences, University of Southampton $\qquad$ Sep 2018 – Jun 2022

- Project title: Self-force in hyperbolic black hole encounters.
- Supervisor: Prof. Leor Barack.
- Project: Modelling of hyperbolic orbits of binary black holes with back-reaction in the extreme-mass-ratio limit using perturbation theory focusing on the derivation and development of a model to calculate the self-force correction to the scatter angle.
- Teaching: Running of undergraduate problem classes and helping with assessment.

MPhys in Physics, The University of Manchester $\qquad$ Sep 2014 – Jun 2018

- Final degree grade: First-class honours with an average of 80.4%.
- Modules: Gravitation, The Early Universe, Quantum Field Theory, Electrodynamics, etc.
- Master's project: Using Markov chain Monte Carlo methods on power spectra of the cosmic microwave background to resolve various tensions in the data through the use of different cosmological models.

A levels, Hereford Sixth Form College $\qquad$ Sep 2012 – Jun 2014

- A2 levels: Physics (A*), Mathematics (A), Chemistry (A) and Biology (A).
- AS levels: Further Mathematics (A).

GCSEs, Lacon Childe School $\qquad$ Sep 2007 – Jun 2012

- Eleven level 2 awards including GCSEs in English language and German.

Computing

- Extensive experience with `Mathematica` including tensor algebra, data analysis and graphics.
- Extensive experience with `C++` including numerical calculations and data analysis.
- Extensive experience with `Python` including data analysis and graphics.
- Extensive experience with Git.
- Extensive experience with LaTeX.

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Prizes

- **Doctoral Prize**, Engineering and Physical Sciences Research Council. 2022
- **Best Student Talk Runner Up**, 25th Capra Meeting on Radiation Reaction in GR. Jun 2022

Featured Publications

- L. Barack, Z. Bern, E. Hermann, **O. Long**, *et al.* Comparison of post-Minkowskian and self-force expansions: Scattering in a scalar charge toy model. *Phys. Rev. D*, **108**(024025), Jul 2023. 🔗
- L. Barack & **O. Long**. Self-force correction to the deflection angle in black-hole scattering: A scalar charge toy model. *Phys. Rev. D*, **106**(104031), Nov 2022. 🔗
- **O. Long** & L. Barack. Time-domain metric reconstruction for hyperbolic scattering. *Phys. Rev. D*, **104**(024014), Jul 2021. 🔗

Other publications

- L. J. Gomes Da Silva, R. Panosso Macedo, J. E. Thompson, J. A. Valiente Kroon, *et al.* Hyperboloidal discontinuous time-symmetric numerical algorithm with higher order jumps for gravitational self-force computations in the time domain. *arXiv:2306.13153.* 🔗
- M. Boschini, D. Gerosa, V. Varma, *et al.* Extending black-hole remnant surrogate models to extreme mass ratios. *Phys. Rev. D*, **108**(084015), Oct 2023. 🔗
- L. J. Gomes Da Silva, R. Panosso Macedo, **O. Long** & J. A. Valiente Kroon. Numerical Algorithm for the Computation of the Scalar Self-Force on a Charged Particle on a Schwarzschild background in the Time Domain. (*in preparation*).
- M. Boyle, K. Chatziioannou, *et al.* The SXS Collaboration catalog of binary black hole simulations II. (*in preparation*).
- N. Warburton, B. Wardell, *et al.* The Black Hole Perturbation Toolkit. (*in preparation*).
- LISA Waveform Working Group. LISA Waveform Modelling Whitepaper. (*in preparation*).

Invited talks

- "Self-force meets post-Minkowskian in the scattering regime" Gravitational Waves meet Amplitudes in the Southern Hemisphere, International Center for Theoretical Physics South American Institute for Fundamental Research, 24th August 2023.
- "Hyperbolic self-force calculations within a hyperboloidal framework" Infinity on a Gridshell, Niels Bohr Institute, 10th July 2023.
- "Extraction of high-order post-Minkowskian results from scattering self-force calculations" QCD meets Gravity 2022, Universität Zürich, 13th December 2022.

Conference presentations

- "Comparison of post-Minkowskian and self-force expansions: Scattering in a scalar charge toy model" 26th Capra Meeting on Radiation Reaction in General Relativity, Niels Bohr Institute, 4th July 2023.
- "Self-force in hyperbolic black hole encounters" LISA Symposium XIV, 25th – 29th July 2022. 🔗
- "Self-force in hyperbolic black hole encounters" 23rd International Conference on General Relativity and Gravitation, Chinese Academy of Science via Zoom, 5th July 2022. 🔗
- "Self-force in hyperbolic black hole encounters" 25th Capra Meeting on Radiation Reaction in General Relativity, University College Dublin, 22nd June 2022. 🔗
- "Self-force in hyperbolic binary-black-hole encounters" BritGrav22, University of Glasgow via Zoom, 4th April 2022. 🔗

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- "Time-domain metric reconstruction for hyperbolic scattering" 24th Capra Meeting on Radiation Reaction in General Relativity, Perimeter Institute via Zoom, 10th June 2021. 🔗

- "Towards a self-force calculation of the scatter angle in hyperbolic encounters" BritGrav21, University College Dublin via Zoom, 13th April 2021. 🔗

- "Towards a self-force calculation of the scatter angle in hyperbolic encounters" LISA Symposium XIII, 1st – 3rd October 2020. 🔗

- "Towards a self-force calculation of the scatter angle in hyperbolic encounters" 23rd Capra Meeting on Radiation Reaction in General Relativity, University of Texas at Austin via Zoom, 24th June 2020. 🔗

Conference posters

- "Time-domain metric reconstruction using the Hertz potential" 3rd meeting of the GWVerse COST action, Institute for Fundamental Physics of the Universe, International School for Advanced Studies, 13th – 16th January 2020.

Other events attended

- Black Hole Perturbation Toolkit Workshop (via Zoom), The Institute for Computational and Experimental Research in Mathematics, Brown University, 25th – 27th July 2022.

- From Scattering Amplitudes to Gravitational-Wave Predictions for Compact Binaries, Universität Zürich & ETH Zürich, 4th – 15th July 2022.

- Advances and Challenges in Computational Relativity Workshop (Online), The Institute for Computational and Experimental Research in Mathematics, Brown University, 14th – 18th September 2020.

- Black Hole Perturbation Toolkit Workshop (Online), Astronomical Institute of the Academy of Sciences of the Czech Republic, 25th – 27th May 2020.

- Kavli RISE Summer School on Gravitational Waves, University of Cambridge, 23rd – 27th September 2019.

- 22nd International Conference on General Relativity and Gravitation and 13th Edoardo Amaldi Conference on Gravitational Waves, Palau de congressos de Valencia, 8th – 12th July 2019.

- 22nd Capra Meeting on Radiation Reaction in General Relativity, Centro Brasileiro de Pesquisas Físicas, 17th – 21st June 2019.

- LISA Waveform Working Group Meeting, Max Planck Institute for Gravitational Physics (Albert Einstein Institute), 13th – 15th May 2019.

- BritGrav19, Durham University, 15th – 16th April 2019.

- Black Hole Perturbation Toolkit Workshop, University College Dublin, 19th – 21st March 2019.

Research collaborations

Laser Interforemeter Space Antenna (LISA) Consortium — Oct 2018 – Present
- Member of the Waveform Working Group and LISA Early Career Scientists (LECS).

The Black Hole Perturbation Toolkit — Mar 2019 – Present
- Contributor to the KerrGeodesics package.

Simulating eXtreme Spacetimes (SXS) collaboration — Nov 2022 – Present
- Contributor to the Spectral Einstein Code (SpEC).

LIGO Scientific Collaboration (LSC) — Apr 2023 – Present
- Contributor to the pySEOBNR code.

References

Available upon request.

Updated 10th October 2023.