



## Academic positions

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

- Postdoctoral Researcher Nov 2022 – Present

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 Aug 2022 – Oct 2022
- Doctoral Prize Senior Research Assistant Jun 2022 – Jul 2022
- Research Assistant Jan 2022 – Mar 2022

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

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### Ph.D. in Mathematical Sciences, University of Southampton

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

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

Sep 2012 – Jun 2014

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

### GCSEs, Lacon Childe School

Sep 2007 – Jun 2012

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

## Computing

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- 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 **L<sup>A</sup>T<sub>E</sub>X**.



## Prizes

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

## Publications

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- 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. 
- L. Barack, Z. Bern, *et al.* Comparison of post-Minkowskian and self-force expansions: scattering in a scalar charge toy model. (*in preparation*).
- 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*).
- N. Warburton, B. Wardell, *et al.* The Black Hole Perturbation Toolkit. (*in preparation*).
- S. Akçay, E. Barausse, *et al.* LISA Waveform Modelling Whitepaper. (*in preparation*).









## Invited talks

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- “Double the hype: A hyperboloidal calculation of hyperbolic self-force” Infinity on a Gridshell, Niels Bohr Institute, 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

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- “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. 
- “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

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- “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

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- 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

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| <b>Laser Interferometer Space Antenna (LISA) Consortium</b>   | Oct 2018 – Present |
| • Member of the Waveform Working Group and LISA Early Career Scientists (LECS).   |                    |
| <b>The Black Hole Perturbation Toolkit</b>  | Mar 2019 – Present |
| • Contributor of scatter orbits to the KerrGeodesics package.  |                    |
| <b>Simulating eXtreme Spacetimes (SXS) collaboration</b>  | Nov 2022 – Present |
| • Using the Spectral Einstein Code (SpEC) to model hyperbolic binary-black hole (BBH) encounters.   |                    |

## References

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Available upon request.