# Benjamin James Leather

## Personal Data

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| Current Address: | Am Mühlenberg 1, 14476 Potsdam |
| Phone: | +(353)831330888 |
| Email: | benjamin.leather@aei.mpg.de |
| Website: | https://benjaminleather.com |
| LinkedIn: | https://www.linkedin.com/in/benjamin-leather/ |

## Personal Profile

Researcher with broad-ranging expertise in Physics and Mathematics, able to work both independently and as a supportive team member. Extensive range of qualifications in relevant subjects. Experienced in programming. Able to quickly assimilate information, summarise and draw conclusions methodically. Confident presenting to both technical and less-skilled audiences. Thrives on new intellectual challenges.

## Education

**2018-2022**

**Postdoctoral Researcher**

**Max-Planck-Institut für Gravitationsphysik (Albert Einstein Institute)**

Developing gravitational self-force calculations that are applicable to more realistic scenarios of systems with a spinning primary and where the smaller companions are in eccentric inspirals.

**2018-2022**

**Ph.D., Physics**

**University College Dublin**

*Thesis: Numerical approaches to first- and second-order self-force calculations*

Supervisor: Dr. Niels Warburton

Secondary Supervisor: Prof. Adrian Ottewill

**2014-2018**

**MPhys (Hons) Physics with Theoretical Physics - First Class**

**The University of Manchester**

*MPhys. Project: Field Theory of topological defects* (Supervisor: Prof. Apostolos Pilaftsis)

Achieved first class grades and was above the class-average in the majority of examinations and in all laboratory work.

Introduced and gained knowledge of key-concepts that underpin major fields in Physics, for example Relativity and Quantum Mechanics.

Gained powerful mathematical skills that can be used in solving physical systems and real-world situations.

Developed good laboratory practice as well as the recording and handling of data obtained from experiments. Also had practice in formal report writing for laboratory.

## Publications

- *Applying the effective-source approach to frequency-domain self-force calculations for eccentric orbits*
  **Benjamin Leather** and Niels Warburton
  In Preparation.

- *Hyperboloidal method for frequency domain self-force calculations*
  Rodrigo Panosso Macedo, **Benjamin Leather**, Anıl Zenginoğlu, Niels Warburton and Barry Wardell
  Phys. Rev. D **105**, 104033, arXiv:2202.01794

- *Frequency-domain methods for first- and second-order self-force calculations in Schwarzschild spacetime*
  Jeremy Miller, **Benjamin Leather**, Adam Pound and Niels Warburton
  In Preparation.

- *Applying the effective-source approach to frequency-domain self-force calculations for the Teukolsky formalism*
  **Benjamin Leather**, Niels Warburton and Barry Wardell
  In Preparation.

- *LISA Waveform Modelling Whitepaper*
  LISA Waveform Working Group (including **Benjamin Leather**)
  In Preparation.

- *The Black Hole Perturbation Toolkit*
  Warburton *et al.* (including **Benjamin Leather**)
  In Preparation.

- *Teukolsky Package (Mathematica) - Black Hole Perturbation Toolkit*
  Barry Wardell, Niels Warburton, Marc Casals, Adrian Ottewill, Chris Kavanagh, Leanne Durkan, **Benjamin Leather**, Theo Torres
  https://bhptoolkit .org/Teukolsky/

## Contributed Talks

- **23rd Capra Meeting on Radiation Reaction in General Relativity** June 2020
  *A view to second-order self-force calculations for eccentric orbits* University of Austin, Texas (virtual)

- **BritGrav 21** April 2021
  *A view to second-order self-force calculations for eccentric orbits* University College Dublin (virtual)

- **24th Capra Meeting on Radiation Reaction in General Relativity** June 2021
  *Calculating the second-order self-force for a Teukolsky formalism* Perimeter Institute (virtual)

- **American Physical Society April Meeting 2022** April 2022
  *Hyperboloidal method for frequency domain self-force calculations* New York Marriott Marquis

- **24th Capra Meeting on Radiation Reaction in General Relativity** June 2022
  *Calculating the second-order self-force for a Teukolsky formalism* University College Dublin

## Science Outreach

**Invited Talks**

- **Astronomy on Tap - Birr Castle Observatory** October 2019
  *Talk Title: Ripples in Space and Time*

## Teaching Experience

**Tutor, University College Dublin**

- *ACM10070 - Mathematical Modelling for Science* Autumn 2018

- *ACM20050 - Classical Mechanics and Special Relativity* Autumn 2018

- *MATH10290 - Linear Algebra for Science* Autumn 2018, Autumn 2019

- *MST20050 - Linear Algebra II* Spring 2019, Spring 2020

- *ACM30030 - Multivariable Calculus for Engineers II* Autumn 2020, Autumn 2021

- *ACM10100 - Differential and Difference Equations* Spring 2021

- *MATH10210 - Foundations of Mathematics for Computer Science* Spring 2021

Working with lecturers and other tutors to supervise Undergraduate level courses in Physics and Mathematics. Gave tutorials to classes of up to 75 students of different abilities in aforementioned courses. Had experience marking interim assignments for all of these courses. Marked the midterm examinations for *ACM10070* and *ACM20050* and the final examination for *MATH10290*.

## Relevant Work Experience

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| JUNE 2017 - SEP. 2017 | **Summer Internship at the University of Manchester** |
| | Worked with Professor Terrance Wyatt at the High Energy Particle (HEP) Group at the University of Manchester on a research project over the summer of 2017. The project was entitled "Extensions to a novel approach to kinematic reconstruction for improved signal-background discrimination in searches for di-Higgs production in the $bb\tau_h\tau_l$ channel at 13 TeV". |
| | Reproduced an extensive analysis technique based on a penalty function, $\psi$, using C++ and ROOT based on previous successful project work that gained recognition from the ATLAS working group at CERN. |
| MAR. 2011 - APRIL. 2011 | **Shropshire County Council** |
| | Supervised staff in several development projects around the area, mainly offering help with computing and applying basic mathematics and physics. Here I mainly developed my inter-personal skills in working with a team of 10 people in the department. |
| | Attended several meetings whilst shadowing the team-leader throughout the week which helped to improve my leadership skills. |

## Positions of Responsibility

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| OCTOBER 2012 - ONGOING | **ECB UKCC1 Coach Qualification (ECB Level 1 Coaching Assistant)** |
| | Cricket coach at Bridgnorth Cricket Club. Coaching junior cricketers from Year 4 (Aged 7) upwards from training sessions at beginner level to junior cricket matches. Helped to develop my communication skills with audiences of all ages. |
| | Working with managers on team selection and as a coach on match-days which especially improves my decision-making when selecting a side. |
| SEP. 2015 - JUNE 2016 | **Treasurer of the University of Manchester Cricket Club** |
| | Managed the business account for the Men's cricket club and handled over £10,000 (GBP) of transactions. Developed financial skills and improved my attention to detail. |
| | Worked with the Chairman and Vice-Chairman in securing Sponsorship deals for the club. Had to liaise with representatives of different companies in order to negotiate a beneficial sponsorship deal for both parties. |
| SEP. 2014 - JUNE 2015 | **First Year Student Representative** |
| | Attended several teaching review meetings and presented feedback obtained from a wide cohort of students to lecturers and the head of first year. Successfully changed teaching for the Properties of Matter course after an overwhelming backlash from first year students and blocked a ban on calculators for certain examinations. |
| | Again this shows my communication skills and in particular my ability to persuade an audience. |

## Interests and Activities

**Cricket**

A Regular player for Bridgnorth Cricket Club, 1st and 2nd XI in the Birmingham Cricket League. Won the Bowling award in 2012 and 2010. Also previously been involved in the Shropshire County Cricket squad for my age group.

**Duke of Edinburgh Award**

Completed Silver Award involving 3 Expeditions: Much Wenlock and Church Stretton (2 Days - 2011), Peak District National Park (3 Days - 2011), Snowdonia National Park (Qualifying Expedition, 3 Days - 2012). Completed Gold Award involving 2 Expeditions to Lake District National Park (3 Days - 2013 and 4 Days - 2014).

**World Challenge: South Africa and Namibia**

In the summer of 2013 I undertook a World Challenge Expedition for three and half weeks to South Africa and Namibia. This required the raising of over £3845 (GBP) through a variety of fund-raising events and jobs before travelling in South Africa and Namibia for four weeks with a group from school. Worked in a Namibian school in the town of Grünau, painting the school and teaching basic science and mathematics to the students. Undertook the role of group leader and accountant, faced with challenging and sometimes difficult situations, which developed my leadership and communication skills.

## IT and Programming Skills

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| BASIC KNOWLEDGE | HTML, CSS, PHP, JQuery |
| INTERMEDIATE KNOWLEDGE | Python, Linux |
| ADVANCED KNOWLEDGE | Wolfram Mathematica, C, C++, LaTeX, Microsoft Office Specialist |

## Additional Skills

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| LANGUAGES | Conversational level French (AS-level) |
| WEBSITE DEVELOPMENT | Developed a personal website. Proficient in coding in html, CSS, and JQuery |

## References

**References Available on Request**