Thomas Brosnan

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Education

University of Cambridge   2025 – Present
MASt in Theoretical Physics, Part III of the Mathematical Tripos.
Modules: Advanced QFT, Field Theory in Cosmology, Black Holes, Standard Model.

Trinity College Dublin   2021 – 2025
BA (Hons) In Theoretical Physics. Graduated with a First Class Honours (86%).
Modules: Differential Geometry, Lie Groups, QFT, General Relativity.

St Colmcille's Secondary School - Dublin   2015-2021
Leaving certificate, 613/625 points, H1's in Physics, Maths, Applied Maths, DCG, Chemistry.

Research Experience

Quantum Field Theory on Causal Sets   July - August 2025
Dublin Institute for Advanced Studies (DIAS) - School of Theoretical Physics
- Investigated quantum fields on causal sets alongside Dr Yasaman Yazdi. Compared causal set propagators with well known continuum curves in different spacetimes such as de Sitter.
- Showed through simulations that a distinguished vacuum, known as the Sorkin-Johnston (SJ) vacuum is part of the family of continuous de Sitter invariant vacua, known as the α-vacua.
- In the process of writing a paper on the results.

Quantum Aspects of Black Holes in de Sitter Spacetime   September 2024 - May 2025
Trinity College Dublin - School of Mathematics
- My Final Year Project under the supervision of Prof. Manuela Kulaxizi involved the exploring aspects of QFT in curved spacetimes, such as the Unruh affect and Hawking Radiation.
- Subsequently used these ideas to analyse Raphael Bousso and Stephen Hawking's "(Anti-)Evaporation of Schwarzschild -de Sitter Black Holes". My thesis can be found here.

Testing Single-Pulse-Search Algorithms   June - August 2024
University of California, Berkeley/Irish I-LOFAR Observatory
- Conducted research as part of Breakthrough Listen's Search for Extraterrestrial Intelligence, supervised by Professor Evan Keane.
- Developed a pipeline for evaluating the efficiency of single pulse detection algorithms. Github here.
- Coordinated dual site observations of exoplanets and pulsars using Irish and Swedish I-LOFAR radio telescopes.

Testing Theories of Gravity with Pulsars   May - July 2023
Trinity College Dublin - School of Mathematics
- Completed a research project as part of the Hamilton Trust Internship under the supervision of Professor Evan Keane. Used binary pulsars as a medium to test theories of gravity by calculating the predicted change in their orbital parameters.
- Took the initiative to show that corrections predicted by Yukawa-like potentials entered at the same order as the second order corrections from standard General Realtivity (GR), hindering their experimental distinction. My work can be found here.

Work Experience

Teaching Assistant   2023 - 2025
Trinity College Dublin - School of Mathematics
- Graded and gave tutorials for first year module "Techniques in Theoretical Physics" and second year module: "Advanced Classical Mechanics"

Applied Maths Teacher   2021-2024
St Colmcille's Secondary school - Dublin
- Taught 5th and 6th year classes of around 15 students

Coding Instructor   2021 - 2022
Olus Education - Dublin
- Involved teaching classes in Java, Python and HTML

Awards & Honors

Gold Medal 2025
Trinity College Dublin-Achieved prize for achieving a grade above 80% across my whole degree.

Arthur Lyster Prize 2021
Trinity College Dublin -Achieved prize for Junior Fresh mathematics results

Trinity Entrance Award 2021
Trinity College Dublin-Achieved prize on the basis Leaving certificate results

Specialized Skills

Programming Languages: Java, Python, Shell scripting (Bash, csh, ect), C++. Git, Mathematica

Linux: Experience with large data management on Linux servers. Currently maintaining home Linux server on a Raspberry pi 5.

I-LOFAR Telescope: Experience creating observing scheduals for the Irish I-LOFAR radio telescope.

LaTeX: I have written detailed notes, lab reports and papers all in LaTex. I gave an "Introduction to LaTex" seminar for the TPSA in October 2024.

Other Interests

Treasurer of the Theoretical Physics Student Association (TPSA): As treasurer I developed and managed budgets to support ongoing activities while identifying and securing new funding sources to sustain and expand operations. The TPSA runs weekley seminars where students enter a collaborative space to discuss homework problems or ask physics questions. The association also hosts hackathons, faculty talks as well as workshops to help fellow students.

Captain of the PLANCKS Team: I was captain of the team that represented Trinity at the UK & Ireland preliminary and subsequently Ireland at the international final in 2024. PLANCKS is a exam-based physics competition for bachelor's and master's students.

Communication: I am passionate about communicating and sharing my work with others.

- Recently (December 2025) as part of the part III seminar series, I gave a seminar about "Dynamical Dark Energy from Causal Set Theory" to my fellow students. The slides of which can be found here.
- During the Summer of 2025 I created a 6 part lecture series Introducing General Relativity aimed at new students, that is now on the TPSA's YouTube channel.
- I am also an admirer of the open source philosophy, hence any code I have developed is available on my GitHub page and any notes I have typed up are hosted on my website.

Miscellaneous: In my free time I compete for St John's college Cambridge basketball team. I also read recreationally, particularly works of Sci-Fi and Fantasy.

References

- Professor Evan Keane: evan.keane@tcd.ie
- Professor Chaolun Wu   wuch@tcd.ie
- Professor Manuela Kulaxizi   kulaxizm@tcd.ie