Xavier Kervyn

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Born on 18 May 2001. Belgian

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Research Interests

Keywords: quantum gravity: gauge/gravity duality, quantum structure of black holes and information theory, HEP and string theory. Twistor methods, integrability, topological field & string theories.

I am a graduate student in theoretical physics at the University of Cambridge. My coursework in field theory and mathematical physics, alongside my research experiences, have altogether driven my interest towards studying the role of symmetries in the context of HEP theory.

My previous research experiences demonstrate my ability to work efficiently in a team but also study and solve research problems independently. I wish to continue carrying out research in theoretical physics over the summer, prior to joining TUM & LMU in Munich next Fall. There, I intend to further my education in topological string theory, symplectic geometry, topology and mathematical gauge theories before starting a PhD in mathematical physics in Europe or North America.

Education

Technische Universität München & Ludwigs-Maximilians-Universität 2023 – 2025
Elite Master Course in Theoretical and Mathematical Physics Munich, Germany
Grade: N/A. Incoming student (Fall 2023)

Peterhouse, University of Cambridge 2022 – 2023
Master of Advanced Study (MASt) in Applied Mathematics Cambridge, UK
Grade: N/A. Expected graduation in June 2023.

Eidgenössische Technische Hochschule Zürich 2021 – 2022
Swiss-Mobility, Bachelor of Science in Physics Zurich, Switzerland
Grade: 5.58/6. Exchange year in the frame of the Swiss-Mobility program

Ecole Polytechnique Fédérale de Lausanne 2019 – 2022
Bachelor of Science in Physics Lausanne, Switzerland
Grade: 5.18/6 (first two years). Only student to go to ETH Zürich

Research Experience

University of Cambridge 2022 – Present
Essay, Department of Applied Mathematics and Theoretical Physics Cambridge, UK

- Title: *BMS Symmetries of Gravitational Scattering* (Dr. Prahar Mitra). Grade: N/A
- BMS analysis, covariant phase space formalism, IR structure of gravity, celestial holography.

CERN CMS collaboration & ETH Zürich 2022
Bachelor project, High-Energy Physics Group Meyrin, Switzerland

- Title: *Towards an automatised analysis framework for the upcoming Compact Muon Solenoid ECAL upgrade, aiming at improved amplitude and time resolutions with High-Luminosity LHC* (Dr. Simone Pigazzini)
- Study of a CMS ECAL prototype with a class IV LASER. Python package available on my Github.

ETH Zürich 2021
Semester project, Exoplanets and Habitability Group Zurich, Switzerland

- Title: *Measure and characterization of the impact of non-perfect nulls on the detectable planet population by LIFE, based on different stellar and planetary properties* (Prof. Sascha Quanz & Felix Dannert). Grade: 6/6
- Built a model to characterize the impact of non-perfect nulls on the detection yield and derived technical requirements on the concept, taking into account sources of instrumental perturbation

Publications

1. No peer-reviewed publications yet, working on it!

Invited Talks & Seminars

1. **Kervyn, X.** (Mar. 2023) Gravitational scattering and covariant phase space methods in gravity (Talk, given in the frame of the Cambridge DAMTP Part III Seminars series)
2. **Kervyn, X.** (Dec. 2022) Holography and Twistor methods in AdS_5 (Talk, given in the frame of the Cambridge DAMTP Part III Seminars series)
3. **Kervyn, X.**, Roux, N. (Jul. 2022) Towards an automatized analysis framework for the upcoming CMS ECAL upgrade, aiming at improved amplitude and time resolution with HL-LHC. (Bachelor project, supervised by Dr. Simone Pigazzini)
4. **Kervyn, X.** (Dec. 2021) Measure and characterisation of the impact of non-perfect nulls on the detectable planet population by LIFE, based on different stellar and planetary properties. (Semester project, supervised by Prof. Dr. Sascha Quanz and Felix Dannert)

Conferences, Schools and Workshops attended

1. (Apr. 2023, Scheduled) **Eurostrings 2023**, Gijon, Spain. *String Theory, Quantum Gravity, QFT*
2. (Apr. 2022) **Young Physicists Forum 2022**, Zürich, Switzerland. *Green Energy Physics*

Teaching

Science Tutor (volunteer) 2022 – Present
Village Book Builders (remote)

- 1:1 weekly tutoring sessions with a child in Uganda. Helping with mathematics, physics and english
- VBB fights inter-generational poverty in low-income countries and prevents dropout rate at school

Employments

Recovery Team Leader 2020 – 2021
EPFL Rocket Team Lausanne, Switzerland

- Managed a team of 10 students, coordinated the project with other subsystems (approx. 8h/week).
- Test / manufacturing procedures; parachutes, altimeter and ejection system design and confection.
- Design of the drogue chute for the 'Bella Lui II' rocket: 1st place at the EuRoc competition in Portugal in the fall 2021, 2nd at the Spaceport America Cup (category SRAD-10K) in the summer 2021.

Specific Skills

Languages: French (native speaker), English (C2 proficiency), German (B1-B2 proficiency)

Theoretical and Mathematical Physics: relevant coursework includes so far

- General Relativity, Black Holes, Solitons Instantons and Geometry, Gauge/Gravity Duality;
- (Advanced) Quantum Field Theory, Symmetries Particles and Fields, String Theory, SUSY;

Programming: C++ (OOP), Python (NumPy, Pandas, Matplotlib, Seaborn, Plotly.express, SciPy)

Data Analysis: Python (advanced), MATLAB (intermediate), Microsoft Excel (elementary)

Scientific work: LaTeX, 3+ years of experience in writing scientific reports, Mathematica

Awards, Grants & Scholarships

Peterhouse Study Grant – *Peterhouse, Cambridge* 2023
£300 study grant awarded to attend the Eurostrings 2023 conference (Gijon, Spain)

Cross Keys membership – *Peterhouse Cross Keys* 2023
The Cross Keys celebrates Peterhouse's highest-level sporting athletes and their achievements

Annual scholarship – *Swiss Study Foundation* 2022
CHF 20'000 awarded for Masters studies at the University of Cambridge

Colbianco Excellence scholarship – *Colbianco Stiftung* 2022
CHF 2'000 awarded for Masters studies at the University of Cambridge

Scholarship – *e-fellows.net* 2022
Admitted to the career and student network due to my results and extracurricular commitment

Fellowship – *Swiss Study Foundation* 2022
The SSF supports supports outstanding students willing to contribute to science and society

Be A Consultant for a Day – *Roland Berger Zurich* 2022
One of 20 students selected from top Swiss universities to participate to a case study

Swiss Mobility Program scholarship – *EPF Lausanne* 2021
CHF 1'500 awarded due to my results to pursue my studies at ETH Zurich

Baccalaureate Merit Award – *Région Provence-Alpes Côte d'Azur* 2019
€400 awarded for achieving the highest distinction at the French Baccalaureate

Athlete Award – *Gap Hautes Alpes Athletisme* 2018
€120 awarded for my result at the 2018 French Cross-Country Championships

Prix Maupassant de la Jeune Nouvelle – *AMOPA 05* 2016
Literary prize, awarded for an essay on the first World War for the "Brevet des Collèges"

Academic References

- **Dr. Prahar Mitra** (*Part III essay setter*). Office B0.02, Department of Applied Mathematics & Theoretical Physics, University of Cambridge, Wilberforce Road, Cambridge CB3 0WA, UK. Email: pm729@damtp.cam.ac.uk
- **Dr. Simone Pigazzini** (*CERN supervisor*). Office 32 2-C24, Institut für Teilchen- und Astrophysik, ETH Zürich, 23 Route de Meyrin, CH-1211 Genève, Switzerland. Email: simone.pigazzini@cern.ch. Phone: +41 22 767 63 19
- **Prof. Matthias Gaberdiel** (*Lecturer for Quantum Mechanics I*). Office HIT K 23.1, Institut für Theoretische Physik, ETH Zürich, Wolfgang-Pauli-Str. 27, CH-8093 Zürich, Switzerland. Email: gaberdim@ethz.ch. Phone: +41 44 633 25 82