Xavier Kervyn

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Born on 18 May 2001. Belgian

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Research Interests

Keywords: quantum gravity, holography, CFT, supergravity, formal string theory, black holes, asymptotic symmetries, symmetries and dualities, SUSY, integrability in string and field theory, quantum information and gravity, twistors, celestial amplitudes and flat space holography.

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 and integrability 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 will be carrying out research on the implications of integrability for holography this summer, prior to undertaking a second master in math. physics.

Education

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. Graduate coursework in mathematical physics.

Ecole Polytechnique Fédérale de Lausanne 2019 – 2022
Bachelor of Science in Physics Lausanne, Switzerland
Grade: 5.18/6 (first two years)

Research Experience

Università degli Studi di Padova & Institute for Advanced Study 2023
Summer Research Student (planned), Dept. of Physics and Astronomy Theoretical Physics Padova, Italy

- Will join Prof. A. Sfondrini to work on the applications of integrability to string theory and holography this summer, looking at: integrable models and their deformations; worldsheet dualities and extended field theories; non-commutative and non-associative field theory; integrability in gauge/gravity duality.

University of Cambridge 2022 – Present
Part III 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 of LIFE and derived technical requirements on the concept, taking into account sources of instrumental perturbation

Publications & Preprints(*)

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

Contributed 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, *viva voce* examination)
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, *viva voce* examination)

Conferences, Schools and Workshops attended (scheduled)

1. (Jul. 2023) **Integrability, Dualities and Deformations 2023**, Durham, UK
2. (Jul. 2023) **Young Researchers Integrability School & Workshop 2023**, Durham, UK
3. (Apr. 2023) **Eurostrings 2023**, Gijon, Spain
4. (Apr. 2023) **Intersections of String Theory and QFT III**, King's College London, UK
5. Apr. 2022. **Young Physicists Forum 2022**, ETH Zürich, Switzerland

Teaching

Science Tutor (volunteer) 2022 – 2023
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

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

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

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

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

Prix Maupassant de la Jeune Nouvelle – *Assoc. des Membres d'Or de la Palme Académique* 2016
Literary prize

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

- **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

- **Prof. Stephan Brunner** (*Lecturer for Mathematical Methods for Physicists*). Office PPB 312, Swiss Plasma Center Theory Group, Station 13, EPF Lausanne, CH-1015 Lausanne, Switzerland. Email: stephan.brunner@epfl.ch. Phone: +41 21 693 45 65