

# Xavier Kervyn

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Born on 18 May 2001. Belgian

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## RESEARCH INTERESTS

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*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.

## EDUCATION

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<b>Peterhouse, University of Cambridge</b>	2022 – 2023
<i>Master of Advanced Study (MASt) in Applied Mathematics</i>	Cambridge, UK
<b>Eidgenössische Technische Hochschule Zürich</b>	2021 – 2022
<i>Swiss-Mobility, Bachelor of Science in Physics</i>	Zurich, Switzerland
<b>Ecole Polytechnique Fédérale de Lausanne</b>	2019 – 2022
<i>Bachelor of Science in Physics</i>	Lausanne, Switzerland

## RESEARCH EXPERIENCE

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<b>Università degli Studi di Padova</b>	2023
<i>Summer Research Student (planned), Dept. of Physics and Astronomy – Theoretical Physics</i>	Padova, Italy
<ul style="list-style-type: none"><li>Will join <a href="#">Prof. A. Sfondrini</a> to study the spectrum of a new integrable 2D QFT, deriving its Bethe Ansatz equations and looking at its relations to string theory &amp; the holographic conjecture in <math>\text{AdS}_3</math>.</li></ul>	
<b>University of Cambridge</b>	2022 – Present
<i>Part III Essay, Department of Applied Mathematics and Theoretical Physics</i>	Cambridge, UK
<ul style="list-style-type: none"><li>Title: <i>BMS Symmetries of Gravitational Scattering</i> (<a href="#">Dr. Prahar Mitra</a>). Grade: N/A</li><li>BMS analysis, covariant phase space formalism, IR structure of gravity, celestial holography.</li></ul>	
<b>CERN CMS collaboration &amp; ETH Zürich</b>	2022
<i>Bachelor project, High-Energy Physics Group</i>	Meyrin, Switzerland
<ul style="list-style-type: none"><li>Title: <i>Towards an automatised analysis framework for the upcoming Compact Muon Solenoid ECAL upgrade, aiming at improved amplitude and time resolutions with High-Luminosity LHC</i> (<a href="#">Dr. Simone Pigazzini</a>)</li><li>Study of a CMS ECAL prototype with a class IV LASER. Python package available <a href="#">on my Github</a>.</li></ul>	
<b>ETH Zürich</b>	2021
<i>Semester project, Exoplanets and Habitability Group</i>	Zurich, Switzerland
<ul style="list-style-type: none"><li>Title: <i>Measure and characterization of the impact of non-perfect nulls on the detectable planet population by LIFE, based on different stellar and planetary properties</i> (<a href="#">Prof. Sascha Quanz</a> &amp; <a href="#">Felix Dannert</a>). Grade: 6/6</li><li>Built a model to characterize the impact of non-perfect nulls on the detection yield of <a href="#">LIFE</a> and derived technical requirements on the concept, taking into account sources of instrumental perturbation</li></ul>	

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## PUBLICATIONS & PREPRINTS(\*)

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

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## CONTRIBUTED TALKS & SEMINARS

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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  $\text{AdS}_5$  (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)

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## CONFERENCES, SCHOOLS AND WORKSHOPS ATTENDED (scheduled)

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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**, Gijón, Spain
4. Apr. 2022. **Young Physicists Forum 2022**, ETH Zürich, Switzerland

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## TEACHING

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<b>Science Tutor (volunteer)</b>	2022 – 2023
<i>Village Book Builders</i>	(remote)
<ul style="list-style-type: none"><li>• 1:1 weekly tutoring sessions with a child in Uganda. Helping with mathematics, physics and English.</li><li>• VBB fights inter-generational poverty in low-income countries and prevents dropout rate at school.</li></ul>	

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## EMPLOYMENTS

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<b>Recovery Team Leader</b>	2020 – 2021
<i>EPFL Rocket Team</i>	Lausanne, Switzerland
<ul style="list-style-type: none"><li>• Managed a team of 10 students, coordinated the project with other subsystems (approx. 8h/week).</li><li>• Test / manufacturing procedures; parachutes, altimeter and ejection system design and confection.</li><li>• 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.</li></ul>	

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## SPECIFIC SKILLS

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**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:**  $\text{\LaTeX}$ , 3+ years of experience in writing scientific reports, Mathematica

#### AWARDS, GRANTS & SCHOLARSHIPS

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<b>Greta Burkill Fund award</b> – <i>Peterhouse, Cambridge</i>	2023
<b>Bruckmann Fund award</b> – <i>Peterhouse, Cambridge</i>	2023
<b>Annual scholarship</b> – <i>Swiss Study Foundation</i> CHF 20'000 awarded for Masters studies at the University of Cambridge	2022
<b>Scholarship</b> – <i>Colbianco Stiftung</i> CHF 2'000 awarded for Masters studies at the University of Cambridge	2022
<b>Scholarship</b> – <i>e-fellows.net</i> Admitted to the career and student network due to my results and extracurricular commitment	2022
<b>Fellowship</b> – <i>Swiss Study Foundation</i> The SSF supports outstanding students willing to contribute to science and society	2022
<b>Swiss Mobility Program scholarship</b> – <i>EPF Lausanne</i> CHF 1'500 awarded due to my results to pursue my studies at ETH Zurich	2021
<b>Baccalaureate Merit Award</b> – <i>Région Provence-Alpes Côte d'Azur</i> €400 awarded for achieving the highest distinction at the French Baccalaureate	2019
<b>Prix Maupassant de la Jeune Nouvelle</b> – <i>Assoc. des Membres d'Or de la Palme Académique</i> Literary prize	2016

#### ACADEMIC REFERENCES

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- **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](mailto: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](mailto: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](mailto: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.  
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