

BARNABE LEDOUX

PhD student at ESPCI |

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Paris 75013, France

PhD candidate in physics at the Gulliver Laboratory in ESPCI, with David Lacoste, on the topic “Growth in uncertain environments”. My curriculum includes courses in statistical physics, biophysics and physics of complex systems. I am particularly keen to integrate environmental considerations into my training, and hope to reconcile my research with these concerns during my PhD. I work at the frontier between physics and biology, but also economics.

EDUCATION

April 2025 **INTP, SURBA, FRANCE**

I followed the spring school Mathematical Theory in Community Ecology.

➤ **Physics and Ecology** : Population dynamics, Coexistence, Diversity, Random matrices.

October 2024 **NORDITA, STOCKHOLM, SWEDEN**

I followed the program Measuring and Manipulating Non-Equilibrium Systems.

➤ **Physics** : Out of equilibrium statistical physics, Random walks, Entropy.

2023 - 2024 **ÉCOLE NORMALE SUPÉRIEURE, PARIS, FRANCE**

As a student in the ICFP (International Centre for Fundamental Physics and its interfaces) Master's program, I followed the “Soft matter and biological physics” curriculum.

➤ **Physics** : Statistical physics (non-equilibrium systems), Statistical physics of complex and disordered systems, Ecology and evolution, Active matter and collective phenomena, Physics of biological systems, Physics of fluids and non-linear systems, Physics of interfaces.

2020 - 2024 **ÉCOLE POLYTECHNIQUE, PALAISEAU, FRANCE**

Polytechnique engineering student. I specialize in Physics, but have additional training in mathematics and biology. **Ranking 25/435** among École Polytechnique students.

➤ **Physics** : Statistical physics of condensed matter (electrons in solids, entanglement, mesoscopic quantum physics), Quantum physics, Physics of biological systems, Physics of living systems, Optoelectronics, Statistical physics, Relativity, Nonlinear optics, Digital physics, Electromagnetism.

➤ **Mathematics** : Analysis, Statistics, Linear Algebra.

➤ **Informatics** : Java, Python, Freefem ++.

➤ **Biology** : Molecular biology, Cell biology.

➤ **Humanities** : Literature, Philosophy, History of arts.

2018 - 2020 **LYCÉE MICHELET, VANVES, FRANCE**

MPSI-MP preparatory class

➤ **Physics** : Mechanics, Optics, Electronics, Electromagnetism, Statistical physics, Quantum physics.

➤ **Mathematics** : Analysis, Algebra, Statistics.

➤ **Informatics** : Python.

2018 **LYCÉE MICHELET, VANVES, FRANCE**

Baccalauréat mention très bien.

EXPERIENCE

Today
September 2024

PhD, LABORATOIRE GULLIVER ESPCI, Paris

PhD student in physics with David Lacoste on the topic “Population growth in an uncertain environment. This subject allows us to tackle questions of statistical physics, but also interdisciplinary projects at the frontier with ecology and biology.

Python

Juillet 2025	Official Marker IPHO (International Physics Olympiads), SOCIÉTÉ FRANÇAISE DE PHYSIQUE, Paris <ul style="list-style-type: none"> > Correcting exams from the best physics students internationally. > Debating with representatives from different countries.
Juillet 2025 Janvier 2025	Tutorial teacher in physics and chemistry for bachelor students, LYCÉE HENRI IV, Paris <ul style="list-style-type: none"> > Support students in their understanding of physics. > Correcting homeworks.
Juillet 2025 Janvier 2025	Scientific partner in primary schools, FONDATION LA MAIN À LA PÂTE, Paris <ul style="list-style-type: none"> > Opening perspectives for students in priority education areas. > Helping primary schools teachers to teach sciences.
July 2024 April 2024	Research internship, LABORATOIRE GULLIVER ESPCI, Paris <ul style="list-style-type: none"> > Working in the field of statistical physics applied to biological systems. > Working with experimentalists. <div>Python</div>
September 2023 April 2023	Research internship, CAVENDISH LABORATORY, Cambridge <ul style="list-style-type: none"> > Working on areas at the cutting edge of condensed matter physics research. In particular, to study radiative effects in heat transport within solids using a quantum description and preparing conferences. <div>Python</div> <div>Phonopy</div> <div>Phono3py</div>
September 2022 June 2022	Internship, RATP, Paris <ul style="list-style-type: none"> > Data analysis of train wheel measurements. > Physical study of a wheel defect. <div>VBA</div> <div>Excel</div> <div>Office</div>
July 2024 September 2021	Evaluator in Physics-Chemistry, IN MP AND MPSI PREPARATORY CLASSES, Lycée Michelet, Vanves <ul style="list-style-type: none"> > Evaluate students on physics-chemistry problems 3 hours per week.
Today September 2021	Private teacher in physics-chemistry and mathematics, HIGH SCHOOL TO UNIVERSITY LEVEL, <ul style="list-style-type: none"> > Help to understand and manipulate physical tools.
May 2021 August 2020	Internship, IN THE ASSOCIATION “LA MAIN À LA PÂTE”, Le Havre <ul style="list-style-type: none"> > Teaching and promoting science in primary school classes. > Adapting complex scientific knowledge for pupils aged 9 to 12 (light, climate change, sound waves, electricity, robotics). > Working with students from REP+ (priority education network).

DATA SCIENCE SKILLS

Programming skills	Python, VBA (Virtual Basics for Application), Freefem++, Java.
Office	LaTeX, Pack Office (Word, Excel, PowerPoint).
Operating Systems	Windows, Linux, Android.

WORKS & PUBLICATIONS

2025 - ESPCI	"Universal features of autocatalytic growth" part of "Economic principles of cell biology"
2025 - ESPCI	"Inhibition of bacterial growth by antibiotics" transmitted for publication
2025 - ESPCI	"Limits to Growth in Uncertain Environments" presented at the Clifrium 2025, Banque de France in Paris
2025 - ESPCI	"Co-evolution in transient compartmentalization dynamics" presented at the Gulliver-Centuri days in Marseille
2025 - ESPCI	"Inhibition of bacterial growth by antibiotics" presented at the Journées de Physique Statistique 2024 in Paris
2023 - Cavendish Laboratory	Prize for research internship in physics awarded by the École Polytechnique foundation.
2023 - Cavendish Laboratory	"First-principles Wigner formulation of coupled radiative and conductive heat transfer". The project was presented at conferences.
2022 - École Polytechnique	Collective Scientific Project Report : Heat Perception .
	Nominated among the 14 best joint scientific projects (out of 111 projects proposed in 2022).

LANGUAGES

> Score **TOEFL** : 107/120

French	    
English	    
German	    
Japanese	    

FORCES

- > Versatile
- > Curious
- > Loves to learn
- > Hardworking
- > Autonomous

CENTRES D'INTÉRÊTS

MUSIC :	Guitar (13 years), Bass guitar, Member of the school orchestra.
LITERATURE :	English & American Literature.
SPORTS :	Climbing, Running, Hiking.