Elie Hammou

University of Cambridge, UK

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Research interests

I am currently working with Prof. Maria Ubiali's group on developing robust methods to fit Parton Distribution Functions, describing the structure of the proton, and new physics signals from colliders data. I am particularly interested in exploring possible extensions of the Standard Model, particularly using Effective Field Theories. As a phenomenologist, my focus is to investigate in which measure such extensions could be visible in present and future experiments and observations.

Education

PhD student in particle physics **2022 – Today**

University of Cambridge, DAMTP *Cambridge, UK*

- Supervised by Prof. Maria Ubiali.
- Working on the description of potential physics beyond the Standard Model with Effective Fields Theories.
- Special focus on fitting Parton Distribution Functions from collider data.

MASt Physics (Part III) **2020 – 2021**

University of Cambridge *Cambridge, UK*

- Graduated with merit, 73/100.

Diplôme d'ingénieur (Master in Mathematics and Physics) **2017 – 2020**

Ecole polytechnique *Palaiseau, FR*

- Graduated with 3.86 GPA.

Licence de Philosophie (Bachelor degree in Philosophy) **2018 – 2019**

University Paris-Nanterre *Nanterre, FR*

- Studies pursued remotely in parallel of Ecole polytechnique.
- Graduated with mention Bien, 14.6/20.

Classe préparatoire (Bachelor degree in Mathematics and Physics) **2015 – 2017**

Lycée Saint-Louis *Paris, FR*

- Graduated with 4.0 GPA.

Relevant Coursework

- Standard Model (SM)
- Beyond the Standard Model (BSM)
- Group Theory (SFP)
- Quantum Field Theory (QFT)
- Advanced QFT
- Supersymmetry
- Cosmology
- General Relativity
- Statistical Physics
- Effective Field Theories
- QCD
- Machine Learning Methods

Publications

1. E. Hammou, Z. Kassabov, M. Madigan, M. L. Mangano, L. Mantani, J. Moore, M. M. Alvarado, and M. Ubiali. Hide and seek: how PDFs can conceal New Physics. 7 2023 [arXiv:2307.10370]

2. T.-H. Dang, M. Konczykowski, V. I. Safarov, E. Hammou, L. R. Vega, N. Ollier, R. Grasset, A. Alessi, H.-J. Drouhin, H. Jaffrès, et al. Effect of high-energy electron irradiation on the electronic properties of beta-gallium oxide. In *Oxide-based Materials and Devices XIII*, volume 12002, pages 46–53. SPIE, 2022 [spiedigitallibrary.org]

Talks

Conference, Rencontres de Blois 2023 **May 2023**

Interplay between PDFs and new physics, [Link to slides] *Blois, France*

PhD Schools

Advanced Artificial Intelligence for precision High Energy Physics **Jul 2023**
Lake Como School of Advanced Studies *Como, Italy*

- Followed Machine Learning, QCD, Bayesian methods and data analysis and quantum machine learning courses.

GGI Lectures on the Theory of Fundamental Interactions 2023 **Jan 2023**
Galileo Galilei Institute *Florence, Italy*

- Followed Effective Field Theories, Gravitational Particle Production, Statistical Methods for Data Analysis in Particle Physics, Tabletop Experiments, Precision Electroweak Physics and Neutrino Physics courses.

Research Experience

Research Assistant and PhD student **Jan 2022 – Sep 2022**
University of Cambridge, DAMTP, PBSP *Cambridge, UK*

- Member of the research team led by Prof Maria Ubiali for an eight-month position (ongoing).
- Working on the ERC funded project Physics Beyond the Standard Proton (PBSP).
- Using Effective Field Theory (EFT) methods, numerical simulations and LHC data to look for deviations from SM predictions induced by new physics in the proton.

Part III Essay in Physics **2021 – 2022**
University of Cambridge, DAMTP *Cambridge, UK*

- Guided by Prof Maria Ubiali.
- Undertook a literature review on EFT strategies to probe for BSM physics using a phenomenological approach showing new physics could induce measurable shifts in observables.
- Grade of 75/100.

Research internship **2019 – 2021**
Ecole polytechnique, LSI & ETSF *Palaiseau, FR*

- Supervised by Prof Henri-Jean Drouhin for a one-year project.
- Investigated the impact of irradiation on semi-conductors through luminescence experiments and numerical simulation.
- Paper detailing results presented at Photonics West 2022 (San Francisco).
- Awarded the Research Centre prize for best Masters project.

Research project **2019 – 2021**
Ecole polytechnique *Palaiseau, FR*

- Supervised by Prof Frédéric Daigne.
- Simulated in Python the dynamics of periodic novae (nuclear surface explosions) in a binary star system.
- Grade A.

Research project **2018 – 2019**
Ecole polytechnique *Palaiseau, FR*

- Supervised by Dr. Eric Charkaluk.
- Simulated an optimised asteroid drill design to maximise radiation of internally generated heat and prevent machine overheating, with a team of undergraduate researchers.
- Produced prototypes via 3D printing for demonstration.
- Grade of 18/20.

Teaching experience

Graduate teaching, Standard Model course **2022 – Today**
University of Cambridge, DAMTP *Cambridge, UK*

- Course lectured by Prof. Fernando Quevedo and Prof. David Tong in Lent terms.
- Example class teacher for groups of 15-20 in Part III (Master students).
- Marked and provided feedback on regular assignments.

Undergraduate teaching, Principles of Quantum Mechanics course **2021 – Today**
University of Cambridge, DAMTP *Cambridge, UK*

- Course lectured by Dr. David Skinner in Michaelmas terms.
- Hired by Prof. Christopher Tout.
- Lead supervisions (recitation sections) for groups of 2 students in Part II (Third year students).

Undergraduate teaching, Particle and Nuclear Physics course **2021 – 2022**
University of Cambridge, Department of Physics *Cambridge, UK*

- Course lectured by Prof. Tina Potter in Lent and Easter terms.
- Lead supervisions (recitation sections) for groups of 3 students in Part II (Third year students).

Highschool teaching, Standard Model course **2019 – 2020**
Ecole polytechnique *Palaiseau, France*

- Provided subject tutoring and mentorship to students preparing for the French university entrance examinations.

Other work experience

Informatics and Logistics Intern **2019**
Vranken-Pommery Monopole *Aigues-Mortes, FR*

- Developed software to optimise management of employees and vinification (winemaking) processes.

Teaching support **2017 – 2018**
Apprentis d'Auteuil *Lille, FR*

- Supported disabled children and those with additional educational needs to rejoin formal education and gain valuable professional skills.

Skills

Languages: French (native), English (fluent), Spanish (B1), Russian (A2)
Programming Languages: C, C++, Java, SQL, Python, Caml, LaTeX