

# Guillaume Falmagne

*Postdoctoral researcher in complex systems (Princeton University)*

## Education and research experience

2022 – now **Postdoctoral research associate**, High Meadows Environmental Institute, Princeton University, *Complex socio-ecological systems*, Supervisor: Simon LEVIN

Spring 2022 **Postdoctoral researcher**, Subatech (IMT Atlantique, CNRS), Nantes, *Partonic energy loss in the quark-gluon plasma*, Supervisor: François ARLEO

2018 – Dec 2021 **PhD in particle physics**, Laboratoire Leprince-Ringuet, École Polytechnique (Institut Polytechnique de Paris).

Courses Advanced Quantum Field Theory, CERN-Fermilab Hadron Collider Physics school (2019), International School of QCD (LPT Orsay, 2018). Models for the energy transition, plant seeds, ethics of research.

Research *The  $B_c^+$  meson in heavy ion collisions with the CMS detector; Partonic energy loss in the quark-gluon plasma*, supervisors: Raphaël GRANIER DE CASSAGNAC, François ARLEO.

2017–2018 **2nd year of Master in High Energy Physics**, École Polytechnique (Université Paris-Saclay), *summa cum laude*

Research **5-month internship**, feasibility study on PhD topic

end 2016 – jun 2017 Volunteering and cultural [experience](#) in South America and Eastern Europe.

2015 – end 2016 **12-month research internship**, CERN, Geneva,  $\Lambda_b^0$  production charge asymmetry measurements with the LHCb detector, supervisor: Sascha STAHL.

2013–2015 **Bachelors degree and 1st year of Master in Fundamental Physics**, École Normale Supérieure de Cachan (Paris-Saclay) and Université Pierre et Marie Curie (Paris 6), *magna cum laude*

Research (2015) **4-month internship**, SLAC National Accelerator Laboratory, Stanford University, *Matching NNLO and parton showers and MINLO jet clustering in the SHERPA generator*, supervisors: Lance DIXON, Stefan HOECHE.

Research (2014) **2-month internship**, Laboratoire Leprince-Ringuet, École Polytechnique, *Resolution unfolding of the CMS detector for bottomonium suppression in the quark-gluon plasma*, supervisor: Raphaël GRANIER DE CASSAGNAC.

2011–2013 Classes préparatoires in Mathematics and Physics, Lycée Henri Poincaré (Nancy, France)

2011 Baccalauréat in Sciences, *summa cum laude*






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## Awards and fellowships

- 2024 In the final-5 shortlist for the **Prize of the Lopez-Loreta Foundation**,  
(submitted) 1-million euro grant over 5 years
- 2023 **Best poster (2nd place) of the Collective Intelligence Symposium**, Santa Fe Institute
- 2022 **PhD thesis award of Institut Polytechnique de Paris**
- 2022 **PhD thesis award of Groupement de Recherche QCD**
- 2022 **Accessit to the Daniel Guinier PhD thesis award of Société Française de Physique**
- 2022 **CERN Senior Research Fellowship**, declined for HMEI Research Associate position, Princeton U.
- 2013 **Admission at ENS Cachan after national competitive exams**, 'normalien': full 4-year funding

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## Main publications

- 2024 **Probing the path-length dependence of parton energy loss via scaling properties in heavy ion collisions**, François Arleo, Guillaume Falmagne, *PRD Letters* 109 (2024), L051503
- 2019 **Quenching of hadron spectra in XeXe and PbPb collisions at the LHC**, François Arleo, Guillaume Falmagne, *Proc. of Hard Probes 2018*, *PoS* 075
- Role (2018-23)  Extending the model and its comparison to measurements; set forth three additional scaling laws
- 2022 **Observation of the  $B_c^+$  Meson in Pb-Pb and pp Collisions at  $\sqrt{s_{NN}} = 5.02$  TeV and Measurement of its Nuclear Modification Factor**, CMS collaboration, *Phys. Rev. Lett.* 128, 252301
- Role (2018-21)  Contact author and main analyser
- 2021 **Observation of a  $\Lambda_b^0 - \bar{\Lambda}_b^0$  production asymmetry in proton-proton collisions at  $\sqrt{s} = 7$  and 8 TeV**, LHCb collaboration, *JHEP*10 (2021) 060
- Role (2015-17)  Major analyser
- 2019–2021 **Author of all papers from the CMS Collaboration submitted in this period (> 200)**  
 Direct contributions to: Muon reconstruction in heavy ion collisions (CMS-PAS-MUO-21-001 Public Analysis Summary), Fragmentation of jets containing a  $J/\psi$  (PLB(2021) 136842)
- 2015 **Les Houches 2015: Physics at TeV Colliders Standard Model Working Group Report**, J.R. Andersen et al., *arXiv:1605.04692*
- Role (2015)  Contribution to matching NNLO and parton showers in V-Higgs + MINLO procedure in SHERPA

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## Current projects

- 2022-now **Interpretable Early Warning System using Machine Learning in a Large-scale Online Game-experiment (r/place)**, with Anna B. Stephenson (Princeton) and Simon A. Levin (Princeton), in writing, to be submitted to PNAS
- 2022-now **A dynamical model for tipping cascades due to the moisture recycling network in the Amazon rainforest**, with Nico Wunderling (PIK), work in progress
- 2023-now **Understanding scaling laws and optimization principles of organizations using a Reddit social experiment (r/place)**, with Anna B. Stephenson (Princeton) and Chris Kempes (Santa Fe Institute for Complexity), work in progress
- 2023-now **Extracting uni-dimensional voter spectra from ranked choice voting ballots**, with Samuel S. Wang (Princeton), Keena Lipsitz (CUNY), Simon A. Levin (Princeton), and Annie B. Stephenson (Princeton), work in progress
- 2023-now **The large-scale propagation of cooperation on multilayer networks**, with Giuseppe Ferro (Princeton), Woi Sok Oh (Princeton), and Emma Zajdela (Princeton), work in progress

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## Scientific talks

- 2024 **International School and Conference on Network Science (NetSciX)**, Venice (Italy),  
*Tipping cascades in the Amazon rainforest due to the moisture recycling network*
- 2023 ERSI Critical Transitions Workshop, flashtalk, PIK, Berlin (Germany),  
*Trees, networks and games for large-scale cooperation*
- 2023 Seminar at Theoretical Ecology Tea, EEB, Princeton,  
*Structural aspects of large-scale cooperation*
- 2023 GdR QCD General Assembly, talk for 2022 PhD award, [online](#),  
*Collective phenomena and critical transitions: from plasma to complex socio-ecological systems*
- 2023 **Collective Behaviour Workshop**, [Isaac Newton Institute](#), Cambridge (UK),  
*Early warning signals and the structure and emergence of collaborations with a large-scale experiment*
- 2023 Seminar at Max Planck Institute for Human Development, Berlin (Germany),  
*Early warning signals and the structure of collaborations using a large-scale experiment on Reddit*
- 2023 Seminar at PIK (Potsdam Institute for Climate Impact Research, Germany),  
*Investigating early warning signals with a large-scale collaborative experiment on Reddit*
- 2023 **Collective Intelligence Symposium**, [poster](#), Santa Fe Institute (NM, USA),  
*Surveying early warning signals of transitions using a large-scale collaborative experiment*
- 2021 **CERN-LHC Seminar**, [online \(recording available\)](#),  
*First observation of the  $B_c^+$  meson in PbPb and pp collisions at 5.02 TeV at CMS*
- 2021 Rencontres QGP France, [Étretat](#) (France),  
*First observation of  $B_c^+$  meson production in PbPb and pp collisions with CMS*
- 2021 **9th Edition of Large Hadron Collider Physics Conference (LHCP)**, [online \(recording available\)](#),  
*Exotic quarkonia production in heavy ion collisions:  $X(3872)$  and  $B_c^+$*
- 2021 **19th International Conference on Strangeness in Quark Matter (SQM)**, [online](#),  
*First measurement of the  $B_c^+$  meson nuclear modification factor in PbPb collisions with CMS*  
📖 Published proceedings: [EPJ Web of Conferences 259](#), 12011 (2022)
- 2021 **14th International Workshop on Heavy Quarkonium (QWG)**, [online](#),  
*Quarkonium production studies in nuclear collisions at CMS*
- 2020 Journées CMS-France, [online](#),  $B_c$  production: Towards a first observation in heavy ions collisions
- 2019 Journées de Rencontre des Jeunes Chercheurs, [Moulin-Mer](#) (France),  
*Probing the quark-gluon plasma with the  $B_c$  meson in CMS*  
📖 Published proceedings: C. Armand et al., [JRJC 2019 Book of Proceedings](#), p.88
- 2019 **GdR Intensity Frontier Workshop**, [Sommières](#) (France),  
 $B_c$  meson production in pp and PbPb collisions with CMS, and plenary talk ( $B_c$  session summary)
- 2019 QGP France, [Étretat](#) (France),  
*Modification of  $B_u^+$ ,  $B_s^0$  and  $B_c^+$  mesons in PbPb collisions with the CMS detector*
- 2018 **Int. Conf. on Hard & EM Probes of High-Energy Nuclear Collisions**, [Aix-les-Bains](#) (France),  
 $B_s^0$  and  $B^+$  meson nuclear modification factors in PbPb collisions at 5.02 TeV with CMS detector  
📖 Published proceedings: G. Falmagne for the CMS Collaboration, Proc. of Hard Probes 2018, [PoS 143](#)

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## Teaching experience

- 2023 Private research mentor, *CCIR*
- 2018 – 2021 **Teaching assistant**, *École Polytechnique (Institut Polytechnique de Paris)*  
Optics, Waves, and Radiation (Bachelor 2<sup>nd</sup> year). Advanced Particle Physics (Master 1<sup>st</sup> year).
- 2020 **Research supervisor**, *École Polytechnique*  
Noémie Pilleux: Master 1st year, 2 months. Natalie Blot: Bachelor, 2 months.
- 2014 – 2016 Private tutoring, *LiveMentor*  
Mathematics and physics for students in classes préparatoires.
- nov-dec 2014 Teaching internship in physics in high school, *Lycée Frédéric Mistral, Fresnes (France)*

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## Service

### Conference organization

dec 2023 **Central organizer of the 4th Critical Transitions Workshop**, *Potsdam Institute for Climate Impact Research (PIK)*, Potsdam (Germany)

### Scientific outreach

Nov 2023 **Two pictures exhibited in “Birdiversity”**, *Princeton*  
Communicating the science and challenges of bird diversity through art

oct 2019 Volunteer at **CERN Open Days**, *CMS site*, Geneva  
Outreach on CMS activities, 80,000 visitors in total in a week-end

apr 2019 Animation of the CERN stand at **Geek Touch Convention**, Lyon (France)  
Demonstrating CERN activities to a broad public

### Lab and school life

2023 Member of the **Climate Committee** of the EEB department, *D&I and general climate*  
2019–2022 **Representative** of students and postdocs and sustainable development leader at **LLR Lab Council**  
2014–2015 Member of the **student association** of the ENS Cachan  
In charge of communication and partnerships  
nov 2013 Humanitarian association of ENS Cachan: social microcredit event (*The Rise*, Babyloan)

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## Languages

French, English native/fluent  
German Reading, writing, conversation  
Spanish, Italian Reading, basic conversation

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## Non-professional activities

Rugby 10+ years in clubs and a university team  
Scuba-diving CMAS two star diver  
Running Typical performance: 10km in 40min  
Music Flute (classical formation, university bands), classical singing (multiple choirs)  
Photography [Travel blog](#), pictures exhibited in “Birdiversity” (Princeton) and in “A World Of Stations” (Paris), [instagram](#)