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

Summer 2024 Complex Systems Summer School, Santa Fe Institute (SFI)
4-week interdisciplinary course on complex behavior in mathematical, physical, living, and social systems

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,
Λ_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 Recipient of the **Prize of the Lopez-Loreta Foundation**,
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*

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 $\sqrt{s_{\mathrm{NN}}} = 5.02$ 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*, JHEP10 (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/ψ (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

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 CoCCoN (Cooperation and Collective Cognition Network) seminar, HU Berlin, online,
CORESO/COLNET: COoperation in Large-scale NETworks

2024 **European Geosciences Union (EGU) General Assembly**, Vienna (Austria), online,
Interpretable Early Warning System using Machine Learning in a Large-scale Game-experiment

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

Fall 2024 (planned) **Instructor of the Programming for Biology course**, *EEB department, Princeton University*

2023 Private research mentor, *CCIR*

2018 – 2021 **Teaching assistant**, *École Polytechnique (Institut Polytechnique de Paris)*
Optics, Waves, and Radiation (Bachelor 2$^{\text{nd}}$ year). Advanced Particle Physics (Master 1$^{\text{st}}$ 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)*

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)

Languages

French, English native/fluent

German Reading, writing, conversation

Spanish, Italian Reading, basic conversation

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

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