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,
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 (submitted) In the final-5 shortlist for 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** via the Computer Science track, *'normalien': full 4-year funding*

Teaching experience

2023 Private research mentor, *CCIR*

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

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 $\sqrt{s_{\text{NN}}} = 5.02$ 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

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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

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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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

References

François Arleo
CNRS, Director of research
Laboratoire Subatech
Office H124, IMT Atlantique
Nantes, France
francois.arleo@cern.ch

Raphaël Granier de Cassagnac
CNRS, Director of research
Scientific Director of the Chair in
Science & Video game
Laboratoire Leprince-Ringuet
École polytechnique, 91128 Palaiseau, France
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