

Étienne Fodor

Physics of Active Matter

Assistant Professor, ATTRACT Fellow

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Dept of Physics and Materials Science

University of Luxembourg

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Scientific positions and education

- Since 2020 **Assistant Professor**, Dept of Physics and Materials Science, University of Luxembourg
- 2017–20 **Oppenheimer Research Fellow**, DAMTP, University of Cambridge
- 2016–17 **Postdoctoral Research Associate**, DAMTP, University of Cambridge
- 2013–16 **PhD in Theoretical Physics**, Université Paris Diderot | Summa cum laude
Tracking nonequilibrium in living matter and self-propelled systems
Supervisors | Paolo Visco, Frédéric van Wijland
- 2012–13 **Master in Physics – 2nd year**, École Normale Supérieure de Paris
ICFP - Macroscopic Physics and Complexity
- 2011–12 **Agrégation de Physique**, École Normale Supérieure de Cachan
Competitive training for teaching Physics at College level
- 2010–11 **Master in Physics – 1st year**, École Normale Supérieure de Lyon
- 2009–10 **Bachelor in Physics**, École Normale Supérieure de Lyon

Research, supervision and teaching experience

- Since 2020 **Group supervision**, Dept of Physics and Materials Science, University of Luxembourg
Postdoc | Luke K. Davis
PhD students | Yiwei Zhang, Atul Tanaji Mohite
- 2017–20 **PhD co-supervision**, DAMTP, University of Cambridge
Students | Øyvind L. Borthne, Timothy Ekeh
- 2019–20 **Part III project supervision**, DAMTP, University of Cambridge | 8 months
Part III student | Jacob W. Knight (University of Cambridge) | BP Nevill Mott Prize
- 2019 **Research visit** James Franck Institute, University of Chicago | 2 weeks
Host researcher | Suriyanarayanan Vaikuntanathan
- 2017–18 **Part III project supervision**, DAMTP, University of Cambridge | 8 months
Part III student | Timothy Ekeh (University of Cambridge)
- 2016–17 **Internship supervision**, DAMTP, University of Cambridge | 5 months
Master student | David Martin (École Normale Supérieure de Paris)
- 2015–16 **Research visit**, YITP, Kyoto University | 2 months/year
Host researcher | Hisao Hayakawa
- 2013–16 **Tutorials in medical Physics**, Université Paris Diderot | 64 hours/year
- 2013 **Master internship – 2nd year**, Université Paris Diderot | 16 weeks
Supervisors | Paolo Visco, Frédéric van Wijland
- 2012–13 **Physics tutorials at College level**, Lycée Fénélon, Paris | 23 hours
- 2011 **Master intership – 1st year**, University of Oxford | 12 weeks
Supervisors | Adam S. Wyatt, Ian A. Walmsley
- 2010–11 **Physics tutorials at College level**, Lycée la Martinière Monplaisir, Lyon | 60 hours
- 2010 **Bachelor internship**, Université de Genève | 8 weeks
Supervisors | Jérôme Extermann, Luigi Bonacina, Jean-Pierre Wolf

Scholarships, fellowships and awards

- 2020–25 **ATTRACT Fellowship**, Fonds National de la Recherche, Luxembourg
- 2017–20 **Oppenheimer Research Fellowship**, University of Cambridge
Junior Research Fellowship, St Catharine's College, Cambridge
- 2017 **PhD prize**, Institut des Systèmes Complexes, Paris (3rd prize)

- 2015 **Best talk prize**, SIAM-IMA Annual Conference, University of Cambridge
- 2015 **Best talk prize**, Active Liquids Conference, Lorentz Center, Leiden University
- 2013–16 **Teaching Assistantship**, Université Paris Diderot
- PhD Scholarship**, École Normale Supérieure de Cachan
- 2011–13 **Master Scholarship**, École Normale Supérieure de Cachan

Scientific presentations, organized events, and review service

Invited conference talks

- 2020 **Symmetry, Thermodynamics and Topology in Active Matter**, KITP online
- 2018 **Why Measure Entropy Production?**, Princeton University
- Active Matter Session**, University of California, Berkeley

Contributed conference talks

- 2021 **Workshop on Stochastic Thermodynamics II**, Sante Fe online
- 2020 **Motile Active Matter Conference**, Bonn
- 2019 **StatPhys, Out-of-equilibrium aspects**, Buenos Aires
- International Soft Matter Conference**, Edinburgh
- Statistical Physics of Complex Systems**, Nordita, Stockholm
- 2018 **Nonequilibrium Collective Dynamics**, Technische Universität Berlin
- Fundamental Problems in Active Matter**, Aspen Center for Physics
- 2017 **SIAM-IMA Annual Conference**, University of Cambridge
- Edwards Centre Mini Conference**, University of Cambridge
- Open Statistical Physics**, Milton Keynes
- 2016 **StatPhys, Biological Physics**, Lyon
- Non-Gaussian Workshop**, Kyoto University
- 2015 **Lorentz Center, Active Liquids**, Leiden University
- 2014 **Condensed Matter in Paris**, Université Paris Descartes
- ESPCI, Journées de Physique Statistique**, Paris

Invited seminars

- 2021 **Non-equilibrium Statistical Physics**, Georg-August-Universität Göttingen
- Quantum Science and Technology**, University of Luxembourg
- Centre de Physique Théorique**, Aix-Marseille Université
- 2020 **School of Physics and Astronomy**, University of Edinburgh
- Department of Physics**, University of Bath
- 2019 **ICTP, Quantitative Life Sciences Group**, Trieste
- James Franck Institute, Department of Chemistry**, University of Chicago
- Physics of Living Systems**, Massachusetts Institute of Technology
- Physics and Materials Science Research Unit**, University of Luxembourg
- Institute of Physics, Computational Soft Matter**, University of Amsterdam
- 2018 **LiPhy Laboratory**, Université Grenoble Alpes
- Charles Coulomb Laboratory**, Université de Montpellier
- ESPCI, Gulliver Laboratory**, Paris
- St Catharine's College, Graduate Research Seminars**, Cambridge
- Research Colloquium Series**, California State University, Fullerton
- 2017 **DAMTP, Soft Matter Seminar**, University of Cambridge
- DAMTP, BioLunch Seminar**, University of Cambridge
- 2016 **School of Mathematical Sciences**, Queen Mary University of London
- DAMTP, Soft Matter Seminar**, University of Cambridge
- MSC Laboratory Seminar**, Université Paris Diderot
- Yukawa Institute for Theoretical Physics**, Kyoto University
- 2015 **LiPhy Laboratory**, Université Grenoble Alpes

Physics-Biology Interface Seminar, Université Paris Sud
 DAMTP, Soft Matter Seminar, University of Cambridge
 Yukawa Institute for Theoretical Physics, Kyoto University

2014 MSC Laboratory, Physique du vivant, Université Paris Diderot
 MSC Laboratory, Theory Group, Université Paris Diderot

Organized events

2018–20 Statistical Physics and Soft Matter Seminars, DAMTP, University of Cambridge
 2019 Colloids as a Toolbox for Statistical Mechanics, University of Cambridge
 2018 World Congress of Biomechanics, Non-equilibrium Biomechanics session, Dublin

Review service EPL, Nat Phys, New J Phys, Phys Rev (E, Lett, Res, X), PNAS, J Stat Mech

Scientific production

- [26] **Irreversibility and biased ensembles in active matter: Insights from stochastic thermodynamics**
 ÉF, RL Jack, and ME Cates, arXiv:2104.
- [26] **Active engines: Thermodynamics moves forward**
 ÉF and ME Cates, arXiv:2101.12646
- [25] **Inferring dissipation from static structure in active matter**
 L Tociu, G Rassolov, ÉF, and S Vaikuntanathan, arXiv:2012.10441
- [24] **Thermodynamics of active field theories: Energetic cost of coupling to reservoirs**
 T Markovich, ÉF, E Tjhung, and ME Cates, arXiv:2008.06735
- [23] **Statistical mechanics of active Ornstein-Uhlenbeck particles**
 D Martin, J O’Byrne, ME Cates, ÉF, C Nardini, J Tailleur, and F van Wijland,
 Phys Rev E **103**, 032607 (2021)
- [22] **Collective motion in large deviations of active particles**
 Y-E Keta, ÉF, F van Wijland, ME Cates, and RL Jack, Phys Rev E **103**, 022603 (2021)
- [21] **Time-reversal symmetry violations and entropy production in field theories of polar active matter**
 ØL Borthne, ÉF, and ME Cates, New J Phys **22**, 123012 (2020)
- [20] **Thermodynamic cycles with active matter**
 T Ekeh, ME Cates, and ÉF, Phys Rev E **102**, 010101(R) (2020)
- [19] **Dissipation controls transport and phase transitions in active fluids: Mobility, diffusion and biased ensembles**
 ÉF, T Nemoto, and S Vaikuntanathan, New J Phys **22**, 013052 (2020)
- [18] **Autonomous engines driven by active matter: Energetics and design principles**
 P Pietzonka, ÉF, C Lohrmann, ME Cates, and U Seifert, Phys Rev X **9**, 041032 (2019)
- [17] **How dissipation constrains fluctuations in nonequilibrium liquids: Diffusion, structure and biased interactions**
 L Tociu, ÉF, T Nemoto, and S Vaikuntanathan, Phys Rev X **9**, 041026 (2019)
- [16] **Driven probe under harmonic confinement in a colloidal bath**
 V Démery and ÉF, J Stat Mech **2019**, 033202 (2019)
- [15] **Optimizing active work: Dynamical phase transitions, collective motion and jamming**
 T Nemoto, ÉF, ME Cates, RL Jack, and J Tailleur, Phys Rev E **99**, 022605 (2019)
- [14] **Non-Gaussian noise without memory in active matter**
 ÉF, H Hayakawa, J Tailleur, and F van Wijland, Phys Rev E **98**, 062610 (2018)
- [13] **The statistical physics of active matter: From self-catalytic colloids to living cells**
 ÉF and M Cristina Marchetti, Physica A **504**, 106 (2018)

- [12] **Extracting maximum power from active colloidal heat engines**
D Martin, C Nardini, ME Cates, and ÉF, EPL **121**, 60005 (2018)
Editor's choice | Highlights of 2018
- [11] **Active mechanics reveal molecular-scale force kinetics in living oocytes**
WW Ahmed,* ÉF,* M Almonacid,* M Bussonnier, NS Gov, M-H Verlhac, P Visco, F van Wijland, and T Betz, Biophys J **114**, 1667 (2018)
- [10] **Spatial fluctuations at vertices of epithelial layers: Quantification of regulation by Rho pathway**
ÉF,* V Mehandia,* J Comelles, R Thiagarajan, NS Gov, P Visco, F van Wijland, D Riveline
Biophys J **114**, 939 (2018)
- [9] **Entropy production in field theories without time-reversal symmetry: Quantifying the non-equilibrium character of active matter**
C Nardini, ÉF, E Tjhung, F van Wijland, J Tailleur, and ME Cates, Phys Rev X **7**, 021007 (2017)
- [8] **Nonequilibrium dissipation in living oocytes**
ÉF,* WW Ahmed,* M Almonacid,* M Bussonnier, NS Gov, M-H Verlhac, T Betz, P Visco, and F van Wijland, EPL **116**, 30008 (2016)
- [7] **How far from equilibrium is active matter?**
ÉF, C Nardini, ME Cates, J Tailleur, P Visco, and F van Wijland, Phys Rev Lett **117**, 038103 (2016)
Editor's suggestion | Physics (2016)
- [6] **Active cage model of glassy dynamics**
ÉF, H Hayakawa, P Visco, and F van Wijland, Phys Rev E **94**, 012610 (2016)
- [5] **Modeling the dynamics of a tracer particle in an elastic active gel**
E Ben Isaac, ÉF, P Visco, F van Wijland, and NS Gov, Phys Rev E **92**, 012716 (2015)
- [4] **Active cell mechanics: Measurement and theory,**
WW Ahmed, ÉF, and T Betz, Biochimica et Biophysica Acta - Mol Cell Res **1853**, 3083 (2015)
- [3] **Activity-driven fluctuations in living cells**
ÉF,* M Guo,* NS Gov, P Visco, DA Weitz, and F van Wijland, EPL **110**, 48005 (2015)
Editor's choice | Europhysics News 46/5 (2015)
- [2] **Generalized Langevin equation with hydrodynamic backflow: Equilibrium properties**
ÉF, DS Grebenkov, P Visco, and F van Wijland, Physica A **422**, 107 (2015)
- [1] **Energetics of active fluctuations in living cells**
ÉF, K Kanazawa, H Hayakawa, P Visco, and F van Wijland, Phys Rev E **90**, 042724 (2014)

* Equal contribution of these authors to this work