

Paul BACONNIER

Postdoctoral researcher

Education

- 2019-2023 **PhD Thesis**, *Gulliver*, ESPCI, Paris
Title: *Active elastic solids: collective motion, collective actuation & polarization*. Funded by École Doctorale Physique en Île-de-France (ED 564), in collaboration with Corentin Coulais (University of Amsterdam). Advisor: Olivier Dauchot.
- 2018-2019 **MSc in Physics**, *École Normale Supérieure*, Paris
ICFP Soft matter track. High-level fundamental physics courses on soft matter theory, equilibrium and out-of-equilibrium statistical physics, non-linear physics, fluids and solids mechanics.
○ Master International Center for Fundamental Physics
- 2015-2019 **Engineering degree**, *ESPCI*, Paris
École Supérieure de Physique et de Chimie Industrielles de la ville de Paris. Graduate engineering school of Physics, Chemistry and Biology.
○ Master-level Diplôme d'ingénieur ESPCI Paris
○ Advanced Master of Science and Technology
- 2013-2015 **Prep Classes**, *Lycée Fénelon*, Paris
BSc equivalent program in Physics/Mathematics/Chemistry.

Research experience

Keywords: Statistical and nonlinear physics, mechanics, active matter, metamaterials, memory.

- 2023-2026 **Postdoc**, *AMOLF*, Amsterdam/Leiden
Memory effects and aging in driven amorphous materials. Advisor: Martin van Hecke.
- 2019-2023 **PhD Thesis**, *Gulliver*, ESPCI, Paris
Active elastic solids. Advisor: Olivier Dauchot.
- 2015-2017 **Team scientific project (PSE)**, ESPCI, Paris
Stroboscopy and fluorescence lifetime with a fan. Advisors: Antonin Eddi, Emmanuel Fort, Suzie Protière.
- 2016-2019 **Internships**
Gulliver laboratory with O. Dauchot (4 months, ESPCI, Paris, France), Van der Waals-Zeeman Instituut - Institute of Physics with D. Bonn (4 months, University of Amsterdam, The Netherlands), EDF R&D with S. Mimouni (6 months, Chatou, France).

Publications

h-index = 5, citations = 233, most cited = 131

- [11] P. **Baconnier**, M. Aksil, V. Démery, and O. Dauchot, "Reentrant transition to collective actuation in active solids with a polarizing field," *arXiv preprint arXiv:2504.08572*, 2025.
- [10] P. **Baconnier**, O. Dauchot, V. Démery, *et al.*, "Self-aligning polar active matter," *Reviews of Modern Physics*, vol. 97, no. 1, p. 015 007, 2025.
- [9] P. **Baconnier**, V. Démery, and O. Dauchot, "Collective actuation in active solids in the presence of a polarizing field: A review of the dynamical regimes," *arXiv preprint arXiv:2504.08599*, 2025.
- [8] D. Shohat*, P. **Baconnier***, I. Procaccia, M. van Hecke, and Y. Lahini, "Aging of amorphous materials under cyclic strain," *arXiv preprint arXiv:2506.08779*, 2025.
- [7] P. **Baconnier**, M. H. Teunisse, and M. van Hecke, "Dynamic self-loops in networks of passive and active binary elements," *arXiv preprint arxiv:2412.12658*, 2024.

- [6] P. **Baconnier**, D. Vincent, and O. Dauchot, "Noise-Induced Collective Actuation in Active Solids," *Physical Review E*, vol. 109, no. 2, p. 024 606, 2024.
- [5] C. Hernández-López, P. **Baconnier**, C. Coulais, O. Dauchot, and G. Düring, "Model of active solids: Rigid body motion and shape-changing mechanisms," *Physical Review Letters*, vol. 132, no. 23, p. 238 303, 2024.
- [4] P. **Baconnier**, D. Shohat, and O. Dauchot, "Discontinuous tension-controlled transition between collective actuations in active solids," *Physical Review Letters*, vol. 130, no. 2, p. 028 201, 2023.
- [3] P. **Baconnier**, D. Shohat, C. Hernández-López, *et al.*, "Selective and collective actuation in active solids," *Nature Physics*, vol. 18, no. 10, pp. 1234–1239, 2022.
- [2] S. Mimouni, P. **Baconnier**, and G. Davy, "Overview of mitigation models dedicated to severe accidents and consequences on flow rate through containment concrete structures," *Nuclear Science and Engineering*, 2021.
- [1] A. Eddi, P. **Baconnier**, M. Blons, S. Pautrel, S. Protière, and E. Fort, "Experimental teaching - a tribute to Yves Couder by the example: Stroboscopy and fluorescence lifetime with a fan," *Comptes Rendus. Mécanique*, vol. 348, no. 6-7, pp. 439–445, 2020.

Review service

Soft Matter, Physical Review Letters, Physical Review X, Physical Review E, Traffic and Granular Flow Conference (TGF2024).

Conferences

International conferences

- Jun. 2025 **Functionality Through Nonlinearity**, Poster, London, United Kingdom
- May. 2025 **Mechanical Computing Meeting**, Poster, AMOLF, Netherlands
- May. 2025 **Infomatter Symposium: Fundamentals of Computing in Matter**, Poster, AMOLF, Netherlands
- Feb. 2025 **École de physique des Houches**, *Contributed talk*, Les Houches, France
- Mar. 2024 **APS March Meeting 2024**, *Long contributed talk*, Minneapolis, USA
- Oct. 2023 **Rising Stars in Soft and Biological Matter symposium**, *Contributed talk*, virtual
- Mar. 2023 **APS March Meeting 2023**, *Contributed talk*, Las Vegas, USA
- Mar. 2022 **APS March Meeting 2022**, *Contributed talk*, Chicago, USA
- Mar. 2021 **APS March Meeting 2021**, *Contributed talk*, Virtual
- Jul. 2021 **Cargèse summer school**, *Poster*, Cargèse, France

National conferences

- Oct. 2024 **Journées de la Matière Condensée 2024**, *Contributed talk*, Marseille, France
- May. 2023 **33rd Dutch Soft Matter Meeting**, *Invited talk*, Amsterdam, The Netherlands
- Jan. 2023 **Journées de la Physique Statistique**, *Short talk*, Paris, France
- Mar. 2022 **25^e Rencontre du non-linéaire**, *Contributed talk*, Paris, France
- Jan. 2022 **Les Journée de la Physique Statistique**, *Short talk*, Paris, France
- Jan. 2020 **Les Journée de la Physique Statistique**, *Short talk*, Paris, France
- Jun. 2018 **24th Dutch Soft Matter Meeting**, *Soundbite*, Leiden, The Netherlands

Workshops

- May. 2025 **Non-Reciprocity Across Scales**, *Contributed talk*, University of Amsterdam, Netherlands
- May. 2023 **CECAM - Pathways, Memory, and Emergent Computation in Nonequilibrium Systems**, *Contributed talk*, Sede Boquer, Israël
- Jul. 2022 **PSL Soft and Living Matter days**, *Contributed talk*, Paris, France
- Apr. 2020 **Autonomous behavior in robotic and living matter**, Virtual
- Jun. 2021 **GDR MePhy - From Computational Fabrication to Material Design**, *Contributed talk*, Virtual

Lab seminars

Talks, Gulliver (Paris, France), AMOLF (Amsterdam, The Netherlands), LOMA (Bordeaux, France), Liphy (Grenoble, France), iLM (Lyon, France), LPENS (Lyon, France), IRPHE/IUSTI (Marseille, France), MSC (Paris, France)

Outreach

- Oct. 2025 **AMOLF open day**, *Stand with educational scientific experiments*, AMOLF, Amsterdam
- Oct. 2023 **Leiden family day**, *Stand with educational scientific experiments*, Leiden university, Leiden
- Jun. 2022 **Outreach video**, *Selective and Collective Actuation in Active Solids*, ESPCI, Paris
- Nov. 2021 **Live experiments**, *Conférence expérimentale*, ESPCI, Paris
- Jan. 2020 **Chroniques Doctorales**, *PC Focus*, ESPCI, Paris
Three Minute Thesis ESPCI outreach contest.
- Oct. 2020 **Atelier Fresque du climat**, *Fête de la science*, ESPCI, Paris
Climate sciences popularization for kids.

Teaching and supervision

Teaching

- 2020-2022 **ESPCI**, BSc (2 x 2h)
Tutorials of Linear systems: Analytical tools for linear systems analysis.
- 2019-2021 **ESPCI**, BSc (2 x 60h)
Practical work of Thermodynamics: molecular dynamics, python, statistical physics.
- 2021-2022 **ESPCI**, BSc (1 x 72h)
Practical work of Mechanics: machining, functional dimensioning.
- 2018-2020 **Private lessons in physics for bachelor students**, 100h

Supervision

- 2019-2022 **ESPCI**
Co-supervision of M. Aksil, M. Vinteler, A. Marché, H. Fabre, J. Craquelin and R. Troubat (BSc interns, 1-2 months), D. Shohat (MSc intern, 6 months).
- 2023-2025 **AMOLF**
Co-supervision of T. Labrosse and A. Hoekstra (MSc interns, 6 months).

Rewards

- Aug. 2025 **Claudine Hermann prize 2023**, *Société Française de Physique (SFP)*
Awarded to young researchers for outstanding PhD work in condensed matter physics.
- Mar. 2022 **GNSP PhD speaker award finalist**, *APS March Meeting*
Selected in the final three candidates who gave a talk at the award session, 500€.
- Jan. 2021 **PC Focus Scientific photo contest**
Third and public prizes for my photo *"Excitations sonores dans un hexagone actif élastique"*.
- Jan. 2020 **PC Focus Chroniques Doctorales**
First prize of science popularization, 1500€.
- Jul. 2019 **Doctoral scholarship**
From the doctoral school EDPIF (Physics in Île-de-France), 100000€
- Jan. 2019 **Excellence scholarship ESPCI Alumni**
Given to students for the excellence of their academic track, 5000€.

Academic & community service

- 2023 **Lab retreat organization**, AMOLF, Amsterdam
Scientific/educational program and overall organization for a 1-week retreat.
- 2020-2022 **Student representative**, *Gulliver*, ESPCI, Paris
Representative of the non permanents members at the lab council.

Seminars

2020-2022 **Organizer**, *Gulliver student seminar*, ESPCI, Paris

Weekly seminar for Gulliver graduate students and postdocs to develop presentation skills.

Membership

SFP, APS (GSNP, DSOFT), ESPCI Alumni

Interests

Combat sports Judo, ju-jitsu, muay thai, kickboxing

Biking Maintenance, travelling and commuting around

Academic references

Prof. Olivier Dauchot

Laboratoire Gulliver
UMR 7083, ESPCI Paris
10 Rue Vauquelin
75005 Paris, France
olivier.dauchot@espci.fr

Prof. Gustavo Düring

Instituto de Física
Pontificia Universidad Católica de Chile
Av. Libertador Bernardo O'Higgins 340
8320165 Santiago, Chile
gduring@fis.puc.cl

Dr. Vincent Démery

Laboratoire de Physique
ENS Lyon
15 parvis René Descartes
69342 Lyon, France
vincent.demery@ens-lyon.fr

Prof. Silke Henkes

LION - Theoretical Physics
Leiden University
Niels Bohrweg 2
2333 CA Leiden, Netherlands
shenkes@lorentz.leidenuniv.nl

Prof. Itamar Procaccia

Weizmann Institute of Science
Perlman Institute of Chemical Sciences
Herzl St 234
Rehovot 76100, Israel
itamar.procaccia@weizmann.ac.il

Prof. Martin van Hecke

LION - Biological & Soft Matter
Leiden University
Niels Bohrweg 2
2333 CA Leiden, Netherlands
mvhecke@physics.leidenuniv.nl

Dr. Corentin Coulais

Soft Matter Group
Amsterdam University
Science Park 904
1098 XH Amsterdam, Netherlands
C.J.M.Coulais@uva.nl

Prof. Yoav Lahini

School of Physics and Astronomy
Tel Aviv University
Chaim Levanon St 55
6997801 Tel Aviv-Yafo, Israel
lahini@tauex.tau.ac.il

Dr. Bas Overvelde

Soft Robotic Matter
AMOLF
Science Park 104
1098 XG Amsterdam, Netherlands
B.Overvelde@amolf.nl