

# 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 = 6, citations = 308, most cited = 158

- [12] P. **Baconnier**, M. Aksil, V. Démery, and O. Dauchot, "Reentrant transition to collective actuation in active solids with a polarizing field", *Physical Review Letters* **135**, 188302 (2025).
- [11] P. **Baconnier**, O. Dauchot, V. Démery, G. Düring, S. Henkes, C. Huepe, and A. Shee, "Self-aligning polar active matter", *Reviews of Modern Physics* **97**, 015007 (2025).
- [10] P. **Baconnier**, V. Démery, and O. Dauchot, "Collective actuation in active solids in the presence of a polarizing field: a systematic analysis of the dynamical regimes", *Physical Review E* **112**, 045505 (2025).
- [9] P. **Baconnier**, M. H. Teunisse, and M. van Hecke, "Dynamic self-loops in networks of passive and active binary elements", *Physical Review Letters* **135**, 207402 (2025).

- [8] S. Mohanty\*, P. **Baconnier**\*, H. A. H. Schomaker, A. Comoretto, M. van Hecke, and J. T. B. Overvelde, "Multimodal motion and behavior switching of multistable ciliary walkers", arXiv preprint:2512.09840 (2025).
- [7] D. Shohat\*, P. **Baconnier**\*, I. Procaccia, M. van Hecke, and Y. Lahini, "Aging of amorphous materials under cyclic strain", arXiv preprint arXiv:2506.08779 (accepted in PNAS) (2025).
- [6] P. **Baconnier**, D. Vincent, and O. Dauchot, "Noise-Induced Collective Actuation in Active Solids", *Physical Review E* **109**, 024606 (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* **132**, 238303 (2024).
- [4] P. **Baconnier**, D. Shohat, and O. Dauchot, "Discontinuous tension-controlled transition between collective actuations in active solids", *Physical Review Letters* **130**, 028201 (2023).
- [3] P. **Baconnier**, D. Shohat, C. Hernández-López, C. Coulais, V. Démery, G. Düring, and O. Dauchot, "Selective and collective actuation in active solids", *Nature Physics* **18**, 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* **348**, 439–445 (2020).

## Review service

Physical Review Letters, Physical Review X, Physical Review E, Soft Matter, 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 **33<sup>rd</sup> Dutch Soft Matter Meeting**, *Invited talk*, Amsterdam, The Netherlands
- Jan. 2023 **Journées de la Physique Statistique**, *Short talk*, Paris, France
- Mar. 2022 **25<sup>e</sup> 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 **24<sup>th</sup> Dutch Soft Matter Meeting**, *Soundbite*, Leiden, The Netherlands

### Workshops

- Dec. 2025 **Slender and Active Mechanics of Emerging Materials and Systems**, *Contributed talk*, Edinburgh, United Kingdom

- 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), LPENS (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, 1-3 months), D. Shohat (MSc intern, 6 months).
- 2023-2025 **AMOLF**  
Co-supervision of T. Labrosse, A. Hoekstra, E. Terme (MSc interns, 4-6 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€.

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## 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 permanent members at the lab council.

### Conferences

Apr. 2026 **"Multistable Active Matter" meeting organization**, *AMOLF*, Amsterdam  
Main organizer of a two-days meeting with around 60 participants (budget = 12000€).

### 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, DSOF), ESPCI Alumni

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## Interests

Combat sports Judo, ju-jitsu, muay thai, kickboxing  
Biking Maintenance, travelling and commuting around

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## Academic references

### Prof. Olivier Dauchot

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### Prof. Gustavo Düring

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### Prof. Silke Henkes

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### Prof. Martin van Hecke

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### Dr. Corentin Coulais

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### Dr. Bas Overvelde

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