

# 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 multistable systems. 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 = 4, citations = 115, most cited = 87

- [10] P. **Bacconnier**, D. Vincent, M. Aksil, and O. Dauchot, "Collective actuation in active solids with an external polarizing field," *Manuscript in preparation (work presented at the APS March Meeting 2023 - A07.7)*, 2025.
- [9] D. Shohat, P. **Bacconnier**, I. Procaccia, M. van Hecke, and Y. Lahini, "Aging of amorphous materials under cyclic strain," *Manuscript in preparation*, 2025.
- [8] P. **Bacconnier**, O. Dauchot, V. Démery, *et al.*, "Self-aligning polar active matter," *accepted at Reviews of Modern Physics*, arXiv:2403.10151, 2024.
- [7] P. **Bacconnier**, M. H. Teunisse, and M. van Hecke, "Proliferation and prohibition of self-loops in ensembles of interacting binary elements," *in review at Physical Review letters*, arxiv:2412.12658, 2024.
- [6] P. **Bacconnier**, 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.

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## Review service

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

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## Conferences

### International conferences

- 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>th</sup> Dutch Soft Matter Meeting**, *Invited talk*, Amsterdam, The Netherlands
- Jan. 2023 **Les Journée de la Physique Statistique**, *Short talk*, Paris, France
- Mar. 2022 **25<sup>th</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

- May. 2023 **CECAM - Pathways, Memory, and Emergent Computation in Nonequilibrium Systems**, *Contributed talk*, Sede Boqer, 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**, LOMA (Bordeaux, France), AMOLF (Amsterdam, The Netherlands), Liphy (Grenoble, France), iLM (Lyon, France), LPENS (Lyon, France), IRPHE/IUSTI (Marseille, France), MSC (Paris, France)

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## Outreach

- 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.

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## Teaching and supervision

### Teaching

- 2020-2022 **ESPCI**, BSc (2 × 2h)  
Tutorials of Linear systems: Analytical tools for linear systems analysis.  
2020-2021 **ESPCI**, BSc (2 × 60h)  
Practical work of Thermodynamics: molecular dynamics, python, statistical physics.  
2021-2022 **ESPCI**, BSc (1 × 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 (BSc intern, 6 months).

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## Rewards

- Mar. 2022 **GNSP PhD speaker award finalist**, *APS March Meeting*  
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€.  
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.  

### Seminars

2020-2022 **Organizer**, *Gulliver student seminar*, ESPCI, Paris  
Weekly seminar for Gulliver graduate students and postdocs to develop presentation skills.  

### Membership

SFP, APS (GNSP, DSOFT), 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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**Dr. Vincent Démery**

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**Prof. Martin van Hecke**

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