

Émilien Dilly

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Post doc : Laboratoire interdisciplinaire de Physique, université Grenoble Alpes

EDUCATION

Université Paris Cité

Paris, 2021–2024

PhD Student

Laboratoire Matière et Système Complexe

Thesis : Helices, Perversions and Tendrils: from Plant-Inspired Rod Mechanics to Curvature Generation in Tendril Bearing Plants

École Normale Supérieure

Paris, 2016–2021

Bachelor in Physics

Masters in Physics : International Center of Fundamental Physics Master ; Soft Matter and Biophysics

EXPERIENCE

Institut Pierre Gille De Gennes

Paris, Jun-Aug 2018

Intern

- Modelization and experiments on water droplet breakup bathed in oil in micro channels under heat.
- Reference : Marie-Caroline Julien
- Keywords: *image analysis, capilarity, surface tension, fluid mechanics*

University of North Carolina

Chapel Hill USA, Feb.-Juil. 2018

Graduate Intern

- Guided shear waves and solitons in nonlinear viscoelastic materials such as the spine
- Reference : Gianmarco Pinton
- Keywords: *non linear materials, viscoelasticity, spectral numerical methods, finite elements, solitons*

Institut Curie

Paris, Feb.-Juil. 2018

Graduate Intern

- Modelization of a Hopf bifurcation in the inner ear of mammals rationalizing spontaneous oscillations of hair cells. Linear stability analysis of a non linear dynamical system.
- Reference : Thomas Risler
- Keywords: *biomechanics, hair cells, mechanotransduction, linear stability analysis, mathe-matica.*

Université de Paris MSC

Paris, Sept 20- Jan 21

Graduate Intern

- Electric stimulation of chick's embryos' guts, and its effect on development.
- Reference : Nicolas Chevalier
- Key words: *morphogenesis, smooth muscle, electrophysiology*

Université de Paris MSC

Paris, Sept 20- Jan 21

PhD student

- Helices, Perversions and Tendrils: from Plant-Inspired Rod Mechanics to Curvature Generation in Tendril Bearing Plants
- Reference : Drazen Zanchi et Julien Derr
- Key words: *rod mechanics, helical rods, perversions, plant morphogenesis, tendrils, python, abaqus, shooting methods, non linear physics, bifurcation analysis, kink-antikink structures and interaction*

École Normale Supérieure de Lyon / Laboratoire Reproduction et Développement des plantes

Lyon, Oct. 24 - Dec. 24

Post Doctoral Reasearcher

- Perversion stability in helical rods and critical phenomena in helical rods. Tendril curvature generation mechanics and dynamics.
- Reference : Julien Derr and Drazen Zanchi
- Key words: *rod mechanics, helical rods, perversions, plant morphogenesis, tendrils, python, abaqus, shooting methods, non linear physics, bifurcation analysis, kink-antikink structures and interaction*

Université Grenoble Alpes / LIPHY

Grenoble, Jan. 25 - Today

Post Doctoral Reasearcher

- Instability and non linear mechanical behaviour of beams with T-shape sections.
- Mechanical instabilities of ribbon with geodesic curvature.
- Fluid structure interaction in inflatable structures.
- Reference : Emmanuel Siéfert
- Key words: *mechanics, instability, non linear, boundary layer, non linear analysis, ribbon*

PUBLICATIONS AND SCIENTIFIC PRODUCTION

- **Dilly, É.**, Neukirch, S., Derr, J., Zanchi, D. (2024). Critical phenomena in helical rods with perversion. DOI : hal-04838602
- Github Package for perversion shape computation in helical rods. PyPerv
- **Dilly, É.**, Neukirch, S., Derr, J., Zanchi, D. (2023). Traveling perversion as constant torque actuator. Physical Review Letters, 131(17), 177201. Editor Suggestion, DOI : 10.1103
- Gianoli, F., Hogan, B., **Dilly É.**, Risler, T., Kozlov, A. S. (2022). Fast adaptation of cooperative channels engenders Hopf bifurcations in auditory hair cells. Biophysical Journal, 121(6), 897-909. DOI : 10.1016

CONTRIBUTIONS

- APS March Meeting 2018: Kerdraon, M., **Dilly, E.**, Descroix, S., and Jullien, M.-C., *Droplet breakup with in situ marangoni-induced elongational flow*, vol. 2018, 2018.
- GdR PhyP 2021, Carry le Rouet: **Dilly, E.**, J. Derr, S. Neukirch, D. Zanchi, *Biomechanics of Tendrils*.
- International Plant Biomechanics Day 2021: *Biomechanics of Tendrils*.

- Lab Seminar 2021 ENS Lyon: *Biomechanics of Tendrils*.
- Ein Gedi Workshop 2023 / Israel: **Dilly, E.**, T. Lacombe, T. Simonneau, S. Neukirch, L. Doualla, J. Derr, D. Zanchi, *Biomechanics of Tendrils: Force and Curvature Generation in Climbing Plants*.
- Lab Seminar MSC 2023: *Tendrill writhing: a biomechanical description*.
- Nonlinear Physics Meeting 2023 (RNL) Paris: *Perversions in helices: phase transition and soliton crystallization*. **Dilly, E.**, J. Derr, S. Neukirch, D. Zanchi. *Poster*.
- GdR PhyP 2024, Carry le Rouet: **Dilly, E.**, J. Derr, S. Neukirch, D. Zanchi, *Biomechanics of Tendrils*.
- 27th Nonlinear Physics Meeting (RNL) 2024 Paris : March 18-20, 2024, Université Paris Cité, *Writhing instability and curvature generation in tendril-bearing plants*.
- Experimental physics and modelling Seminar, ENS Lyon : 12th November 2024 *Perversions in Helical Rods : From Plant-Inspired Rod Mechanics to Curvature Generation in Tendrils*.
- ELAN Seminar, INRIA Grenoble 2024: 14th November 2024 *Perversions in Helical Rods : From Plant-Inspired Rod Mechanics to Curvature Generation in Tendrils*.
- LIPHY Lab seminar, Université Grenoble Alpes, : 18th November 2024 *Perversions in Helical Rods : From Plant-Inspired Rod Mechanics to Curvature Generation in Tendrils*.
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RESEARCH GRANTS AND SCHOLARSHIPS

- 2021 : EDPIF, doctoral school (Paris) PhD 3-year full scholarship.
- 2016 : École normale supérieure (Paris) 4-year full scholarship

RESEARCH TRAINING

- 2024 : 10th CISM-AIMETA Advanced School; Mechanics of Active and Biological Structures: from Fundamentals to Recent Results; Professor Antonio De Simone and Pedro Miguel Reis
- Université Paris Cité : Science ouverte : webinaire introductif
- Université Paris Cité : Science ouverte. Gérer ses données de la recherche : quel intérêt pour un jeune chercheur ?
- Comprendre l'écosystème de la recherche en France - Organisation de la recherche à Université Paris Cité
- Impacts Environnementaux du numérique INRIA
- Intelligence artificielle pour et par les enseignants (Inria)
- Machine learning in Python with scikit-learn (Inria)
- Intégrité scientifique dans les métiers de la recherche de l'Université de Bordeaux

PROGRAMMING SKILLS

Programming Languages Python Packages

Software & Tools

Python, Bash, MATLAB, Mathematica
Pandas, Matplotlib, Numpy, Scipy, Opencv
Jupyter
HTML, LaTeX, Excel, Mathematica, ABAQUS

TEACHING EXPERIENCE

- Undergraduate, second year, Thermodynamic Tutorial
- Graduate, Non linear Physics Tutorial
- Undergraduate, third year, Laboratory teaching Fluid Mechanics