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CRCN
Laboratoire de Physique, ENS Lyon
Lyon, France

Since 2012, I have been a CNRS permanent researcher, developing experimental methods to investigate bacterial adhesion and biofilm formation, working at the interface between physics and microbiology

Research Experience

Jan. 2019: CNRS researcher, **Laboratoire de Physique, ENS de Lyon**, France.

2012-2018: CNRS researcher, **Laboratoire Interdisciplinaire de Physique**, Grenoble, France.

2010-12: Postdoctoral Fellow, **Harvard University**, USA.

Department of Molecular and Cellular biology, Richard Losick group.

Studying the impact of chemical and mechanical signals on *B. subtilis* biofilm development.

2007-12: Postdoctoral Fellow, **Harvard University**, USA.

Department of Engineering and Applied Science, Howard Stone group.

Using microfluidics to study the effect of shear stress on bacterial adhesion and biofilm formation.

Education

2006 : PhD in Physics, Université Louis Pasteur, Strasbourg, France

“Fluctuation and destabilization of a supported lipid bilayer”, under the supervision of Thierry Charitat.

2003 : Master’s degree, “Condensed matter physics”, Université Louis Pasteur, Strasbourg, France

2002 : Engineering degree, Ecole Centrale de Lyon, France

Teaching and Mentoring

Since 2019 – LPENSL, Lyon, France

- Kennedy Chagua Encarnacion, **PhD student**, co-advised (90%) with Martin Castelnovo, LPENSL, 2019-2022 (defense scheduled: October 2022).
- Jules Edwards, M2 Microfluidics, Institut Pierre-Gilles de Gennes, Paris, Feb-Aug 2022.
- Anne Solivellas, ESTBB Lyon 2nd year, lab technician, May-Aug 2022
- Elise-Noelle Chêne, ESTBB Lyon 2nd year, lab technician, May-Aug 2021
- David Delphin, M2 Imagerie, Lyon 1, Feb-Juil 2020.

2012 -2018 LIPhy, Grenoble, France

- Sofia Gomes, M1 Nanotechnology, Jan-Jun 2019
- Abdoul-Razak Tidjani, M2 Immunology-Microbiology-Infection, Jan-June 2016 (co-advised with Ina Attree, CEA Grenoble)
- Marie-Cecilia Duvernoy, **PhD student**, Université Joseph Fourier (co-advised with Catherine Quilliet, LIPhy, and Nicolas Desprat, LPS, ENS Paris), 2012-2015.
- Frederic Jean, M2 BIOMED, INP Grenoble, Feb-July 2015 (co-advised with Delphine Débarre, LIPhy)
- Sara Melziade, M2 Environmental Engineering, Politecnico di Milano, Italy, Nov 2014-April 2015.
- Anuraag Boddupalli, M2 Nanobiotechnologies, Erasmus Mundus program, Feb-July 2014.
- Hugo Biard, M1 Physics, mars-june 2013.
- Christophe Goethals, L3 Biochemistry, may-june 2012.

2007-2012 - Harvard University, Cambridge, MA, USA.

- Yi Shen, Masters student, Wageningen University, Holland.
- Angela Jimenez, Bachelor student, City University of New York, USA.

2003-2006 - University Louis Pasteur, Strasbourg, France.

Teaching assistant, Physics department, University Louis Pasteur, Strasbourg, France
(~300 hours teaching over 3 years)

Scientific organization

Since 2021: member of the topical Team “Biofilms in Space”, European Space agency

Since 2020: Head of the microfluidics working group within the EquipEx “Spatial-Cell-ID” (creation of a platform in Lyon for *in situ* spatial transcriptomics)

2017 Co-organizer “Mechanobiology and Physics of Life”, Grenoble, Jan. 30th.

2016 Co-organizer “Nano and microenvironments for cell biology” workshop, Grenoble, Oct. 20th.

2013 Invited co-editor for the New Journal of Physics focus issue on “The Physics of Biofilms”.

2010 Co-organizer of the invited session “Biofilms and Multicellularity”, American Physical Society March meeting 2010, Portland, OR, USA.

Main Grants

2020-2023: *Projet émergent* ENS Lyon: Development of a microfluidic platform for spatial transcriptomics (23k€, main coordinator)

2020: MITI CNRS Grant 80Prime: Bacteria meet surfaces: how the micromechanical environment impacts bacterial virulence (PhD grant +60k€ main coordinator)

2017: Défi Mécanobiologie, CNRS: Role of lectines in adhesion and virulence of *Pseudomonas aeruginosa* (12 k€ main coordinator)

2015: Explorative Grant from IXXI (Institut des systemes complexes): Effect of shear stress on circadian oscillators (5 k€, main coordinator)

2013-2016: ANR “TRANSMIG” Transendothelial Migration of cancer cells (450 k€, Coordinator: Claude Verdier)

2012: SMINGUE foundation, Grenoble (35 k€, main coordinator)

2012: CNRS startup grant (20 k€)

Publications

1. Gomez S, Bureau L, John K, Chêne E-N, Débarre D, **Lecuyer S**, Substrate stiffness impacts early biofilm formation by modulating *Pseudomonas aeruginosa* twitching motility, *eLife* 12:e81112, <https://doi.org/10.7554/eLife.81112>, 2023.

2. Marra D, Karapantsios T, Caserta S, Secchi E, Holynska M, Labarthe S, Polizzi B, Ortega S, Kostoglou M, Lasseur C, Karapanagiotis I, **Lecuyer S**, Bridier A, Noirot-Gros M-F, Briandet R, Migration of surface-associated microbial communities in spaceflight habitats, *Biofilm* 5 (100109) <https://doi.org/10.1016/j.biofilm.2023.100109> (2023)

3. Duvernoy MC, Croquette V, Bensimon D, Quilliet C, Balland M, **Lecuyer S** and Desprat N, *Asymmetric adhesion of rod-shaped bacteria controls microcolony morphogenesis*, *Nature*

Communications, 9:1120, DOI: 10.1038/s41467-018-03446-y, 2018.

4. Trinschek S, John K, **Lecuyer S** and Thiele U. *Continuous vs. arrested spreading of biofilms at solid-gas interfaces : the role of surface forces*, Phys. Rev. Lett., Aug 18;119(7):078003. doi: 10.1103/PhysRevLett.119.078003, 2017.
5. **Lecuyer S**, Stocker R, and Rusconi R, *Focus on the physics of biofilms*, New J. Phys. (17) e030401, 2015.
6. Hemmerlé A, Malaquin L, Charitat T, **Lecuyer S**, Fragneto G and Daillant J, *Controlling interactions in supported bilayers from weak electrostatic repulsion to high osmotic pressure*, Proc. Natl. Acad. Sci. USA (109) 19938-19942, 2012.
7. Shen Y, Siryaporn A, **Lecuyer S**, Gitai Z and Stone HA, *Flow Directs Surface-Attached Bacteria to Twitch Upstream*, Biophys. J. (103) 146-151, 2012.
8. Autrusson N, Guglielmini L, **Lecuyer S**, Rusconi R and Stone HA, *The shape of an elastic filament in a two-dimensional corner flow*, Phys. Fluids (23) 063602, 2011.
9. Rusconi R, **Lecuyer S**, Autrusson N, Guglielmini L and Stone HA, *Secondary flow as a mechanism for the formation of biofilm streamers*, Biophys. J. (100) 1392-1399, 2011.
10. **Lecuyer S.**, Rusconi R., Shen Y., Vlamakis H., Forsyth A., Kolter R. and Stone H.A., *Shear stress increases the residence time of adhesion of Pseudomonas aeruginosa*, Biophys. J. (100) 341-50, 2011.
11. Guglielmini L., Rusconi R., **Lecuyer S.**, Stone H.A., *Three-dimensional features in low-Reynolds-number confined corner flows*, J. Fluid Mech. (668) 33-57 (2010).
12. Ristenpart WD, Vincent O, **Lecuyer S**, Stone HA., *Dynamic angular segregation of vesicles in electro- hydrodynamic flows*, Langmuir (26) 9429-9436, 2010.
13. Subramanian A.B., **Lecuyer S.**, Ramamurthi K.S., Losick R. and Stone H.A *Particle/fluid interface replication as a means of producing topographically patterned PDMS surfaces for lipid bilayer deposition*, Adv. Mat. (22) 2142-+, 2010.
14. Rusconi R.*, **Lecuyer S.***, Guglielmini L. and Stone H.A., *Bacterial streamers in curved microchannels*, J. R. Soc. Interface (7) 1293-1299, 2010. (*Equal contributions)
15. Ramamurthi K.S., **Lecuyer S.**, Stone H.A., Losick R., *Geometric Cue for Protein Localization in a Bacterium*, Science (323) 1354-1357, 2009.
16. Charitat T., **Lecuyer S.**, Fragneto G., *Fluctuations and Destabilization of Single Phospholipid Bilayer*, Biointerphases (3(2)) 3-15, 2009.
17. Scomparin C., **Lecuyer S.**, Ferreira M., Tinland B., Charitat T., *Diffusion in supported lipid bilayers: influence of substrate and preparation technique on the internal dynamics*, Eur. Phys. J. E (28(2)) 211-220, 2009.
18. **Lecuyer S.**, Ristenpart W.D., Vincent O., Stone H.A., *Electrohydrodynamic Size Stratification and Flow Separation of Giant Vesicles*, Appl. Phys. Lett. (92(10)) 104105, 2008.
19. Jourdainne L., **Lecuyer S.**, Arntz Y., Picart C., Schaaf P., Senger B., Voegel J-C., Lavallo P., Charitat T., *Dynamics of Poly(L-Lysine) in Hyaluronic Acid/Poly(L-Lysine) Multilayer Films studied by Fluorescence Recovery After Pattern Photobleaching*, Langmuir (24(15)), 7842-7847, 2008.
20. **Lecuyer S.**, Fragneto G., Charitat T., *Effect of an electric field on a floating lipid bilayer: a neutron reflectivity study*, Eur. Phys. J. E (21) p.153, 2006.
21. **Lecuyer S.**, Charitat T., *From supported membranes to tethered vesicles: lipid bilayers destabilisation at the main transition*, Europhys. Lett. (75) 652-658, 2006).