

Matthias Le Bec, PhD

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Education

- 2019-2022 **PhD** – Université Paris Cité & Institut Curie (UMR 168), France
Biophysics, microbiology, system biology.
- 2017-2018 Double diploma **M.Sc.** “Chemical Frontiers of Living Matter” - University PSL, France
Biochemistry, bioinformatics, biotechnological drugs, supramolecular chemistry.
- 2015-2018 “Diplome d'ingénieur” (**M.Sc.** equivalent) - Chimie ParisTech, France
Biochemistry, organic chemistry, physical chemistry, material chemistry, process.
- 2013-2015 Preparatory class BCPST (**Bachelor** equivalent) - Lycée Louis Barthou, France
Biology, earth science, chemistry, physics and mathematics.
(nationwide competitive entrance exams to Grandes Ecoles)

Research experience

- 2019-2022 **PhD student** - “Spatiotemporal control of cooperation in yeast communities”, Supervisor: Dr. Pascal Hersen, Physical Chemistry Curie Unit (UMR 168) Paris, France.
- Construction of the Optocube: a system for simultaneous imaging and optogenetic patterning of gel embedded microbial populations.
- Extensive use of fluorescence microscopy and microfluidics.
- Modelling of yeast growth and nutrient diffusion (PDE).
- Development of a microscopy control software.
- 2018-2019 **Research engineer** - Université Paris Cité, Matière et Systèmes Complexes lab, Pascal Hersen’s team, France.
- Development of optogenetic and microfluidic tools
- GoldenGate Cloning library construction (MoClo)
- Genetic engineering in yeast and bacteria (CRISPR, HR and plasmid transformations)
- 2018 **Master 2 intern** (6 months) – L. Jullien’s team, Biophysics and chemistry, ENS Paris, France.
- Development of fluorescence microscopy on photoswitchable fluorescent proteins.
- Regular use of fluorimeter and fluorescence microscopy. Production of proteins.
- 2017 **Master 1 intern** (5 months) – C. Doherty’s team, CSIRO Melbourne, Australia.
- Encapsulation of enzymes in biocompatible Metal Organic Frameworks (MOFs)
- Regular use of SEM, IR, UV-Vis spectrometer, PXRD. First experience with SAXS (Synchrotron).

Teaching experience

- 2021 **Instructor for oral exams** in Dynamic Mechanics for bachelor students in physics, Université Paris Cité, 30h.
- 2015-2016 **Private teacher** in maths, physics, chemistry, biology at High school level, ~80h.

Languages and computer languages

French (Native), English (Fluent - TOEIC 960/990)

Python, R, C/C++, ImageJ (Macro scripting),

Other interests

3D printing, prototyping with microcontrollers, mushroom cultivation, gardening.

Presentations and posters

- 2022 **Poster**, Biosynsys conference, Learning Planet Institute, Paris, France
- 2022 **Poster**, Institut Curie -Weisman Institute of Science symposium, Weisman Institute of Science, Rehovot, Israel
- 2021 **Short talk** on spatiotemporal control of yeast cooperation, Paris Biological Physics Community Day, ENS Paris, France.
- 2019 **Poster**, CellTiss Days conference, Giens, France

Publications

1. Optogenetic spatial patterning of cooperation in yeast populations - **M. Le Bec**, S. Pouzet, C. Cordier, S. Barral, V. Scolari, B. Sorre, A. Banderas, P. Hersen – *Nature Communications* **15**, 75 (2024).
2. Spatiotemporal control of cooperation in yeast communities – **M. Le Bec** – PhD thesis, Université Paris Cité (2022).
3. Cybersco.py: software for event-based, conditional microscopy - **M. Le Bec**, L. Chiron, C. Cordier, S. Pouzet, D. Milunov, A. Banderas, J. Di Meglio, B. Sorre, P. Hersen - *Scientific Reports* **12**, 11579 (2022).
4. Optogenetic control of beta-carotene bioproduction in yeast across multiple lab-scales – S. Pouzet, J. Cruz-Ramon, **M. Le Bec**, C. Cordier, A. Banderas, S. Barral, S. Castano-Cerezo, T. Lautier, G. Truan and P. Hersen - *Frontiers in Bioengineering and Biotechnology* **11**, (2023).
5. Autonomous and assisted control for synthetic microbiology – A. Banderas, **M. Le Bec**, C. Cordier, P. Hersen - *International Journal of Molecular Sciences* **21** (23), 9223 (2020).
6. The promise of optogenetics for bioproduction: dynamic control strategies and scale-up instruments – S. Pouzet, A. Banderas, **M. Le Bec**, T. Lautier, G. Truan, P. Hersen - *Bioengineering* **7** (4), 151 (2020).

References

- Dr. Pascal Hersen (PhD supervisor), Physical Chemistry Curie Unit
- Dr. Sébastien Leon (PhD advisor and committee member), Institut Jacques Monod
- Dr. Alvaro Banderas (Senior Postdoc, Hersen Lab), Physical Chemistry Curie Unit
- Prof. Dr. Ludovic Jullien (M2 internship supervisor), ENS Paris