

## PhD studentship: Distributed Biological Circuits in Phage-Bacterial systems

We are looking for a PhD candidate for a funded position available at the Micalis Institute (INRAE Jouy-en-Josas, University of Paris-Saclay) to develop ***synthetic communication in consortia of bacterial cells for distributed biocomputing circuits***.

**Position.** We offer a 3-year PhD position on a highly interdisciplinary project, working on the foundations of new robust distributed algorithms in phage-bacterial systems.

**Background.** Our objective is to design, build, and test synthetic intercellular communication in microbiological mixed culture systems (such as bacterial co-cultures and bacteria-phage mixed cultures) that can be used to implement robust biological distributed algorithms. We will combine *methods from synthetic biology* with *theory from distributed computing* to build and test synthetic bacteria-phage mixed culture systems. Bacteria and phages will be engineered to construct a range of synthetic culture systems using transcription factor and CRISPR based logic for desired algorithmic implementations.

**Job profile.** The candidate should have experience in experimental microbiology and molecular/ synthetic biology. They should have strong communication skills and the willingness to work collaboratively with other members of the team, including biologists, mathematicians, computer scientists, and control theorists. Background in bioinformatics/ computational modelling is an advantage, but not essential.

**Project.** The PhD position is a part of the DREAMY project (Distributed Algorithms for Microbiological Systems) funded by the French National Research Agency (ANR). The interdisciplinary project is a collaboration between partners from several leading French national institutions: LISN, LMF, Micalis Institute, LaBRI, and L2S.

**Application.** For questions, please contact [manish.kushwaha@inrae.fr](mailto:manish.kushwaha@inrae.fr). To apply, please send a cover letter and a CV (with contact details of at least two referees).

### Selected References:

1. Regot, S. *et al.* Distributed biological computation with multicellular engineered networks. *Nature* **469**, 207–211 (2011). <https://doi.org/10.1038/nature09679>
2. Tamsir, A., Tabor, J. J. & Voigt, C. A. Robust multicellular computing using genetically encoded NOR gates and chemical ‘wires’. *Nature* **469**, 212–5 (2011). <https://doi.org/10.1038/nature09565>
3. Ortiz, M. E. & Endy, D. Engineered cell-cell communication via DNA messaging. *J. Biol. Eng.* **6**, (2012). <https://doi.org/10.1186/1754-1611-6-16>
4. Marken, J. P. & Murray, R. M. Addressable, “Packet-Based” Intercellular Communication through Plasmid Conjugation. *bioRxiv preprint* (2019) <https://doi.org/10.1101/591552>
5. Cho, D.-J. *et al.* Distributed Computation with Continual Population Growth. *International Symposium on Distributed Computing (DISC 2020)*. <https://drops.dagstuhl.de/opus/volltexte/2020/13085/>
6. Andaur, V., *et al.* Reaching Agreement in Competitive Microbial Systems. *arXiv preprint* (2021) <https://arxiv.org/abs/2103.07450>