Université Claude Bernard Lyon 1- Hosting offer for a MSCA Post-doctoral fellowship candidate

In Molecular response of *Dictyostelium* to hypoxia

Host Organisation	**Université Claude Bernard Lyon 1**
Department	**ILM**
Laboratory	**Biophysic**
Website (lab / research team)	http://ilm.univ-lyon1.fr/biophysique/
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Host Organisation

The Université Claude Bernard Lyon 1 welcomes Marie Sklodowska Curie Postdoctoral Fellowships applications.

With 62 laboratories and more than 7000 publications per year, and leading French university in terms of the number of patents filed in collaboration with industry, Lyon 1 contributes to scientific and innovation progress in numerous fields: health, mathematics, IT, physics, chemistry, earth and space sciences, life sciences, etc. Creator of emerging knowledge and new technologies, the University is consolidating its research excellence on a global and international level by developing inter- and multidisciplinary approaches targeting the major challenges facing today society.

The Biophysics Laboratory belongs to the **Institute of Ligth and Matter (iLM)**, one of the leading French institutes in condensed matter, atomic, molecular and optical physics with a strong expertise in nanoscience, soft matter and Physics of Life. The institute with CNRS researchers and University of Lyon assistant and full professors hosts 17 experimental laboratories and theoretical laboratories for a total of about 300 members.

Host research lab/team

The Biophysics team consist of 2 professors, 3 assistant professors of Lyon 1 University, 4 permanent CNRS researchers. It is a **leader in Europe for Mechanobiology and cell motility** research. In the past 5 years, the team has also spearheaded investigation on the role of hypoxia on cell motility, gene expression and differentiation in the model amoeba *Dictyostelium discoideum,* but also work on other systems, including mammalian cell and organoids.

Hosting Offer

The **Biophysics lab** of iLM offers to host a MSCA Postdoctoral Fellowship candidate (typically a post-doc of less than 8 years research experience since PhD defence), submitting an application to the next MSCA-2026-PF call for proposals (deadline 09th of September 2026), interested to work on the following research topic:

Molecular response of *Dictyostelium* to hypoxia

Dictyostelium is a single-celled amoeba that normally lives in soil and feeds on bacteria. It is used as a model organism to study cell motility and social behavior (coordinated cell movements, transition to multicellularity). Like most eukaryotes, *Dictyostelium* uses oxygen to produce energy through respiration. As the level of available oxygen can drop rapidly, cells have mechanisms to adapt to this hypoxic situation. In metazoans, adaptation occurs via the PHD (prolyl hydroxylase)/HIF-1 (Hypoxia-Inducible factor 1) pathway which regulates the transcription of around a hundred genes (1, 2). Alternatively, some organisms, such as bacteria, move toward an optimal oxygen concentration, a phenomenon called aerotaxis (3).

We have shown that *Dictyostelium* is aerotactic (4) and these amoebae are able to move up oxygen gradients only if the atmospheric concentration is less than 2% (5). In addition, we have discovered that vegetative cells maintained at high density form aggregates of a few hundred cells, the size of which depends on the oxygen concentration (6). Indeed, cell-cell adhesion of aggregates is reversibly regulated by the oxygen concentration and we seek to identify the proteins responsible. These aggregates are highly mobile and behave like aerotactic "super-cells". This multicellular behavior appears to be an adaptative response to situation when food, such as bacteria, is available but cannot be efficiently processed due to low oxygen. Hypoxia also alter the classical chemotactic streaming induced by starvation such as to steer cells toward higher oxygen level (7).

The Postdoctoral project will consist of identifying molecular factors of the hypoxic response and in particular those involved in aerotaxis and the formation of this new type of aggregates. Transcriptomic and proteomic analysis has already been performed to identify target and marker genes (8). Our results revealed that hypoxia regulates genes expression through multiple independent mechanisms. One of the proposed approaches to identify pertinent genes is the screening of a bank of insertion mutants (9). During the screening, the population of mutants will be selected for their ability to survive and grow under various oxygen scenarios, resulting into proportion changes of individual mutants that can be measured by NGS sequencing. All of these selected mutants will be sequenced in order to identify the mutated gene for each of them. Then the null mutants for these genes will be further characterized for their responses to hypoxia, such as survival, cell motility and genetic adaptation (5,6,7,8,10).

This research is part of a multidisciplinary project in collaboration with the teams of Pr Chris West (Georgia, Athens, USA) and Pr Sathoshi Sawai (University of Tokyo, Japan). The project combines classical biology techniques with biophysics, microfluidics, videomicroscopy (10) and modeling to determine the mechanisms of oxygen control at the molecular level and to understand how these dictate cell migration and morphogenesis.

We are looking for a motivated Posdoctoral scientist with good knowledge of molecular and cellular biology to participate to this ongoing project. The fellowship could last for 12 to 36 months, depending on the type of Postdoctoral Fellowship.

Application process

Interested candidates are invited to contact us exclusively by email at christophe.anjard@univ-lyon1.fr

Make sure that you include the reference to this offer in the title of your email. Please attach a CV, a motivation letter, your MSc marks, **as well as a 1 page research proposal**.

Supervision

The successful Marie-Curie Post-doctoral fellow will be supervised by C. Anjard and J.-P. RIEU. C. Anjard is a professor in genetics and a molecular biologist working with *Dictyostelium* since more than 25 years. J.-P. RIEU is professor in Physics and Biophysics. He belongs to the Lyon-Tohoku international laboratory ElytLab where he is developing microfluidic devices for the control of oxygen together with the team of K. Funamoto (IFS, Tohoku University).

Professional grant application support:

Candidates will receive the support of the supervisors, as well as online training from a professional grant application company, and advices from successful applicants, to prepare and submit their application with the Biophysics Lab of iLM as a host laboratory, to the next MSCA-PF call for proposals.

References

References from our laboratory are shown in bold.

1. Semenza, G. L. Hypoxia-inducible factor 1 (HIF-1) pathway. *Sci STKE* **2007**, cm8 (2007).
2. Weidemann, A. & Johnson, R. S. Biology of HIF-1alpha. *Cell Death Differ* **15**, 621–627 (2008).
3. Taylor, B. L., Zhulin, I. B. & Johnson, M. S. Aerotaxis and other energy-sensing behavior in bacteria. *Annu Rev Microbiol* **53**, 103–128 (1999).
4. **Cochet-Escartin, O. *et al.* Hypoxia triggers collective aerotactic migration in *Dictyostelium discoideum*. *Elife* 10, e64731 (2021).**
5. **Hirose, S., et al. The Oxygen gradient in hypoxic conditions enhances and guides Dictyostelium discoideum migration. Processes, 10(2), 318 (2022).**
6. **Carrère A. et al. Microphase separation of living cells. Nature communication 14, 796 (2023).**
7. **Hirose S., et al. *Dictyostelium discoideum* chemotaxis is altered by hypoxia to orient streaming toward higher oxygen levels. BMC Mol Cell Biol.26(1):34. (2025).**
8. **Hesnard J., et al. Global characterization of *Dictyostelium discoideum* gene expression pattern under hypoxic conditions. BMC Genomics 26(1):1143 (2025).**
9. Gruenheit, N. *et al.* Mutant resources for functional genomics in *Dictyostelium discoideum* using REMI-seq technology. *BMC Biology* **19**, 172 (2021).
10. **Hirose, S. *et al.* The aerotaxis of *Dictyostelium discoideum* is independent of mitochondria, nitric oxide and oxidative stress. *Front Cell Dev Biol* 11, 1134011 (2023).**