



30-month post-doc on the evolution of bacterial metabolism, Université Grenoble Alpes

Context:

Isoprenoid quinones are lipids that shuttle electrons between enzymes of electron transport chains, thus playing a central role in cellular energy production. Quinones are structurally diverse, with differences in the quinone moiety modulating their redox potential. Low potential quinones are used primarily for anaerobic and microaerobic respiration while high potential quinones are used for aerobic respiration and photosynthesis. The history of their diversification and transition from low to high redox potential is poorly understood, but likely connected to major transitions in the history of life: for example, low potential quinones self-oxidize in the presence of O_2 and high potential quinones are thought to have emerged in response to the great oxidation event¹. Understanding the diversity of quinone biosynthetic pathways is thus likely to bring new insights into the evolution of metabolisms. Recently, our consortium has discovered new pathways of quinone biosynthesis² and demonstrated that the evolution of the quinone repertoire is correlated to the adaptation of bacteria to anoxic and oxic environments³. Intriguingly, the presence of a high potential quinone was discovered in a typically anaerobic lineage that usually employs a low potential quinone, the *Desulfobacterota*⁴. This poses questions on how this acquisition shaped the evolution of metabolism and participated in specific environmental adaptations.

Objectives:

We are seeking an enthusiastic post-doctoral researcher to investigate the evolution of metabolism in *Desulfobacterota*, in link with switches toward high potential quinone. This will consist in implementing comparative genomics approaches, metabolic reconstructions and phylogenomics. In addition, state-of-the-art methods will also be employed to leverage structural and phylogenetic information in order to bioinformatically propose candidates for missing steps in quinone pathways that will then be tested experimentally in the lab. We are also open to other projects in link that could be proposed by the candidate.

Skills:

We are looking for a post-doctoral researcher with knowledge of bacterial metabolism and phylogenetics, and experimented with the annotation of metabolic pathways from genomes. The candidate should also be capable to deploy new methods to investigate the diversification of metabolism and metabolic pathways, including sequence and structure-based approaches. More generally, we are seeking someone trained for:

- Genome and metabolism annotation
- Bioinformatics and sequence analysis
- Phylogenetics and/or comparative genomics
- Python programming

- Bash/shell scripting
- Use of a Linux environment
- Use of Git and GitHub/GitLab
- Use of a compute server

Environment:

This post-doc position is part of the [ToLQuin project](#) funded by the ANR (French national funding agency). The recruited researcher will integrate the [compbio@TrEE group](#) within the microbiology [TrEE team](#) of the [TIMC](#) department in Grenoble ([University Grenoble Alpes](#)), and be part of a German-French consortium led by [Dr. Sophie Abby](#) together with [Dr. Felix Elling](#) based at the University of Heidelberg. They will participate to weekly meetings with the team and with the group, and regular meetings with the collaborators.

TIMC-TrEE is a highly inter-disciplinary team, gathering biochemists, molecular microbiologists, biostatisticians and bioinformaticians, with a common strong interest in microbial evolution. The compbio@TrEE group is part of the [BiGre! community](#) that aims at bringing together the community of computational biologists in Grenoble. BiGre! organizes bi-monthly seminars and monthly coworks, with many opportunities to connect with other computational biologists from Grenoble and France.

The lab is located on the University Hospital Campus of La Tronche, in close vicinity to Grenoble (Tram B and D).

Contract:

A 30-month contract is proposed at the University Grenoble Alpes (UGA), with the salary depending on the candidate's experience. The monthly net salary ranges between €2,300 and €3,000, based on experience.

Contact:

Please contact Sophie Abby for more details and link to formal application:

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References:

- (1) Schoepp-Cothenet, B.; van Lis, R.; Atteia, A.; Baymann, F.; Capowiez, L.; Ducluzeau, A. L.; Duval, S.; ten Brink, F.; Russell, M. J.; Nitschke, W. On the Universal Core of Bioenergetics. *Biochim Biophys Acta* **2013**, 1827 (2), 79–93. <https://doi.org/10.1016/j.bbabi.2012.09.005>
- (2) Elling, F. J.; Pierrel, F.; Chobert, S.-C.; Abby, S. S.; Evans, T. W.; Reveillard, A.; Pelosi, L.; Schnoebelen, J.; Hemingway, J. D.; Boumendjel, A.; Becker, K. W.; Blom, P.; Cordes, J.; Nathan, V.; Baymann, F.; Lückner, S.; Spieck, E.; Leadbetter, J. R.; Hinrichs, K.-U.; Summons, R. E.; Pearson, A. A Novel Quinone Biosynthetic Pathway Illuminates the Evolution of Aerobic Metabolism. *Proc. Natl. Acad. Sci. U.S.A.* **2025**, 122 (8), e2421994122. <https://doi.org/10.1073/pnas.2421994122>
- (3) Chobert, S.-C.; Roger-Margueritat, M.; Flandrin, L.; Berraies, S.; Lefèvre, C. T.; Pelosi, L.; Junier, I.; Varoquaux, N.; Pierrel, F.; Abby, S. S. Dynamic Quinone Repertoire Accompanied the Diversification of Energy Metabolism in *Pseudomonadota*. *The ISME Journal* **2025**, 19 (1), wrae253. <https://doi.org/10.1093/ismejo/wrae253>
- (4) Chobert, S.-C.; Kanwar, S.; Lerouxel, O.; Varoquaux, N.; Michaud, J.; Pelosi, L.; Pierrel, F.; Abby, S. S. Global Distribution of Isoprenoid Quinones across Bacteria. *mSystems* **2026**, 11 (7), e01681-25. <https://doi.org/10.1128/msystems.01681-25>