Grégoire Michoud

PhD in Environmental Microbiology

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Education

2010–2014 **PhD**, *Université de Bretagne Occidentale, Laboratoire de Microbiologie des Environnements Extrêmes*, Plouzané, France, Supervisors: Prof. Mohamed Jebbar.

Phd title Study of the high hydrostatic pressure effects on *Pyrococcus yayanosii* a strict piezophile by a multi-omics approach

Description *Pyrococcus yayanosii* a hyperthermophilic archea, isolated at 4,100 m depth, is unable to grow at atmospheric pressure, unlike the other species of the genus. In order to study the mechanisms that this species implement to grow at high hydrostatic pressure, transcriptomics (microarray) and proteomics studies (LC-MS/MS) were done at different pressures. Results suggest the existence of a metabolic shift implemented by the cell to withstand sub et supra-optimal pressures, especially in the mechanisms of energy production, mobility, translation and defense mechanisms.

Other Participation in the design and implementation of a high pressure and high temperature semi-continuous reactor

2009–2010 **Master 2 Microbiology**, *Université Pierre et Marie Curie*, Paris, France.
9 months intership, Institut Pasteur, Paris

2008–2009 **Master 1 Biology**, *Université de Versailles Saint-Quentin*, Versailles, France.
6 months intership, Centre de génétique Moléculaire, Gif-sur-Yvette

2007–2008 **Bachelor's degree Biology**, *Université de Versailles Saint-Quentin*, Versailles, France.

2006–2007 **Technologic Academic Studies Degree of Biological Engineering**, *Université de Lille 1*, Villeneuve D'ascq, France.
3 months Erasmus internship in Belgium

Work Experience

2015– **PostDoc**, *King Abdullah University of Science & Technology, Biological and Environmental Sciences and Engineering Division*, Thuwal, KSA, Supervisor: Prof. Daniele Daffonchio.

Key Words Brine Pools, Red Sea, Hydrocarbon degraders, Hydrostatic pressure

2008-2009 **Master 2 intership**, *Institut Pasteur, Unité de Génétique Moléculaire des Levures, Paris.* Tutored by Dr. Guy-Franck Richard.
Replication study of microsatellites CAG/CTG in model organism *Saccharomyces cerevisiae*

2009 **Master 1 intership**, *CNRS - Centre de Génétique Moléculaire, Gif-sur-Yvette.* Tutored by Dr. Jean-Luc Ferat.
Study of repair of damage associated with type II topoisomerases in *Escherichia coli*

2007 **Bachelor's Intership**, *Centre d'Ingénierie des Protéines - Université de Liège, Liège.* Tutored by Dr. Michael Delmarcelle.
Construction and caracterization of *Bacillus subtilis* strains to industrially produce an enzyme of interest

Publications

Fodelianakis S., Moustakas A., Papageorgiou P., Manoli O., Tsikopoulou I., **Michoud G.**, Daffonchio D., Karakassis I., Ladoukakis M., **2016**. Modified niche optima and breadths explain the historical contingency of bacterial community responses to eutrophication in coastal sediments. *Molecular Ecology*, DOI: 10.1111/mec.13842.

Martinez, N., **Michoud G.**, Cario A., Ollivier J., Franzetti B., Jebbar M., Oger P., Peters J., **2016**. High protein flexibility and reduced hydration water dynamics are key pressure adaptive strategies in prokaryotes. *Scientific Reports*, 6:32816 | DOI: 10.1038/srep32816.

Michoud G. and Jebbar M., **2016**. High hydrostatic pressure adaptive strategies in an obligate piezophile *Pyrococcus yayanosii*. *Scientific Reports*, 6:27289 | DOI: 10.1038/srep27289

Callac N., Oger P., Lesongeur F., Rattray J., Vannier P., **Michoud G.**, Beauverger M., Gayet N., Rouxel O., Jebbar M., Godfroy A., **2016**. *Pyrococcus kukulkanii* sp. nov., a novel hyperthermophilic piezophilic archaeon isolated from a deep-sea hydrothermal vent at the Guaymas Basin. *International Journal of Systematic and Evolutionary Microbiology*, 66:3142–3149 | DOI: 10.1099/ijsem.0.001160

Viterbo D., **Michoud G.**, Mosbach V., Dujon B. and Richard G.F., **2016**. Replication stalling and heteroduplex formation within CAG/CTG trinucleotide repeats by mismatch repair. *DNA Repair*, 42:94–106 | DOI: 10.1016/j.dnarep.2016.03.002

Vannier P., **Michoud G.**, Oger P., Marteinsson V., Jebbar M., **2015**. "Genome expression of *Thermococcus barophilus* and *Thermococcus kodakarensis* in response to different hydrostatic pressure conditions. *Research in microbiology*, 166:717e725 | DOI: 10.1016/j.resmic.2015.07.006

Lossouarn J., Nesbø C.L., Mercier C., Zhaxybayeva O., Johnson M.S.,Charchuck R., Farasin J., Bienvenu N., Baudoux A.C., **Michoud G.**, Jebbar M. et Geslin C., **2015**. "Ménage à trois": a selfish genetic element uses a virus to propagate within *Thermotogales*. *Environmental microbiology*, 17:3278–3288 | DOI: 10.1111/1462-2920.12783

Thiel A., **Michoud G.**, Moalic Y., Flament D., and Jebbar M., **2014**. Genetic manipulations of the hyperthermophilic piezophilic archaeon *Thermococcus barophilus*. *Applied and environmental microbiology*, 80:2299–2306 | DOI: 10.1128/AEM.00084-14

Peters J., Martinez N., **Michoud G.**, Cario A., Franzetti B., Oger P., and Jebbar M., **2014**. Deep Sea Microbes Probed by Incoherent Neutron Scattering Under High Hydrostatic Pressure. *Zeitschrift für Physikalische Chemie*, 228:1121–1133 | DOI: 10.1515/zpch-2014-0547

Book Chapters

Barozzi A., Mapelli F., **Michoud G.**, Crotti E., Merlino G., Molinaro F., Borin S., Daffonchio D., **2017**. Microbial diversity and biotechnological potential of microorganisms thriving in the deep sea brine pools. *submitted*

Mapelli F., Barozzi A., **Michoud G.**, Merlino G., Crotti E., Borin S., Daffonchio D., **2017**. An Updated View of the Microbial Diversity in Deep Hypersaline Anoxic Basins. In book: *Adaption of Microbial Life to Environmental Extremes*, DOI 10.1007/978-3-319-48327-6_2

Jebbar M., Vannier P., **Michoud G.**, Marteinsson V., **2016**. Exploring the Microbiology of the Deep Sea. In book: *The Marine Microbiome*, DOI: 10.1007/978-3-319-33000-6_8

Languages

French Mother tongue

English Fluent

Professional Skills

Microbiology techniques
Cellular cultures of bacteria and archaea (aerobic/anaerobic) mesophiles, thermophiles and hyperthermophiles
High hydrostatic pressure and high temperature cultures
Use of an anaerobic chamber

Methods of analysis
Transmission Electron Microscopy (TEM)
Fluorescence microscopy
Neutronic diffusion on whole cells at the Institut Laue Langevin, Grenoble France

Molecular biology
Total and extrachromosomic nucleic acid extraction (DNA and RNA)
DNA purification using cesium chloride and ethidium bromide
Cloning and sequencing
PCR amplification
2D DNA gel electrophoresis
Protein extraction and quantification
1D and 2D Protein electrophoresis
DNA library preparation for Highthroughput sequencing (MiSeq, HiSeq) Microarray

Bio-Informatic
Genome analysis and comparisons (Blast, KEGG, JGI, Rast, GO)
Metagenomics analysis
RNAseq analysis
Primer and microarray design and analysis (Primer3, Agilent)
Genetics (ApE)

Field Work
Deep water and brine water sampling via Niskin bottles

Informatics

- Perl, R, bash
- Windows, Mac, Linux
- LaTeX, Office software

Various work

Participation in the design and implementation of a high pressure and high temperature semi-continuous during my PhD

Tutoring

2013 **Tutoring of a Master I student, 2 months**.
Expression studies of interest genes regarding the effect of high hydrostatic pressure in the archeal microorganisms *Pyrococcus yayanosii* and *Pyrococcus furiosus*

Conferences, Presentations and Courses Attended

2013 **Thermophiles meeting**, Regensburg, Germany.
Poster : **Grégoire Michoud**, Mickaël Beauverger and Mohamed Jebbar. Genomic and transcriptomic analysis between *Pyrococcus furiosus* a piezosensitive and *Pyrococcus yayanosii* an obligate piezophile

References

Prof. Daniele Daffonchio
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Mail : daniele.daffonchio@kaust.edu.sa

Prof. Mohamed Jebbar
Université de Bretagne Occidentale,
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Tel : +33-2-98-49-88-17
Mail : mohamed.jebbar@univ-brest.fr

Dr. Guy-Franck Richard
Institut Pasteur
Unité de Génétique Moléculaire des Levures
25, rue du Dr Roux, 75015 Paris
Tel: +33-1-40-61-34-54
Mail : gfrichar@pasteur.fr

Miscellaneous

Sailing	Dinghy sailing and cruising boat
Travel	Europe and USA
Reading	Sci-fi, crime fiction