Post-Doc fellowship available from November 2014 at the Microbial Ecology Centre of Lyon University, France.

Project: Linking the functional traits of wheat varieties cultivated as monocultures or assemblages to the functioning and diversity of soil microbial communities in wheat cropping systems

Background: In the 20th century, agriculture has experienced major gains in productivity via homogenization and intensive use of input. This model is jeopardized by the awareness of rapid global change, increased environmental stochasticity and the need for greater sustainability of agriculture. A new paradigm is emerging, in which biodiversity and the mechanisms underlying its dynamics are considered assets for a sustainable agriculture relying more on ecological functions within agroecosystems. Plant and soil microbial genetic diversity should play an essential role in this context, as key elements contributing to agriculture multi-functionality and to the resilience of agroecosystems under rapid climate change and decreased chemical inputs. The main goal of the Wheatamix project (http://www6.inra.fr/wheatamix_eng/), is to better evaluate the possible roles of within-crop genetic diversity to reinforce the multi-functionality and resilience of cropping systems under global change. WHEATAMIX focuses on a major cereal, wheat, in different areas of production in France. WHEATAMIX develops a highly multidisciplinary approach involving geneticists, agronomists, plant ecologists and ecophysiologists, microbial ecologists, economists, and management scientists, as well as key stakeholders (in particular farming organisations).

Scientific objective: This 24 months Post-Doc fellow will analyse the relationships between (i) the functioning, abundance and diversity of soil nitrifying and denitrifying communities and (ii) the functional traits of wheat varieties cultivated as monocultures or assemblages. This will allow a better understanding of plant-(de)nitrifiers interactions, and of the role of wheat varieties and associated soil microbial communities on soil fertility.

Approach: At the heart of this project is a large scale experiment allowing the study of soil nitrifiers and denitrifiers in wheat fields covering a wide range of wheat variety diversity. The lab work will mainly take place at the Microbial Ecology Centre of Lyon, in the team "Microbial functional diversity and N cycle" (http://www.ecologiemicrobiennelyon.fr/spip.php?rubrique31&lang=en). The Post-Doc fellow will participate to field campaigns with other participants of the Wheatamix consortium, and will be in charge of quantifying and analysing the effects of wheat variety diversity on soil microbial communities and soil processes, with a particular focus on N-related processes (mineralisation, nitrification and denitrification) using biochemical assays, qPCR and high throughput sequencing. He/she will also contribute to more comprehensive approaches of the relationships between variety diversity and agroecosystem functioning and services.

Fellowship details: The official starting date for the post-doctoral fellowship will be between November 2014 and March 2015. The selected candidate will be based at the Microbial Ecology Centre of University of Lyon I-CNRS-INRA, France. He/she will be supervised by X. Le Roux (www.researchgate.net/profile/X_Roux/) and co-supervised by A. Cantarel and T. Pommier, while collaborating with different Wheatamix partners. This will imply participation in project workshops and travels to field sites. The position is available for 24 months. Extensions could be possible.

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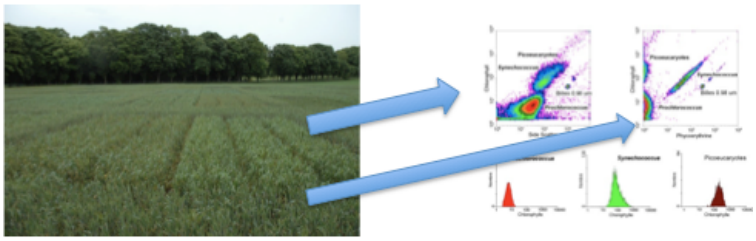
Selection details: Applicants must have a PhD in microbial ecology. Solid knowledge bases on plant/microbes interactions as well as the ecology of microorganisms in soil are essential, and a solid background in molecular approaches such as quantitative PCR and high throughput sequencing is required. Dedication and a creative mind will be important to conduct the project. Good proficiency in English is required. French will not be a selection criterion.

Application: The complete application in English should include a CV, a list of publications and other productions, a statement of research experiences and technical skills appropriate to the proposed subject, and a list of three potential references. Application should be sent to Xavier Le Roux (Xavier.le-roux@univ-lyon1.fr), Amélie Cantarel (amelie.cantarel@univ-lyon1.fr) and Thomas Pommier (thomas.pommier@univ-lyon1.fr).



Selected, publications from the supervisors (2009-2014):

Salles J.F., Poly F., Schmid B. & Le Roux X. 2009. Community niche predicts the functioning of denitrifying bacterial assemblages. Ecology 90: 3324–3332.

Attard E., Poly F., Laurent F., Commeaux C., Terada A., Smets B., Recous S. & Le Roux X. 2010. Shifts between Nitrospira- and Nitrobacter-like nitrite oxidizers underly the response of soil nitrite oxidizing enzyme activity to changes in tillage practices. Env. Microbiol. 12: 315-326.

Attard E., Recous S., Chabbi A., De Berranger C., Guillaumaud N., Labreuche J., Philippot L., Schmid B. & Le Roux X. 2011. Soil environmental conditions rather than denitrifier abundance and diversity drive potential denitrification after changes in land-uses. Global Change Biol. 17: 1975–1989.

Gravel D., Bell T., Barbera C., Bouvier T., Pommier T., Venail P., Mouquet N. 2011. Experimental niche evolution shapes the diversity-productivity relationship. Nature 469: 89-92.

Brown J.R., Blankinship J.C., Niboyet A., van Groenigen K.J., Dijkstra P., Le Roux X., Leadley P.W., Field C.B. & Hungate B.A. 2012. Effects of multiple global change treatments on soil N2O fluxes. Biogeochem. 109: 85-100.

Cantarel A., Bloor J., Pommier T., Guillaumaud N., Moirot C., Soussana J.F., Poly F. 2012. Four years of experimental climate change modifies the microbial drivers of N2O fluxes in an upland grassland ecosystem. Global Change Biology 18: 2520-2531.

Salles J.F., Le Roux X. & Poly F. 2012. Relating phylogenetic and functional diversity among denitrifiers and quantifying their capacity to predict community functioning. Frontiers Microbiol. 3: article 209, doi: 10.3389/fmicb.2012.00209.

Allan E., Weisser W.W., Fischer M., Schulze E.D., Weigelt A., Roscher C., Baade J., Barnard R., Beßler H., Buchmann N., Buscot F., Ebeling A., Eisenhauer N., Engels C., Fergus A., Gleixner G., Gubsch M., Habekost M., Halle S., Klein A.M., König S., Kowalski E., Kreutziger Y., Kertscher I., Kummer V., Lange M., Lauterbach D., Le Roux X., Marquard E., Migunova V.D., Milcu A., Mwangi P., Niklaus P., Oelmann Y., Peterman J., Poly F., Rottstock T., Rosenkranz S., Sabais A., Scherber C., Scherer-Lorenzen M., Scheu S., Schmitz M., Schumacher J., Soussana J.F., Steinbeiss S., Temperton V., Tscharntke T., Voigt W., Wilcke W., Wirth C. & Schmid B. 2013. A comparison of the strength of biodiversity effects across multiple functions. Oecologia 173: 223-237.

Gravel D., Bell T., Barbera C., Combe M., Pommier T., Mouquet N. 2013. Phylogenetic constraints on ecosystem functioning. Nature Communications 3: 1117.

Grigulis K., Lavorel S., Krainer U., Legay N., Baxendale C., Dumont M., Kastl E., Arnoldi C., Bardgett R., Poly F., Pommier T., Schloter M., Tappeiner U., Bahn M., Clément J.C. 2013. Combined influence of plant and microbial functional traits on ecosystem processes in mountain grasslands. Journal of Ecology 101: 47-57.

Le Roux X., Schmid B., Poly F., Barnard R.L., Niklaus P.A., Guillaumaud N., Habekost M., Oelmann Y., Philippot L., Salles J., Schloter M., Steinbeiss S. & Weigelt A. 2013. Soil environmental conditions

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and build up of microbial communities mediate the effect of grassland plant diversity on nitrifying and denitrifying enzyme activities. PLOS One http://dx.plos.org/10.1371/journal.pone.0061069

Lavorel S., Storkey J., Bardgett R.D., De Bello F., Berg M.P., Le Roux X., Moretti M., Mulder C., Diaz S., Harrington R. & Pakeman R. 2013. Linking functional traits of plants and other trophic levels for the quantification of ecosystem services. J. Veg. Sci. 24: 942–948.

Baxendale C., Orwin K.H., Poly F., Pommier T., Bardgett R.D. 2014. Are plant-soil feedback responses explained by plant traits? New Phytologist (in press)

Cantarel A., Pommier T., Desclos-Theveniau M., Diquélou S., Dumont M., Grassein F., Kastl E.M., Laîné P., Grigulis K., Lavorel S., Lemauviel-Lavenant S., Personeni E., Schloter M., Poly F. 2014. Using plant traits to explain plant-microbe relationships involved in nitrogen acquisition. Ecology (in press)

Krause S., Le Roux X., Niklaus P.A., van Bodegom P.M., Lennon J.T., Bertilsson S., Grossart H.P., Philippot L. & Bodelier P.L.E. 2014. Trait-based approaches for understanding microbial biodiversity and ecosystem functioning. Frontiers Microbiol. 5:251. doi: 10.3389/fmicb.2014.00251

Mallon C.A., Poly F., Le Roux X., Marring I., van Elsas J.D. & Salles J.F. 2014. Resource pulses can alleviate the biodiversity-invasion relationship in soil microbial communities. Ecology (in press)

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