**Master Thesis Project in the Bioinformatics and Microbial Ecogenomics**

**Laboratory for Microbiology of Extreme Environments**

**Brest, France**

**Characterization of Subsurface Microbial Communities Associated with**

**CO2 Injection Wells**

The biological repercussions induced by rising levels of carbon dioxide in the atmosphere have prompted the development of novel carbon capture and storage (CCS) technologies for CO2 sequestration. Carbfix is an industrial CCS operation which relies on the precipitation of carbon dioxide into mineral form for permanent storage in the terrestrial subsurface. This occurs via injection of CO2-charged groundwater into basaltic formations, where the evolution of carbonic acid rapidly dissolves surrounding basalt, liberating several divalent cations (Mg2+, Fe2+, Ca2+). These react with aqueous carbonate ions, resulting in the precipitation of carbonate minerals, completing the transformation of carbon dioxide into rock.

The basaltic crust is host to a native microbial population which is subject to acidifying, oxidizing conditions during an injection event. Under these conditions, a subset of the population has the potential to assimilate CO2 into cellular biomass, disrupting the process of conversion into mineral form. This project aims to identify patterns of variation in microbial diversity linked to gas injection. Monitoring wells at varying depths and distances surrounding the injection site were constructed to measure the transformation of gas during migration through subsurface aquifers. These wells have been routinely sampling over a ten-year time span and will enable the reconstruction of microbial diversity across distance, depth, and time in relation to gas injection. Participation in this project will include analysis of 16S bacterial and archaeal diversity through metabarcoding and genome-resolved metagenomics sequencing, correlation of diversity data with environmental parameters (*i.e*., porewater geochemistry), and identification of key microbial groups and metabolic pathways associated with gas injection.