Metabolic engineering of a *Clostridium phytofermentans*

Clostridium phytofermentans is an anaerobic bacterium capable of breaking down and fermenting complex plant polysaccharides such as cellulose, hemicellulose and pectin. Its major fermentation products are ethanol, acetate and hydrogen, which makes it of interest for the fermentation of non-food biomass into value-added chemicals. Our lab is developing *C. phytofermentans* as a synthetic biology platform with the goal using it for production of chemical products from plant biomass. The proposed project involves the metabolic engineering of *C. phytofermentans* to produce butanol by metabolic pathway construction and optimization using methods such as Goldengate, CRISPR, and Cre-Lox. The project will take place within the LGBM laboratory of the Genoscope-CEA in Evry, which contains a genome sequencing facility as well as technical platforms for high-throughput screening of enzymatic activities and long-term directed evolution.

Previous publications co-authored by MSSB students in our group:

Cerisy T, Souterre T, et al. (2017). Evolution of a biomass-fermenting bacterium to resist lignin phenolics. *Appl Environ Microbiol*. 83(11). pii: e00289-17. doi: 10.1128/AEM.00289-17

Boutard M et al. (2016) Global repositioning of transcription start sites in a plant-fermenting bacterium. *Nature Communications* Dec 16;7:13783. doi: 10.1038/ncomms13783.

Tolonen AC et al, (2015). Fungal lysis by a soil bacterium fermenting cellulose. *Environmental Microbiology*. 17(8):2618-27.

Tolonen AC et al, (2015). Physiology, genomics, and pathway engineering of an ethanol-tolerant strain of *Clostridium phytofermentans. Appl Environ Microbiol* . 81(16):5440-8. doi: 10.1128/AEM.00619-15

Boutard M et al, (2014). Functional diversity of carbohydrate-active enzymes enabling a bacterium to ferment plant biomass. *PLOS Genetics* DOI: 10.1371/journal.pgen.1004773.