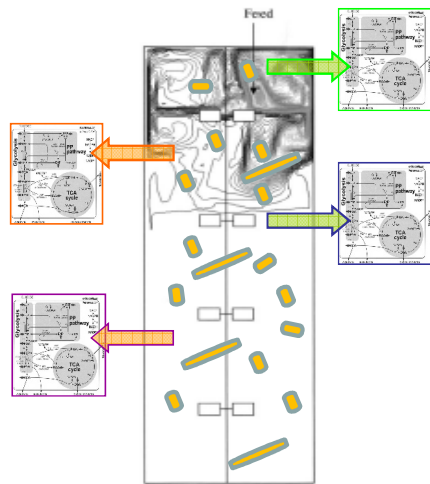


## Scientific Objective:

investigating the dynamics of the microbial response towards fluctuations of the environment in order to improve bioprocess optimization and scale up

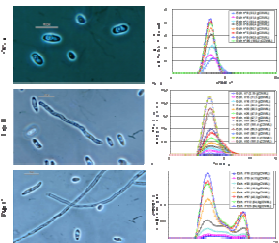


### Sub-populations

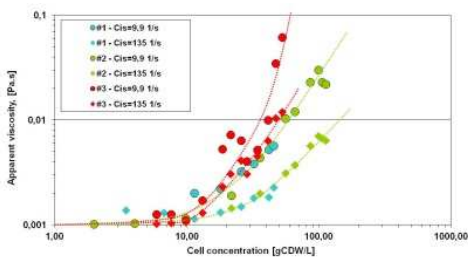
- ✓ Metabolic states
- ✓ Physiological states
- ✓ Morphological states
- ✓ Genetic diversities

**Direct Impact on Process Performances**

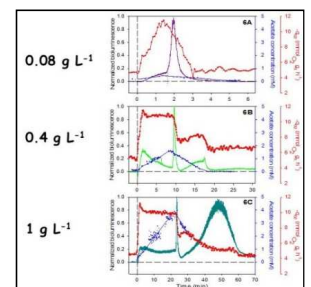
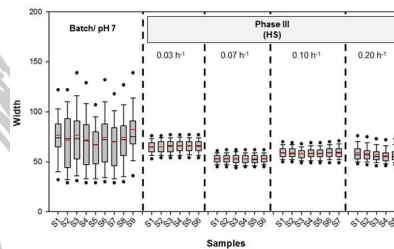
## Highlights: stress response in *E.coli* and *Y. lipolytica* (9 papers)



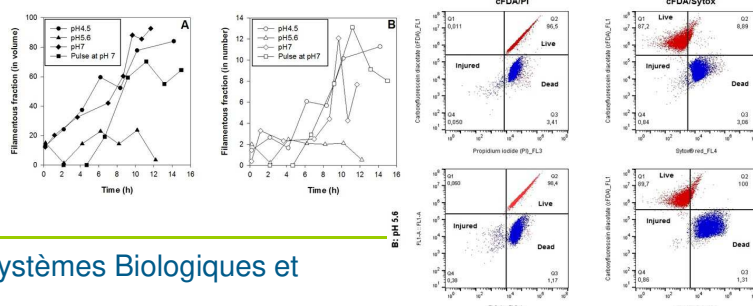
Morphology of *Y. lipolytica*  
(Timoumi et al., 2016)  
Rheology



Quantitative characterization of transient responses (metabolic and transcriptomic) to glucose/acetate pulses / pH perturbations (Sunya et al., 2012a, b & 2013 ; Timoumi et al., 2016)



Quantitative characterization of Sub-populations (Plasmid+ / Plasmid- / Viable But Non Cultivable / Viable Cultivable / Physiologic states / Morphology) and management (Montheard et al., 2012 ; Grousseau et al., 2014 ; Timoumi et al., 2016)



Dynamic Metabolic Model Hydrodynamic Model  
(collaboration Univ Gembloux)