Website draft text under the logo for systems biology.

(Logo still to be processed/provided by Raphaëlle)

In silico systems biology aims at using general mathematical and computational tools to get insights into biological and medical questions, mainly through the study of regulatory networks.

Different modeling strategies are of concern belonging to causal (mechanistic) or correlation (data driven) families. A few examples of interest in our group are : ordinary and partial differential equations, logical modeling, additive models, agent based models, stochastic and data-driven modeling.

* Raphaëlle

We combine mechanistic modeling and data-driven approaches in order to study chondrocyte differentiation in the context of bone tissue engineering (TE) and osteoarthritis (OA). Mechanistic modeling is carried out using additive qualitative formalism mainly whereas we use machine-learning methods to infer regulatory network based on gene expression data. " Then an internal link toward my project description should be enough if readers want more details.

* Morgan

We investigate the hypertrophic switch in human skeletal progenitors through the use of deterministic models, mainly using ordinary differential equations (ODEs). In particular, we study the irreversible bistable behavior of this switch, the interactions between the BMP and Wnt pathways and the receptors-ligand binding dynamics of the BMP pathway.

* Sophie
* Marc

We extend a stochastic model of protein synthesis to unravel regulation upper layers affecting protein expression above the transcriptional level. We combine a data driven systematic mining approach and a mechanistic top-bottom approach to understand Ribo-seq experiments results and t-RNA reprogramming that selectively express transcripts with specific codon usage biases. The first proof of concept of our in silico modeling addresses targeted therapies in cancers like melanomas.