

# Modelling tissue self-organisation and the fate of injury outcome

Diane Peurichard<sup>1</sup>, P. Degond<sup>2</sup>, L. Casteilla, A. Lorsignol, M. Ousset<sup>3</sup>

<sup>1</sup> Institut National de Recherche en Informatique et en Automatique (INRIA), team MAMBA

<sup>2</sup> Imperial College London

<sup>3</sup> StromaLab, Toulouse

In this talk, we investigate the mechanisms by which biological tissues recover after injury. We explore this question on adipose tissue, using a mathematical framework recently developed. Our assumption is that simple mechanical cues between the ECM and the adipocytes can explain adipose tissue morphogenesis and that the same mechanisms are at play in tissue reconstruction after injury. We validate this hypothesis by means of a two-dimensional Individual Based Model (IBM) of interacting adipocytes and ECM fiber elements. The model produces structures that compare quantitatively well to the experimental observations. Our model first seems to indicate that cell clusters could spontaneously emerge as a result of simple mechanical interactions between cells and fibers and surprisingly, vasculature is not directly needed for these structures to emerge. Moreover, the model can successfully generate regeneration or scar formation as function of few key parameters, and seems to indicate that the fate of injury outcome could be mainly due to ECM rigidity.

## References

- [1] D. PEURICHARD, F. DELEBECQUE, A. LORSIGNOL, C. BARREAU, J. ROUQUETTE, X. DESCOMBES, L. CASTEILLA AND P. DEGOND, *Simple mechanical cues could explain adipose tissue morphology*, J. Theor. Biol. (2017).