MODELLING FLOW, CHEMICAL REACTIONS, AND MECHANICAL PROCESSES IN TISSUE

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Experimental research is providing increasing information on biophysical and biochemical processes in cells and tissue. This information on cellular level has to be included in mathematical modeling of the dynamics of biological tissue.

In this contribution, we start from a description on a cellular level for flow, transport and reactions of substances in cellular tissue, and their interactions with the mechanics of the tissue. This results into a coupled system of nonlinear partial differential equations in complex geometric structures. Using experimental information, the relevant parameters of this system are determined in order to pass to a macroscopic scale limit. Finally, using the methods of multi-scale analysis and homogenization, the rigorous scale-limit is performed, leading to a macroscopic (effective) model.