**Cell-induced phase transitions in fibrous biomaterials: Modelling, computations and analysis**

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In this talk we discuss how the mechanical behaviour of the extracellular matrix (ECM) caused by cell contraction is modelled and analysed from a macroscopic perspective, using the theory of nonlinear elasticity for phase transitions. A combination of computational predictions based on the mathematical model, along with targeted experiments, lead for the first time to understanding the mechanisms of the observed cell communication. This communication is realised through the formation of tethers, regions where phase transition takes place, joining contracting cells. The mathematical model used is a variational problem involving a non rank-one convex strain-energy function, regularized by a higher order term. Further, we present results which mathematically justify the above procedure, by showing that appropriate numerical approximations indeed converge in the limit to minimisers of the continuous problem. This is done by employing the theory of $\Gamma$-convergence of the approximate energy minimisation functionals to the continuous model when the discretisation parameter tends to zero. Additional technical difficulties are due to the structure of numerical approximations which are defined in spaces with lower regularity than the space where the minimisers of the continuous variational problem are sought.