Quantitative convergence of the vectorial Allen-Cahn equation towards multiphase mean curvature flow

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In its sharp-interface limit, the vectorial Allen-Cahn equation with a potential with $N \geq 3$ distinct minima has been conjectured to describe the evolution of branched interfaces by multiphase mean curvature flow. In this talk, we give a rigorous proof for (unconditional) convergence of vectorial Allen-Cahn equation towards multiphase mean curvature flow, assuming that a classical (smooth) solution to the latter exists. Our result is valid for a suitable class of multi-well potentials and in two and three ambient dimensions. We even establish a rate of convergence. Our approach relies on a notion of relative entropy for the vectorial Allen-Cahn equation with multi-well potential and, in particular, on the recent concept of "gradient flow calibrations" for multiphase mean curvature flow.
This talk is based on joint work with J. Fischer.