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**A computer-assisted study of diblock copolymer dynamics**

**Abstract**

The diblock copolymer equation models phase separation processes which involve long-range interactions, and therefore promote the formation of fine structure. While the model arises through a regular perturbation from the classical Cahn-Hilliard model for phase separation in binary alloys, its dynamics is considerably richer, and exhibits for example a high level of multistability. As a dissipative model, its long-term dynamics can in principle be completely described by the dynamics on its global attractor, which is comprised of equilibrium solutions and connecting orbits between them. Unfortunately, however, classical mathematical methods have so far failed at uncovering this attractor structure. In this talk, we provide an overview of how rigorous computational techniques can be used to obtain computer-assisted proofs for the existence of equilibrium solutions, curves of secondary bifurcation points, as well as heteroclinic connections. In the course of this, we uncover the formation of energy minimizers with fine structure through a homotopy from the classical Cahn-Hilliard bifurcation diagram, and it will be shown that typical solutions originating close to the homogeneous state are trapped by local minimizers of the energy, and do not in fact reach the global minimizers.