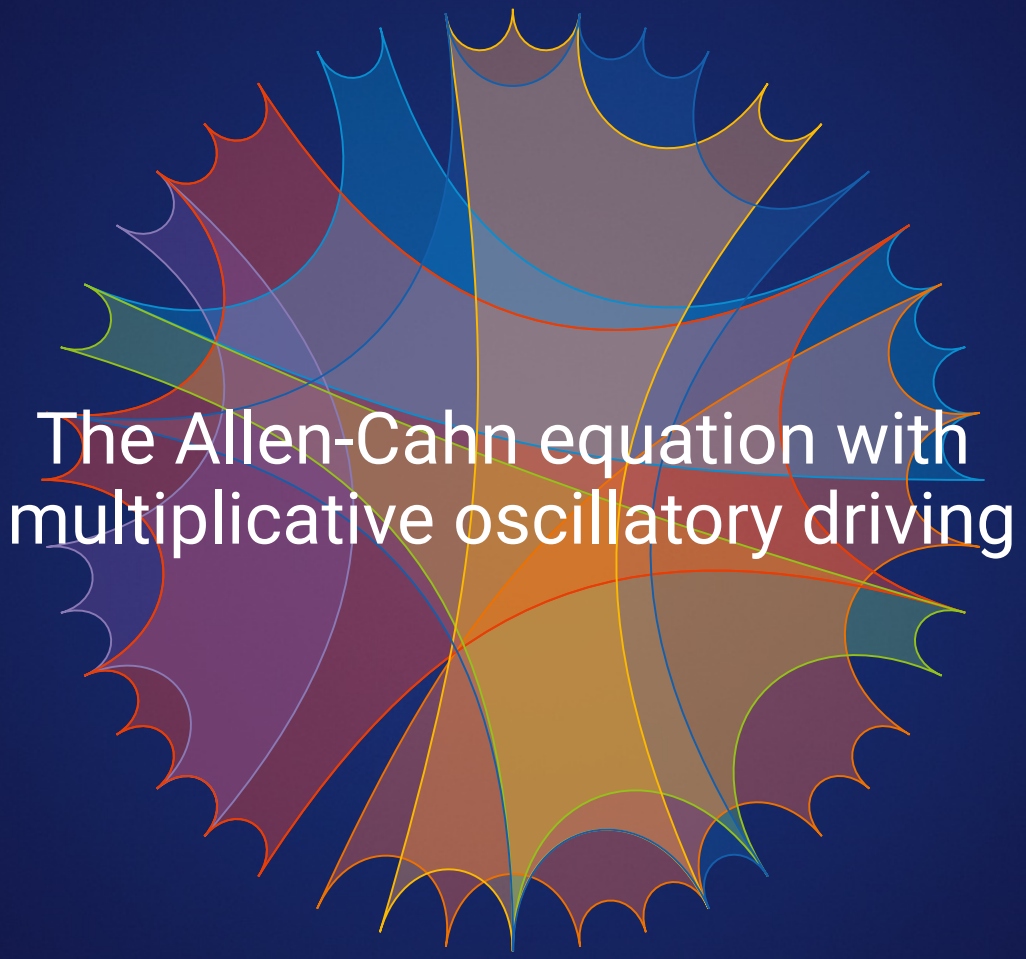
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The Allen-Cahn equation with multiplicative oscillatory driving

JULY 17, 2026, 1:30 PM, Phil 12 GHs

COFFEE & SNACKS IN ROOM 106

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ABSTRACT

The Allen–Cahn equation, also known as the Time-Dependent Ginzburg–Landau equation or Model A, is one of the most generic models for describing systems where domains form. It has been widely used in phase transitions (such as spinodal decomposition), but also in many non-equilibrium systems and other applications like image segmentation and denoising. One of the most salient features of the Allen–Cahn equation is the coarsening process, by which domains grow over time. This process results from the motion and interaction of interfaces between domains.

We will first review some properties of the Allen–Cahn equation in one and two dimensions and present two related length scales that describe the structures emerging from its dynamics in both the linear and nonlinear regimes.
Then, we will examine how the behavior of the Allen–Cahn equation is affected by an oscillatory multiplicative driving, which represents, for example, an oscillation of the temperature in an Ising system that may or may not cross the critical temperature.
These oscillations lead to a novel regime in one dimension with accelerated coarsening when the oscillations cross the critical value. In contrast, we will see that in two dimensions, the coarsening is not affected by such oscillations. However, oscillations can lead to merging of interfaces or to stronger deviations from the usual motion by curvature in two dimensions.

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