2D Spinodal Decomposition

When a system is quenched from the single-phase region of the phase diagram, above T_c, to the two-phase region below T_c it will undergo spinodal decomposition. This behaviour can be observed in the 2D Ising model and readily simulated using Monte Carlo methods. Spinodal decomposition can also be studied within the framework of Landau theory. The order-parameter field ϕ at low temperatures obeys the non-linear diffusion equation

$$\frac{\partial \phi}{\partial t} = \nabla^2 \phi + \phi(1 - \phi^2).$$

The aim of this project is to investigate numerically the resulting dynamics of such a quench in both the Ising model and within Landau theory. Fourier methods can then be used to calculate the structure factor and to determine the dynamic scaling exponent z.

Key Reference: "Theory of Phase Ordering Kinetics", A. J. Bray, Advances in Physics, **51**, 481 (2002).

Key Reference Chapter 7 in "Statistical Mechanics of Phase Transitions", J. M. Yeomans (O. U. P. 1992).