Abstract: Patterns with a nearly periodic microstructure are ubiquitous. Oftentimes, a useful (reduced) description of these patterns is in terms of an underlying phase field. This phase field, however, is not directly observable, and indeed, for typical patterns with defects, there might not even be a single-valued phase field that describes the global pattern.

I will give an overview of some approaches to studying the dynamics of defects in nearly periodic stripe patterns using a phase field description. In particular, I will highlight the interplay between ideas from topology, signal processing, variational analysis, and numerical methods in our approach. This is based on joint work with Nick Ercolani, Alan Newell, and Amit Acharya.