Titles & Abstracts of talks:

Jonathan Robbins:

**Title:** Collective coordinates, asymptotics and domain wall dynamics in ferromagnets

**Abstract:** The method of collective coordinates is a simple and widely used variational procedure for finding approximate solutions to many- or infinite-dimensional, possibly damped and driven, Hamiltonian systems. The approximate solutions are typically characterised by a small number of time-dependent parameters, which are understood to describe a small number of activated modes. The simplicity of the method comes at a price, however, as it is not easy to determine how good (or bad) the approximation is. In certain regimes, asymptotic expansions can provide the requisite estimates, though they require more work.

This is illustrated for the problem of the motion of domain walls in ferromagnets. Domain walls are interfaces between differently oriented magnetic domains, and the dynamics of these interfaces under applied magnetic fields and currents is a problem of current physical and technological interest.

We also describe behaviour in a high-field regime, beyond the well-known Walker breakdown, where a new type of dynamics emerges that appears to be outside the reach of a collective coordinate description. It is found to be exactly characterised through arguments of KPP (Kolmogorov-Petrovskii-Piskounov) type. Physical justification for this description is provided by front propagation theory, but getting rigorous results appears to be a challenge.

This is joint work with Arseni Goussev, Valeriy Slastikov, and Sergiy Vasylkevych.

Jozef Dodziuk:

**Title:** Surjectivity of the Laplacian on infinite graphs

**Abstract:** I will present the proof that the combinatorial Laplacian and some of its generalizations are surjective when considered as operators on the space of all functions on the set of vertices of an infinite, connected graph.