Department of Mathematics and Statistics
Colloquium Lecture Series

Jason Baggett
University of Alaska Fairbanks

"And for the KdV, that nonlinear PDE, we get soliton solutions using the IST"
–Large time solutions to the KdV equation using Inverse Scattering–

The *Korteweg-de Vries* (KdV) equation

$$u_t - 6uu_x + u_{xxx} = 0$$

is of particular interest, because it was the first nonlinear PDE to be solved exactly. In 1967, Gardner-Greene-Kruskal-Miura made the revolutionary connection between the Cauchy problem for the KdV and a famous ODE from Quantum Mechanics known as the Schrödinger equation. In their method, one obtains the scattering data from the Schrödinger equation, and then using the *Inverse Scattering Transform* (IST), reclaims the solution to the KdV. But this method is not just unique to the KdV! Using Inverse Scattering, one can solve many nonlinear evolution PDEs. In fact, it is common to refer to the IST as the "nonlinear Fourier transform" - it is that vital nonlinear PDEs.

In his talk, Lyman Gillispie focuses on numerical methods to solve the KdV for small times. In this second talk on the KdV, we will discuss how the IST works and the intricate relationship between the KdV and Schrödinger equations. In particular, we will discuss how the IST is used to develop asymptotic formulas for *soliton* solutions of the KdV, stable waves which do not dissipate but instead travel on forever. Next, we will talk about *potential fragmentation*, and how it can be used to reclaim the necessary scattering data. Finally, we will discuss the large-time KdV solver that was experimented with last summer as an undergraduate research program.

Thursday, November 12, 2009
Chapman 106
1:00–2:00
Refreshments after the talk in Chapman 101A