

MATHEMATICS DEPARTMENT
North Carolina State University

DIFFERENTIAL EQUATIONS SEMINAR

Wednesday, April 14
2:35 p.m. 330 Harrelson Hall

Michael Shearer

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“Wave structures in the flow of driven thin liquid films: Kinetics and nucleation in scalar conservation laws”

The lubrication approximation for the motion of a thin liquid film over a solid surface leads to a fourth-order parabolic PDE in which surface tension regularizes an underlying hyperbolic conservation law. Physical experiments and numerical simulations of the PDE capture striking effects, including the appearance of undercompressive waves, represented by sharp planar fronts that are unexpectedly stable. In this talk, I describe joint work with Philippe LeFloch in which the theoretical devices of kinetics and nucleation are used to capture the new waves for the conservation law. In particular, nucleation allows for multiple attractors for the same upstream and downstream conditions in the long-time behavior of solutions, a property not encountered before in the theory of conservation laws. Suitable choices for kinetics and nucleation for thin films can be derived from the parabolic equation by considering traveling waves. Numerical simulations of Rachel Levy demonstrate how these theoretical devices of the hyperbolic theory relate back to solutions of initial value problems for the parabolic PDE that includes surface tension.

Graduate students are invited to attend.

For questions, comments, and offers to talk, contact Steve Schechter, schechter@math.ncsu.edu.
Please visit the DE Seminar web page at www.math.ncsu.edu/seminars.html.