Meeting: 999, Nashville, Tennessee, SS 11A, Special Session on Nonlinear Partial Differential Equations and Applications

999-35-180 **Mary C Pugh*** (mpugh@math.toronto.edu), Department of Mathematics, room 4072, 100 St George Street, Toronto, Ontario M5S 3G3, Canada, and **Dejan Slepcev**. *Selfsimilar Blowup of Unstable Thin-film Equations.*

Long-wave unstable thin film equations

$$h_t = (h^n h_{xxx})_x - B(h^m h_x)_x$$

are a fourth-order analogue of the the semilinear heat equation. A "reaction" term destabilizes a "diffusion" term, allowing for a competition between effects. This competition admits a variety of steady states and temporal behaviors, depending on whether the equation is subcritical, critical, or supercritical (as determined by m and n).

Bertozzi and Pugh proved that if $n = 1$ then the initial value problem can yield solutions that blow up in finite time in the critical ($m = 3$) and super-critical ($m > 3$) cases. Witelski, Bertozzi, and Bernoff have done extensive computations and asymptotics on the n=1 case suggesting this blow-up is self-similar. We consider the critical ($m = n + 2$) case and present exact solutions with compact support and zero contact angles that blow up in a self-similar manner. These solutions exist if $0 < n < 3/2$ and cannot exist if $n \geq 3/2$.

This is joint work with Dejan Slepcev (UCLA). (Received August 22, 2004)