# Temple University Mathematics Colloquium


## Nick Moore

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will speak on

## Hybrid analytical/numerical models for fluid-structure problems


ABSTRACT: Models that combine analytical and numerical techniques can reap the benefits of both, and I will discuss the use of such models in the context of two fluid-structure problems. First, inspired by natural examples such as landform evolution, I will discuss the erosion of solid bodies by flowing fluids. Table-top experiments of soft-clay bodies eroding in flowing water show the formation of sharp corners and facets, contrary to the conventional view of erosion as a smoothing process. We develop a model in which an outer flow couples to a boundary layer flow that shears away solid material. This model allows us to rationalize the experimental measurements and extend our understanding of the process. Ultimately, the body converges to a terminal form characterized by nearly uniform shear shear, which, once developed, shrinks self-similarly in time. Second, I will discuss the motion of bodies through viscoelastic fluids. These fluids store and release elastic energy, leading to characteristically unsteady behavior. As an example, a body settling under gravity experiences an overshoot, in which its descent rate temporarily exceeds terminal velocity. We develop a hybrid analytical/numerical method that accurately captures unsteady behavior such as the velocity overshoot, and, unlike many traditional methods, allows efficient and stable computations when the viscoelastic relaxation timescale is long. I will discuss potential applications of the method to more complicated settings, such as many-body interactions and micro-to-macro viscoelastic models.


Thursday, February 20, 2014
Lecture at 2:00 pm
Coffee, tea, and refreshments from 1:45 pm
Room 617, Wachman Hall
Department of Mathematics