# Mathematics Colloquium

## Modeling Fibrin Gel Formation: Continuous to Discrete

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Date: Tuesday, December 18, 2007
Time: 2:00-3:00pm
Room: MG 115

Hemostasis is the normal physiological response to blood vessel injury and is essential to maintaining the integrity of the vascular system. It consists of two interacting processes: platelet aggregation and coagulation. The first involves cell-cell adhesion resulting in a platelet aggregate, and the second involves an enzyme network that leads to the formation of a fibrin gel. Though both processes contribute to the formation of blood clots, those formed at high shear rates are composed primarily of platelets and clots formed at low shear rates are composed predominantly of fibrin gel. In order to understand this phenomenon, a simple mathematical model of chemically-induced monomer production, polymerization, and gelation under shear flow is presented. The model is used to explore how the shear rate and other parameters control the formation of fibrin gel. The results show that the thrombin inhibition rate, the gel permeability, and the shear rate are key parameters in regulating the height of the clot. Experiments show that the gel permeability depends on the chemical environment in which it was made. However, the reasons for these structural differences are unclear. Discrete, Monte Carlo simulations of fibrin polymerization are used to explore what factors determine the microstructure of the gel.