

APRIL 6, 2010
BARUS & HOLLEY, ROOM, 190
3:00PM

Matthias F. Schneider
Biological Physics Group, Mechanical Engineering, Boston University
mfs@bu.edu

Excitable Two Dimensional Films Acoustic Microfluidics - Blood Clotting and the Physics of Nerves

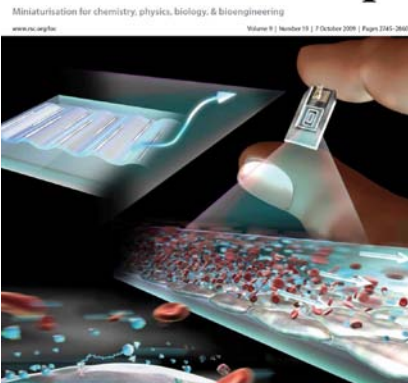
In this talk I would like to present an overview of the various topics I work on: i) lab-on-a-chip microfluidics, ii) the physics of blood clotting and iii) the biophysics of membranes and nerves.

Imagine rinsing your dirty dishes and the more you scrub, the harder everything sticks. What looks like a drama for your kitchen is an important in our blood that helps keep you alive as you read these lines. It has long been observed that, during blood clotting, *increasing shear* rate triggers an *increase in adhesion* of blood platelets. This is a fascinating phenomenon which is in clear contradiction to our daily experience. In the first 2 parts of my presentation I will demonstrate how *surface acoustic waves* with amplitudes below 1nm helped resolve this ~ 50year old mystery.

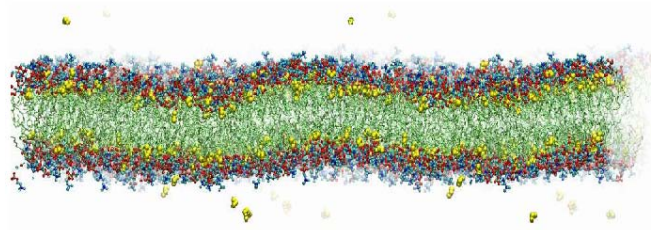
In the final part of my talk I will change topics and point out some major flaws in membrane biology; in particular, the current model of nerve pulse propagation. The conventional model accounts only for the electrical aspect of the pulse, however, the mechanical, optic, chemical and especially thermal aspects are entirely neglected. *All* these properties change *reversibly* during the propagation and *none* of them are explained by the Hodgkin and Huxley model.

I present an alternative view that the nerve pulse propagation is actually a 2D sound wave propagating in the membrane. Our experiments on sound propagation in lipid monolayers strongly support this theory. More examples are given demonstrating that the physics of 2D soft films can actually explain a variety of observations without the introduction of a “clever” protein.

Lab on a Chip



Alexander-Katz A., **MFS** et al. *PRL* (97) 2006
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Griesbauer J.,...**MFS** (97) 2710 *Biophys J* (2009)