



WEEKLY CALENDAR

Physics & Astronomy

202 Nicholson Hall



Baton Rouge, LA 70803-4001

Web: <http://www.phys.lsu.edu>

Louisiana State University

January 31, 2005

Tel: (225) 578-2261

Fax (225) 578-5855



General Seminar

"Moving Fluid with Bacterial Carpets"

Dr. Nicholas C. Darnton

Rowland Institute

Harvard University

Thursday, February 3, 2005 at 3:40 PM in Room 109 Nicholson Hall

Host: Dr. Joseph Giaime

(Refreshments served at 3:15 p.m. in Room 229 Nicholson)

ABSTRACT:

Nicholas Darnton[†], Linda Turner[†], Kenneth Breuer[‡], and Howard C. Berg[†]

[†]Rowland Institute, Harvard University, Cambridge, Massachusetts

[‡]Division of Engineering, Brown University, Providence, Rhode Island

We created a 'bacterial carpet' - a solid-fluid interface capable of active pumping - by attaching *Serratia marcescens* bacteria to PDMS or polystyrene surfaces. The cell bodies formed a densely packed monolayer, while their flagella continued to rotate, churning the nearby fluid. Motion of tracer beads close to the surface was dramatically enhanced compared to Brownian motion in the bulk fluid. The flow field contained complex, ever-changing linear patterns (rivers) and rotational patterns (whirlpools). This surface performs active mixing equivalent to diffusion with a coefficient of 2×10^{-7} cm²/s. When attached to polystyrene beads, the bacteria create 'auto-mobile beads' that perform greatly enhanced translation and rotation. Given the size and strength of the flow patterns near the carpets, the motion must be generated by small numbers of coordinated flagella. In a more confined geometry, large-scale self-coordination occurs, leading to self-pumping channels.

Reminder:

Faculty meeting will be held on Tuesday, February 1, 2005 in Room 109 Nicholson.

Welcome To:

Dr. Pavel Lougovski, a Postdoctoral Researcher with Dr. Jonathan Dowling. He is located in Room 451, 578-2163.