

Spring 2008 Colloquium Series

Physics Department

University of Oregon

4:00 Thursdays, 100 Willamette (except as otherwise noted)
(Reception at 3:45 in the Atrium)

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April 3

Title: Nada

No Colloquium

Abstract:Zip

(Host: Nemo)

April 10

Title: Mycobacterial Mimics, Microparticle Manipulation, and More

Speaker:
Raghuveer Parthasarathy
University of Oregon

Abstract:Lipid membranes, the underlying architecture of all cellular membranes, are remarkable materials: self-assembled, two-dimensional fluids. Membranes can be constructed on solid supports -- these "supported membranes" enable controlled investigations of a variety of membrane properties as well as new sorts of composite materials. In this talk I'll describe two projects being pursued in my lab. (1) Mycobacteria, which include the pathogens that cause tuberculosis and leprosy, have unusual membranes. Building a supported mimic of the mycobacterial envelope, we have discovered that an important mycobacterial lipid has the surprising ability to make membranes resistant to dehydration. (2) Can we harness interactions between membranes to organize non-biological materials? As "building blocks" we focus on lipid membrane-functionalized silica microparticles. To

enable measurements of their interaction energies we have invented a new type of optical trap that sculpts the trapping potential landscape into desired forms. With this approach, we have begun to quantify relationships between interaction energies and membrane properties such as lipid composition and protein binding.

(Host: JT)

TUESDAY, April 15
(NOTE SPECIAL
DATE AND
ROOM!)4pm,
Klamath 331



Speaker:
Howard
Carmichael
University of
Auckland (New
Zealand)

Title: Glauber, Einstein, and Bohr-Kramers-Slater: Old Wine, New Bottle

Abstract:Roy Glauber, in 2005, was awarded the Nobel Prize in Physics "for his contribution to the quantum theory of optical coherence". This Colloquium traces connections to the famous work of Einstein on the photoelectric effect and the infamous BKS (Bohr, Kramers, and Slater) proposal for marrying particles to waves.

(Host: Mike Raymer)

April 17

No Colloquium;
"Focus on Undergraduate Research" posters in Willamette Atrium instead

Title:FOUR!

Abstract:

The annual Focus on Undergraduate Research (FOUR) poster session will be held on Thursday, April 21, in the Willamette Hall Atrium. This poster session is open to all undergraduates that have participated in a math or natural sciences related research project. The poster session will provide student researchers with a valuable opportunity to summarize and present their research to faculty and peers. Additionally, it provides us with an opportunity to acknowledge the efforts of our undergraduates, particularly the graduating seniors, and to promote undergraduate research at the U. of O. This will be a judged poster session with awards being

presented in the categories of Organization and Display,
Scientific Merit and Verbal Presentation.

(Host: Dean Livelybrooks)

April 24

**Speaker: Michael
Wilkinson**

Open University,
UK

**Title: Clustering, Caustics and Collisions in
Turbulent Aerosols**

Abstract:

Small particles suspended in a turbulent gas can cluster together. It is widely believed that this is due to particles being 'centrifuged' away from vortices. It has also been proposed that this clustering effect results in an increased rate of collision of particles. I will describe recent results which quantify the clustering of particles, by means of a mapping to a perturbation of a nine-dimensional quantum harmonic oscillator. The centrifugal effect plays no role in this model, and the results are in good agreement with simulations of particles in turbulent flows. I also argue that the increased rate of collision of particles in turbulent flows is primarily caused by the generation of caustics in the velocity field of the particles, rather than spatial clustering. These results are relevant to the initiation of rainfall and the (hypothesised) formation of planets from dust around a young star. They explain the rapid onset of rainfall from cumulus clouds, but imply serious difficulties with the standard model of planet formation. I will introduce a new theory for the origin of planetary systems. The talk reports work done in collaboration with Bernhard Mehlig, Stellan Ostlund (Gothenburg), Vlad Bezuglyy and Ville Uski (Open).

(Host: Heiner Linke)

May 1

**Speaker: Brian
Schwartz**

The Graduate

**Title: Science as Performance: A Proactive
Strategy to Communicate and Educate
Through Theater, Music, and Dance**

**Abstract: Theater, music, dance, the literary and
visual arts can convey the joys and controversies**

Center of the City
University of New
York

of science. We describe a program at the Graduate Center entitled "Science and the Arts" which is designed to communicate to the public the excitement and wonder of science, technology, engineering, and mathematics. Over the past few years there have been major successes in communicating science to the public through the arts. This is especially evident in theater and film with such recent plays as "Copenhagen" and the Oscar winning film "A Beautiful Mind". The performance series "Science and the Arts" has been developed and tested at the Graduate Center of the City University of New York in mid-Manhattan for more than seven years; see <http://web.gc.cuny.edu/sciart/> . We have established working relationships with actors, playwrights, dancers, choreographers, musicians, composers, artists and scientists who work at the intersection of science and the arts. In this presentation we will illustrate many of our collaborations in theater, dance, music, and art. The National Science Foundation has awarded a grant to the Graduate Center to help develop local community "Science and the Arts" programs. Two of the many outreach programs discussed are: "Street Fair Science" (<http://web.gc.cuny.edu/sciart/0506/street%5Ffair%5Fweb/>) where in the summer of 2006 we brought science to the general public along two New York City street fairs using 12 different booths with science related performances, hand-on experiments, and information and The Science and the Arts Festival (<http://www.scienceartfestival.com/>) held from November 9 to 12, 2006, four days of special science and arts events at venues throughout the City. Faculty members, professionals and students from the university, other educational institutions, museums, theaters and government laboratories seeking to collaborate on science and arts programs should find this presentation of particular interest. * Supported in part by the National Science Foundation, NSF PHY-0431660.

(Host: Stan Micklavzina)

May 8

Title: TBA

Speaker: TBA

Abstract:

TBA

(Host: TBA)

May 15

Title: Cloning the High-Tc Superconductors with Thin Films of Silicon (Si)

Daniel Mattis
Department of
Physics
University of Utah

Abstract:There are 3 parts to this talk. First, we'll see that electrons in thin rods (e.g., solid nanotubes) are very sensitive to any bends or other interruptions to the shape of the channel in which they flow. If two rods intersect, a bound state is created at the intersection. An electron that might otherwise flow down either channel will be trapped at the intersection. Second, when many such rods are combined into a two-dimensional structure, even more interesting things can happen. I will describe a "shaped" ultra-thin film of silicon, with holes punched out at regular intervals L (i.e. an antidot lattice with periodicity L in both directions) and show that the lowest microband is virtually identical to that of holes in a plane of high-Tc material (such as CuO₂). Lastly I will address the question of whether the purely repulsive Coulomb forces among the particles are capable, in principle, of promoting Cooper pairing and, if so, whether one can legitimately predict room temperature superconductivity in -- of all things-- a lightly charged semiconductor.

(Host: Roger Haydock)

May 22

Title: Unruh Effect

**Speaker: Paul
Alsing**
**University of
New Mexico and
Kirtland Air
Force Base**

May 29



Tom Powers
Division of
Engineering
Brown University

June 5

**Speaker:
Colloquium
Cancelled**

Abstract:

TBA

(Host: Mike Raymer)

'Life at low Reynolds number' revisited

Abstract:

At the scale of a cell, viscous effects dominate and inertia is unimportant. We discuss what it is like to swim in the overdamped regime, using a few simple problems to illustrate (1) the physics of fluid-structure interactions for a slender body, (2) hydrodynamic synchronization, and (3) propulsion in a viscoelastic fluid. These problems are motivated by (1) the propulsion of sperm and bacteria via a single flexible flagellum, (2) the coordinated beating of the cilia that line the human airway, and (3) the locomotion of sperm in cervical mucus.

(Host: JT, of course)

I had to break up the band...

Abstract:

Jiving us that we were voodoo...

(Host: The Fraternal and Sororal Order of UO
Physics Graduate Students)

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