

New England Section Newsletter

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Paul H. Carr & Laurence I. Gould, Co-Editors

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2006 JOINT SPRING MEETING NES APS/AAPT: at the Interface Boston University — March 31 – April 1, 2006

<http://physics.bu.edu/nesaps/>

[Mac users: if Internet Explorer won't work, try Safari]

The 2006 joint spring meeting of the New England sections of the APS and AAPT will be held Friday, March 31 and Saturday, April 1, 2006 at Boston University. The theme for this year's meeting will be Physics and Cosmology: at the Interface, with an invited session of prominent scientists discussing their research in talks aimed at a general physics audience. This year's meeting will also feature a new teacher workshop, a graduate teaching fellow workshop, and a physics demo show.

The new teacher workshop will be held on Friday morning and is targeted at those new to teaching physics. This workshop will focus on various aspects of teaching high school physics such as integrating new technologies and the challenges of implementing Physics First. The program will include a presentation by Concord Consortium and hands-on activities. There is an additional fee for this workshop.

A showcase of physics demonstrations will be held Saturday morning. This program will be spearheaded by the demo team from Boston University, but we are seeking individuals from other institutions to show off their favorite demonstrations. Interested parties should contact Andrew Duffy (duffy@bu.edu). A new workshop for graduate teaching fellows is being planned for Saturday afternoon.

Invited Speakers

Lawrence Krauss, Case Western
Angela Olinto, University of
Chicago
Christopher Stubbs,
Harvard-Smithsonian
Andrew Cohen, BU

Organizing Committee

Karl Ludwig, BU
Nick Nicastro, Wachusett Regional
HS
Anthony Tyson, UC
Davis Andrew Duffy, BU

For registration, hotel reservations, and information go to <http://physics.bu.edu/nesaps/>

Mailing address:
NES APS Regional Meeting
Physics Dept.
Boston University
590 Commonwealth Avenue
Boston, MA 02215

2005 FALL MEETING, SOFT CONDENSED MATTER & NANOSCIENCE, AT THE UNIVERSITY OF VERMONT

The Joint New England Sections of the American Physical Society and the American Association of Physics Teachers (AAPT) 2005 Fall Meeting was held on Friday, October 14th and Saturday, October 15th at the University of Vermont (UVM) in Burlington. The total attendance of 120 included 20 students.



Randall L. Headrick, Meeting Co-Chair

Randall Headrick, who Co-Chaired the meeting with Junru Wu, Head of the Physics department, welcomed us to the University of Vermont.



Frances Carr, Vice President for Research, UVM

Frances Carr, Vice President for Research, noting the interdisciplinary nature of our meeting, stated that she is encouraging this at UVM. She said that to expand research we all need to engender the spirit of excitement and discovery that fosters "Eureka" moments.

INVITED SPEAKERS AT THE FALL MEETING

"How Polymer Chains Organize into Crystals"

Prof. M. Muthukumar
Polymer Science and Engineering Department
University of Massachusetts
Amherst, MA 01003

"Organic Semiconductors & Devices"

Professor George Malliaras
Department of Materials Science and Engineering
Cornell University

"The Physics of DNA"

Professor Rudi Podgornik,
Laboratory for Structural and Physical Biology, National Institutes of Health
and Department of Physics, University of Ljubljana, Slovenia

"Gelation: How it Keeps the Stomach From Digesting Itself"

Rama Bansil
Boston University

"Dripping, Jetting, Drops and Wetting: The Magic of Microfluidics"

Professor David A. Weitz
Physics, Harvard Univ.

"Molecular Fluids"

Prof. Sergei S. Sheiko
Department of Chemistry
University of North Carolina at Chapel Hill

"Solid Particles, Liquid Droplets, & New Materials"

Professor Anthony Dinsmore
Physics, Univ. of Mass, Amherst.

BANQUET:



Robert G. Arns, UVM, Banquet Speaker

About 106 people attended the banquet, which was held at the Doubletree Hotel in Burlington. The following is a summary of Prof. Robert G. Arns' talk.

This year we celebrate the World Year of Physics occasioned by the 100 anniversary of Einstein's 1905 publications. His papers of the photoelectric effect and on special relativity did not fit classical antecedents, and in the realm of physics teaching they became part of what has been labeled "modern physics". Modern physics did not enter the mainstream of college-level physics teaching much before the middle of the 20 th century and even today it is often relegated to the afterthought chapters at the end of college-level textbooks. Professor Arns challenged us to make "modern physics" the mainstream of the physics curriculum. After all, "it is 100 years old."

During the discussion period, Nick Nicastro, President of the AAPT, said that he introduces his physics students at Wachusett Regional High School to modern physics, in which they have expressed interest and enthusiasm.

The divide between classical and modern physics was bridged in the Physics 2000 Workshop. Elisha R. Huggins, Dartmouth College, started with special relativity in the first week of his course and then fitted in 20 th century topics, such as introducing magnetism from Coulomb's law and the Lorentz contraction.

MEETING ATTENDEES:



UVM Prof. Emeritus Wesley L. Nyborg (left) with his student, Hal Frost (Ph.D., 1974), who after a career at Los Alamos National Laboratory, has returned to UVM as Research Associate in the Department of Physics to investigate ultrasound physics and bioeffects, as on fetal brain tissue.



Kirsten L. Bonson, UVM, demonstrates a Working Model of an Atomic Force Microscope (AFM). This model, that is suitable for lab courses on nanoscience and nanotechnology, uses a modified phonograph stylus in place of the AFM cantilever and tip, together with a 10 mW laser diode, to generate the light which is reflected from a mirror glued to the end of the stylus. A 10-micron deflection of the stylus causes the reflected beam to move one centimeter on graph paper placed 50 cm from the mirror. This poster paper was co-authored by M. J. Hamblin, D. A. Hammond, & R. L. Headrick.

More information about the meeting is available at

REPORT ON THE COMPLEX FLUIDS WORKSHOP

by Greg Huber, Physics Dept, U Mass Boston, huber@umb.edu

Complex fluids are a hot topic in the field of soft condensed matter research and two workshops this season highlighted the work done by New England physicists, engineers, and other physical scientists in the area. The 23rd New England workshops on Complex Fluids was held at the University of Connecticut, Storrs, June 10, 2005 This series was initiated by Seth Fraden (Brandeis) and Dave Weitz (Harvard), around the turn of the millennium, and continues to attract a large amount of interest.

Water is what the average person would point to as the ideal "fluid", but in fact a lot of everyday life involves fluids with far different properties, or in much more complex states, than a simple glass of water. Blood, paint, detergents and soaps, petroleum products, and milk are examples of complex or structured fluids. Other examples, such as polymeric and Coulombic fluids, liquid crystals, colloidal aggregates, microemulsions, ferrofluids, monolayer and micellar systems are, perhaps, less familiar. The everyday world presents such a multifarious variety and multiplicity of fluid-like materials and behavior that no simple definition encompasses all the phenomena, but, nonetheless, researchers have settled on "complex fluids" as a catch-all phrase.

From the physics point of view, and also important to our understanding and control of complex fluids, the last twenty or so years have seen the development of a set of unifying concepts and principles, which underlie the apparent diversity. This is due to the efforts of physicists, chemists, chemical engineers, material scientists and biophysicists.

Complex fluids are extremely useful and are essential to many industries. Look in around your bathroom, and you will see a number of products based on them: cosmetic lotions, foams, aerosols, shampoos and conditioners, gels, pharmaceutical solutions and preparations. And, of course, the next time you look at a liquid-crystal display, press your finger against it and its fluid behavior becomes immediately clear.

Here is a brief description of some of the invited talks featured at the 23rd workshop, held on June 10, 2005:

- Topology and geometry combine to describe the structure and dynamics of colloidosomes -- large aggregates of colloidal beads, self-adsorbed onto spherical interfaces. A key element in the description is the dislocation defect dynamics on a curved surface. The tools developed to handle this problem can be applied to a number of other problems in applied mathematics, biology and physics.
- The suggestion that the Navier-Stokes equations, as commonly conceived in fluid mechanics, are wrong! While perfectly adequate for incompressible fluids, the usual formulation confabulates two distinct velocities: the volume velocity and the mass velocity. Experimental data for single-component gaseous media subjected to temperature gradients was presented to support this line of reasoning.
- Cells move because of the forces generated by their internal cytoskeleton, a structure chiefly composed of the filamentary protein actin. What generic dynamic phases does the cell employ to achieve motion in response to environmental signals? Intriguing periodic contractions (and their importance for the response to surface rigidity) were one fascinating phase reported on at the Storrs meeting.

- On a related topic, a model was presented that explains why a cell's surface adhesion complexes tend to concentrate in high-curvature regions at the cell's periphery. Key to the model is a "treadmilling" motion that proceeds at a speed proportional to the diffusion constant of the key surface receptor, which mediates the adhesion assembly.
- Studies of monolayer-thick polymer films as they spread on a solid substrate have revealed new types of flow instabilities. By tracing the movement of individual polymer molecules using an AFM, the evolution of the instability pattern on a molecular level could be followed. This leads to a microscopic understanding of the underlying mechanism. For example, one instability was shown to be triggered by conformational changes of brush-like macromolecules in response to the pressure gradient that drives the flow.
- Snails and slugs crawl by generating waves along their bodies which then produce lubrication pressures in a thin layer of viscous fluid. Different models of this phenomenon were investigated with the help of "RoboSnails" -- mechanical crawlers designed to exploit various locomotion strategies.

PROFESSIONAL DEVELOPMENT OPPORTUNITY

The American Board for Certification of Teacher Excellence (www.abcte.org) is seeking outstanding subject matter experts to participate in the development process for the Board's certification exam in physics and your help is needed.

The American Board is a non-profit 501(c)(3) organization dedicated to increasing the number of highly qualified teachers available to schools around the country and is partially funded by a grant through the U.S. Department of Education.

The American Board offers the Passport to Teaching certification – a respected and efficient way for knowledgeable and motivated individuals to become teachers. One element of this premiere teacher certification program is a rigorous content area exam for potential teachers.

To develop these assessments, we rely on the knowledge of subject matter experts. Most meetings of subject matter expert panels will be held in Washington, DC. Each participant will receive a daily honorarium and the American Board will cover food, lodging and travel expenses.

This is a unique opportunity to change the lives of our nation's youth by ensuring that they are taught by exceptional teachers. As a contributor to the development of our exams, you will be helping place individuals with demonstrated subject area mastery and professional teaching knowledge into our classrooms.

If you are interested in participating, please forward your resume or CV to Ryan Wilkes at rwilkes@abcte.org.

Ryan Wilkes,

Content Analyst
American Board for Certification of Teacher Excellence
1225 19th St. NW, Suite 400

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