

THE BIOLOGICAL PHYSICIST

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This issue of THE BIOLOGICAL PHYSICIST brings you the a profile of the biophysics research group in the Department of Physics at the University of South Florida (Tampa), as well as PRE and PRL Highlights, a slew of fall job ads, and some important announcements, including the launch of the new DBP Graduate Education Database, and a new interdisciplinary journal from the Human Frontier Science Program.

Note that some of the announcements (Call for Nominations and Dynamics Days) involve deadlines that are coming up soon!

-- SB

BIOPHYSICS RESEARCH & EDUCATION AT THE UNIVERSITY OF SOUTH FLORIDA

In this special feature, THE BIOLOGICAL PHYSICIST takes you to the Department of Physics at the University of South Florida in Tampa, for a visit with the biophysicists and biological physicists at the center of a unique and vibrant program. Department Chair Pritish Mukherjee introduces the program, and then individual researchers discuss their work...

Pritish Mukherjee

The Department of Physics at the University of South Florida is home to a doctoral program in Applied Physics that is unique within the State of Florida. Initiated in 1999, this program has attracted graduate students from all over the nation and abroad, resulting in a nearly tenfold increase in graduate students in the department since its inception. There are currently approximately 60 students in the graduate program, with 52 doctoral students in the primary emphasis areas of materials physics, biophysics, and atomic, molecular and optical physics. In addition to undergraduate and graduate courses, the Department has five active research programs in biophysics. These include laboratories in cellular and molecular biophysics, optical biophysics, digital holography and microscopy for bio-imaging and bio-nano research.

The Department also offers a minor in biomedical physics for premedical majors. The cornerstone of this minor is an 8-credit hour, two-semester novel course sequence. Titled "Applications of Physics in Biology and Medicine" this sequence is focused on the applications of physical concepts introduced in General Physics to biological systems and for medical applications. Commencing four years ago with a charter class of approximately 50 students, this program now graduates well over 100 minors annually. The course includes:

- The use of mechanics, thermodynamics, electricity, magnetism, optics, quantum physics, atomic physics and nuclear physics in furthering an understanding of the structure and function of biological systems on the molecular, microscopic, cellular and organism levels.
- The physical principles underlying methods for detection in biological systems and medical diagnostics.
- The physics of remediation techniques for medical applications.
- A historical perspective of past accomplishments, present applications and future directions in the use of physics in biology and medicine.

Examples of representative topics encompassed by the two-semester sequence are biomechanics; animal navigation; temperature regulation in biological systems; neuro-physics; physics of hearing, speech and vision; X-ray diffraction for the determination of the structure of DNA; X-ray imaging; computerized tomography (CT); positron emission tomography (PET); ultrasound; magnetic resonance imaging (MRI); electrocardiography; radioisotope labeling; application of fluorescence and spectroscopic techniques; optical microscopy; electron microscopy; use of optical fibers and lasers in surgery and medicine; "optical tweezers" for studying the transport and energetics of single macromolecules; and the emerging area of nanobiotechnology.

Wei Chen

Professor Chen is a biophysicist and physiologist. His research interests are interactions of electromagnetic field and membrane proteins in living systems. His Cellular and Molecular Biophysics Research Laboratory is a highly

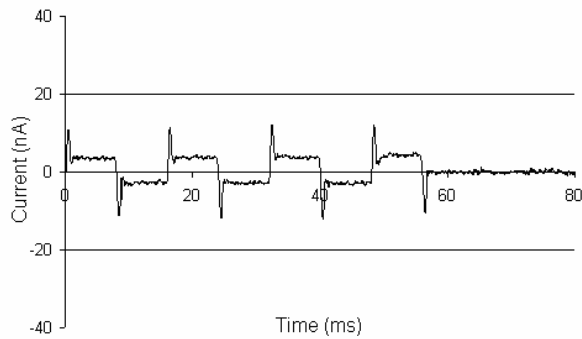


Figure 1. Synchronized Na/K pump currents, showing alternating outward Na and inward K pump currents.

interdisciplinary research lab involving physics, physiology, cell biology and molecular biology. They are studying intensive electric field-induced conformational changes in membrane proteins, especially the voltage-dependent proteins, developing techniques to facilitate the wound healing process, and investigating electric field-facilitated percutaneous drug delivery. The research program was initiated at the University of Chicago and has been continuously funded by NIH since 1994, as well as NSF and the Association of Dermatology. Their research is conducted at, and focused on, the cellular and molecular levels in nano-scales by using broad, state-of-the-art techniques including whole cell and patch clamps, various microscopic imaging systems including multiple-laser confocal microscopy and a full line of cellular and molecular biology techniques.

Recently, Dr. Chen's group developed a novel technique to electrically activate the Na/K pump molecules, the most prevalent active transporters in living systems, by a specially designed oscillating electric field. They realized synchronization of individual pump molecules to work at the same pace, and were able to modulate the pumping rate to achieve a many-fold increase. Figure 1 shows the synchronized Na/K pump currents. In contrast to the currently available measured pump currents showing only the net outward pump currents, the synchronized pumps exhibit alternating outward and inward pump currents with a magnitude ratio close to 3:2, reflecting the stoichiometric ratio of the pumps.

By application to intact cells from both cardiac and skeletal muscles, this technique not only can quickly restore the membrane resting potential

which is decreased due to ion channel opening, but also can effectively hyperpolarize the resting potential. There are potential significances in broad applications in biological and clinical aspects.

Chun-Min Lo

Cell Biophysics Laboratory

My research interest is to apply physical principles and techniques to study cell behavior in tissue culture. At the present time, our laboratory is interested in (1) applying Electric Cell-substrate Impedance Sensing (ECIS) to study the dynamics of cell attachment and spreading, the barrier function of endothelial and epithelial layers, *in vitro* toxicology, electroporation, and the metastatic potential of cancer cells, and (2) studying the effects of substrate rigidity and physical forces on cellular functions by using the transparent, matrix protein coated polyacrylamide substrate combined with fluorescence imaging and micromanipulation to characterize the responses of living cells to mechanical stimulation. Recently we have used the ECIS invasion assay to investigate the effects of a c-Met specific ATP-competitive small-molecule SU11274 on human ovarian carcinoma cell motility and transendothelial invasion. This line of investigation is motivated by evidence that dysregulated HGF/c-Met signaling of cell

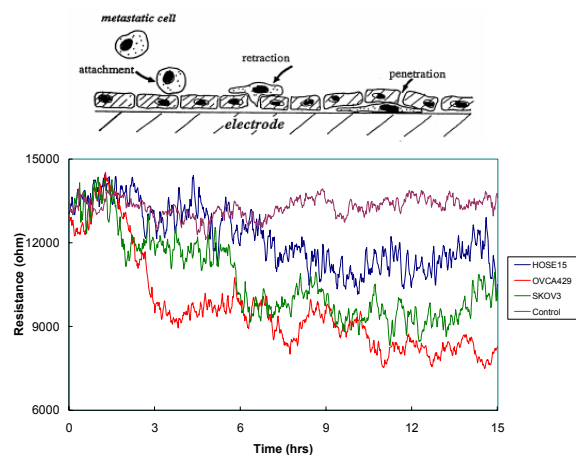


Figure 2. For details, see description of Chun-Min Lo's lab.

migration contributes to tumor invasion and metastasis. Specific inhibitors against HGF/c-Met

signaling, therefore, may have important therapeutic potential for the treatment of cancers in which Met activity contributes to the invasive/metastatic phenotype. Figure 2 shows the type of activities expected to occur during the challenge of the normal endothelial cell layer with the metastatic cell lines. It also demonstrates typical resistance changes measured by the ECIS method as confluent layers of HUVEC cells were challenged with cell suspensions of an ovarian cancer line with a high level of activated c-met (OVCA429), an ovarian cancer line with low level of activated c-met (SKOV3), and a normal human ovarian surface epithelial cell line (HOSE15), which had an undetectable amount of activated c-met. The control curve received HUVEC medium without any cancer cells. This data provides a quick overview of morphological changes of HUVECs challenged by ovarian cancer cells. We will use the ECIS invasion assay to test the hypothesis that inhibition of c-Met may significantly inhibit invasive activity in ovarian cancer cells expressing high levels of activated c-Met. Different patterns of changes in HUVEC integrity caused by the challenge of cancer cells can be discriminated through continuous analysis of ECIS data output. Thus, this strategic approach may serve as a model for the investigation of cellular responses to tumor transmigration in general.

Our laboratory also collaborates with Dr. David Rabson, who is a condensed-matter theorist in our department. His biophysics interests range from the statistical analysis of biological data (e.g., the spike-sorting problem) and modeling of noisy processes to the biocompatibility of quasicrystals.

Garrett Matthews

The Nanoscale Biological Physics Laboratory, under the direction of Garrett Matthews, investigates the structural and mechanical properties of biological molecules, macromolecules, and gels. The goal is to understand the behaviors of the macroscopic system from the microscopic physical properties of its components. Systems currently under investigation include the fibril-forming collagens and the cell surface glycocalyx.

Collagens provide mechanical rigidity to the biological tissues associated with articulation and provide mechanical scaffolds for many other tissues and organs. Under study are the physical properties of collagen fibrils from a unique source - the echinoderms sea cucumber and sea urchin - which retain all of their associated proteoglycans and are thus both native and intact. This particular system allows for determination of both the effects of proteoglycans on fibril mechanics and the interaction characteristics between the associated

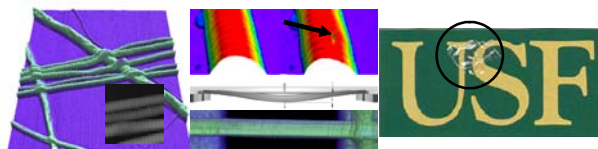


Figure 4. *Left: Fluorescence micrograph of patterned glycosaminoglycans. Right: Atomic force micrograph of a similar structure.*

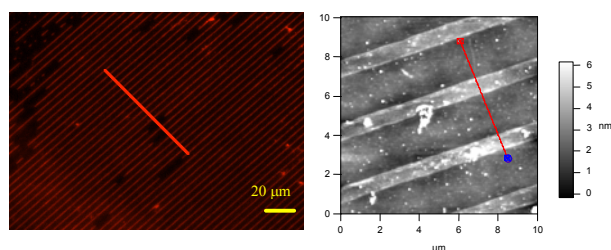


Figure 3. *Left: Collagen fibril network. Middle: Examples of nanoscale manipulation of fibrils. Right: Artificial cornea lying atop the USF logo.*

proteoglycans. A composite model is being developed to help draw conclusions about the self-assembly of fibrils from the monomer and about how load is distributed in the macroscopic system, especially in tendons. Finally, the interactions between intact fibrils have allowed the condensation of collagen films that mimic the physical properties of the cornea. These films are being developed as corneal replacements and/or onlays (see Figure 3).

Another series of studies involves the glycocalyx. The glycocalyx is a cell surface-tethered polymeric 'brush' which plays many physiological roles, including filtering, ligand binding and, as only recently recognized, as the flow sensor in the vascular endothelium. The interactions and mechanical properties of the

glycocalyx, both *in situ* and in models systems (see Figure 4). A specific application for the measurements of these physical properties arises in cancer biology. When metastatic cells are released from primary tumors, they enter the blood stream for transport to distant sites within the body where secondary tumors can be initiated. How metastatic cells interact with endothelial cell glycocalyx is of importance in establishing the sites of potential tumors. Many properties of the glycocalyx may play a role, including the molecular composition and the local mechanical response to load. These properties currently are not well understood and are being studied to determine whether the initial arrest of the metastatic cellular translocation may be disrupted.

M. K. (Paul) Kim

Digital Holography and Microscopy Laboratory

Our laboratory has been developing a number of novel imaging techniques based on digital holography and interferography, which allow image processing capabilities that are impossible or impractical with conventional microscopy methods.

With **Phase Imaging Digital Holography** we can generate quantitative phase images of unstained cells with 10 nm precision of optical thickness profile. The sample image, in Figure 5, is that of SKOV-3 ovarian cancer cells. The nanometric sensitivity of optical thicknesses allows the determination of minute physical and chemical changes in the cells, such as those that accompany cell migration, osmotic volume regulations, etc. A special technique of digital holography using two or more wavelengths allows generation of phase images without 2π -discontinuities. The optical phase unwrapping is orders of magnitude faster than existing software-based unwrapping and therefore allows real-time video-rate biological microscopy. Another technique, **Digital Interference Holography**, allows the so-called optical biopsy, where a three-dimensional tomographic image of a thin layer of tissue can be obtained without surgical incisions. This is accomplished by generating and superposing a series of holographic images while the wavelength of the laser is scanned over a range. The multiplicity of the wavelength gives rise to the

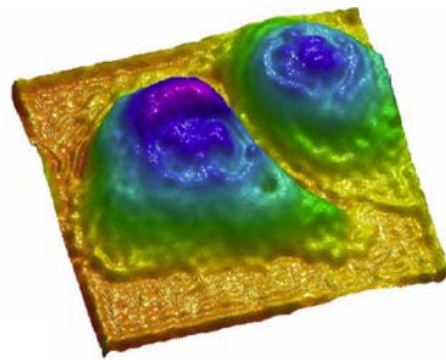


Figure 5. SKOV-3 ovarian cancer cells imaged using Phase Imaging Digital Holography.

tomographic axial resolution, while the holographic process allows the acquisition of 3D images without mechanical raster scanning of focused beam, as is done in other 3D microscopy such as confocal microscopy or optical coherence tomography. Biomedical applications are being developed in order to generate non-invasive tomographic images of about 1 mm thick layers of epithelial tissues, with several microns of depth resolution. In view of the fact that most cancers and other pathologies occur in the epithelial layers of tissues, such a non-invasive optical biopsy technique has great potential for development into effective diagnostic imaging tool.

- M.K. Kim, L. Yu, & C.J. Mann, “Interference techniques in digital holography”, *J. Opt. A* **8**, S518-523 (2006).

Martin Muschol

Laboratory of Optical Biophysics

One focus of our laboratory is how different patterns of action potential stimulation alter the spatio-temporal dynamics of excitability and calcium elevations in populations of axons and secretory terminals. We are using fast-response optical indicator dyes and high-speed (> 500 Hz frame rate) optical recordings to measure excitability changes and calcium elevations in large populations of axons and secretory swellings of the mammalian posterior pituitary gland. We find that axonal excitability and the dynamics of calcium inside nerve terminals depend delicately on the temporal pattern of action potential

stimulation. Both mechanisms contribute to the ability of neurons to change their output (neurotransmitters or hormones) not just in proportion to the number of stimuli originating at the cell body, but also as intricate functions of the temporal pattern of action potential generation. These short-term changes in neuronal plasticity are among the many mechanisms underlying higher functions of the nervous system, such as learning and memory formation.

Another research focus is on phase separation and aggregation kinetics of proteins in solution. Proteins display a rich variety of phase separation phenomena, including crystal formation (Figure 6), liquid-liquid phase separation and gelation. Understanding and controlling protein phase separation has important applications ranging from protein crystal growth for protein structure determinations or controlled drug release to the aggregation of proteins in diseases like sickle cell anemia, eye cataracts or even Alzheimer's or Parkinson's disease. Using static and dynamic light scattering, we study how solution conditions alter protein interactions, map out protein phase diagrams and observe the kinetics of phase separation in supersaturated solutions. Such measurements have revealed that proteins have

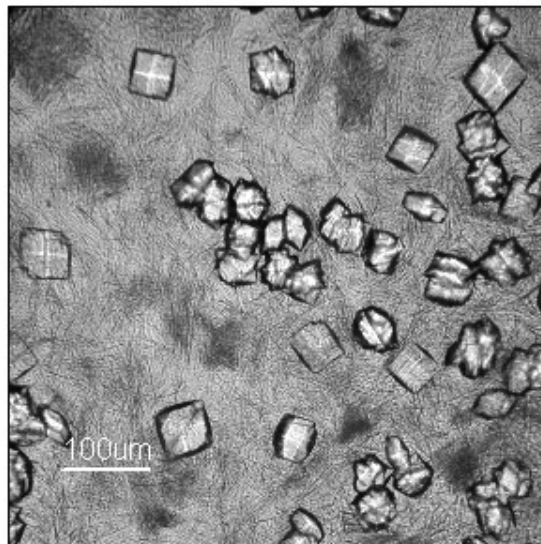


Figure 6. *Fibers and tetragonal crystals of hen-egg white lysozyme coexisting in a supersaturated solution. ($c_{lys} = 100$ mg/ml, $pH = 4.5$, 6.5% NaCl).*

unusual, metastable liquid phases and complex aggregation kinetics. We are particularly interested in how the metastable liquid phase affects the aggregation kinetics and morphology of the emerging solid protein phases.

PRL HIGHLIGHTS

Soft Matter, Biological, &
Inter-disciplinary Physics Articles from
Physical Review Letters

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**Glass Transition of Miscible Binary
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[Brian M. Besancon](#), [Christopher L. Soles](#),
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057801

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[Andrés Santos](#) and [James W. Dufty](#)
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**Force-Induced Desorption and
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[J. Kierfeld](#)

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COMMENTS

Comment on "Can One Predict DNA Transcription Start Sites by Studying Bubbles?"

[Craig J. Benham](#) and [Rajiv R. P. Singh](#)

Published 2 August 2006
059801

van Erp *et al.* Reply:

[Titus S. van Erp](#), [Santiago Cuesta-Lopez](#), [Johannes-Geert Hagmann](#), and [Michel Peyrard](#)

Published 2 August 2006
059802

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Unclustering Transition in Freely Cooling Wet Granular Matter

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078001

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[Roland Roth](#), [Yuichi Harano](#), and [Masahiro Kinoshita](#)

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[Toan T. Nguyen](#) and [Robijn F. Bruinsma](#)

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[C. Bédard](#), [H. Kröger](#), and [A. Destexhe](#)

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[Jorge Viamontes](#), [Patrick W. Oakes](#), and [Jay X. Tang](#)

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[A. Celani](#), [A. Puliafito](#), and [D. Vincenzi](#)

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[C. Korn](#) and [U. S. Schwarz](#)

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See Also: [Phys. Rev. Focus](#)

SPECIAL DBP ANNOUNCEMENT

Launch of New APS/DBP Biological Physics Directory

In response to the rapidly growing interest in our field, the Division of Biological Physics is introducing an online directory of biological physics researchers. The directory will serve graduate or undergraduate students who are searching for biological physics graduate programs or postdoctoral positions, as well as established investigators who are seeking contacts or collaborators in different areas of biological physics. The directory is searchable by program focus, institution, keyword, or geographical location.

All visitors to the DBP website will have free access to the directory.

The directory is available at the DBP Graduate Education webpage:

<http://www.aps.org/units/dbp/graduate.cfm>

If you are an active investigator and member of DBP, we invite you to list yourself in the directory. To enter your information, just visit the site, create a new user account, and then complete the online form:

<http://www.aps.org/units/inst/inst/loginform.cfm?UNIT=DBP>

You can return to the site from time to time and update your information.

The database editor (Steve Hagen) may edit your submitted data slightly, to ensure uniformity in institution names, format, etc. Note that a new listing will not appear online at the very instant that it is submitted -- the database editor has to read and approve each listing first.

We thank the programming team at APS (Sara Connors and Delong Yang) for setting up this resource, and we hope that you, your students, and your colleagues find it useful!

Steve Hagen (DBP Member-at-Large, 2005-2008)

Andrea Markelz (Former DBP Member-at-Large 2002-2005, & Current Webmaster)

Shirley Chan (DBP Secretary-Treasurer 2004-2008)

SPECIAL ANNOUNCEMENT

A town meeting will be held at the fall Materials Research Society (MRS) meeting in Boston, MA, where you will have the opportunity to provide input to the NRC panel leading the decadal study of Condensed-Matter and Materials Physics (CMMP 2010). The committee recently released its interim report highlighting eight challenges for CMMP. The report can be downloaded free of charge at <http://newton.nap.edu/catalog/11730.html>.

The meeting will be held **Thursday, November 30, 2006, 7:00-8:00 PM** in the Exeter room at the Sheraton Hotel. More information on the study and the charge to the committee can be found at <http://www7.nationalacademies.org/bpa/CMMP2010.html>. See also www.nas.edu/bpa and http://www.mrs.org/s_mrs/index.asp. Millie Dresselhaus (co-chair) and Peter Green (committee member and MRS President) will preside at the session. Light refreshments will be provided.

SPECIAL DBP ANNOUNCEMENT

Call for Nominations

It is time to start the election process to fill three positions for the 2007 Executive Committee of DBP: one Vice-Chair and two Members-at-Large.

The Vice-Chair shall serve for one year beginning in March 2007, then for one year as the Chair-Elect in 2008, then for one year as the Chair in 2009, and finally for one year as the Past Chair in 2010, ending in March 2011.

The Members-at-Large shall serve three years beginning in March 2007.

Two candidates will be selected to run for the Vice-Chair, and four candidates for the Members-at-Large.

On behalf of the Nomination Committee, I am inviting you to suggest eligible candidates (which could be yourself) (minimal 2 years of DBP membership) to the Nomination Committee for further consideration. The Committee

Members are listed on the DBP website:

<http://www.aps.org/units/dbp/govern.cfm>.

Please submit suggestions for the Members-at-Large and/or Vice-Chair with a brief statement why you think this is a good candidate for the respective position to the Committee Chair, Dr. Peter Jung, at jungp@ohio.edu. If you have any questions about e.g. responsibilities, please direct them also to Peter.

This invitation is open until Oct. 20, 2006. The final slate of candidates will be assembled by the Committee after Oct. 20 and hopefully the elections will take place November. Thank you.

[Editor's Note: the deadline for nominations closed before "press time", but late nominations may still be accepted.

Contact Peter Jung at the email address above.]

Peter Jung
Nomination Committee Chair
Past Chair, DBP

SPECIAL ANNOUNCEMENT

Dynamics Days 2007

http://www.bu.edu/provost/ddays_07/

Dynamics Days 2007 will take place January 3-6, 2007 in Boston.

“DDays” is an annual conference on topics in nonlinear dynamics. Sessions will cover a very broad range of topics including bio-networks, internal and chemical waves, pattern formation, insect flight, statistical physics, computational neuroscience, synchronization and control of nonlinear systems, cardiac dynamics and much more.

The list of plenary speakers is:

Reka Albert (Penn State), **Michael Brenner** (Harvard), **Jim Collins** (BU), **Iain Couzin** (Oxford/Princeton), **Karin Dahmen** (Illinois), **Bernard Derrida** (ENS Paris/Univ. Paris VI), **Irving Epstein** (Brandeis), **Robert Gilmour** (Cornell), **Leon Glass** (McGill), **Jerry Gollub** (Haverford), **Ray Goldstein** (Cambridge), **George Haller** (MIT), **Anette Hosoi** (MIT), **Wanda Krassowska** (Duke), **Anne Juel** (Manchester), **Nancy Kopell** (BU), **Herbert Levine** (UCSD), **Anna Lin** (Duke), **L. Mahadevan** (Harvard), **Edward Ott** (UMC), **Yves Pomeau** (Paris/Arizona), **Armen Stepanyants** (Northeastern University)

CONTRIBUTED TALKS: A limited number of contributed oral presentations will be accepted. Travel Awards may be available for graduate students and recent PhDs. Information is provided on the conference web site http://www.bu.edu/provost/ddays_07/. **THE DEADLINE FOR ABSTRACT SUBMISSIONS IS TUESDAY OCTOBER 31ST.**

POSTERS: In addition to a special poster session, posters will stay on display during the whole conference. **THE DEADLINE FOR POSTER ABSTRACTS IS THURSDAY NOVEMBER 30TH.**

LOCATION: The meeting will take place at the Hilton Back Bay Hotel. This hotel, located in the heart of one of Boston's most picturesque areas, the historic Back Bay neighborhood, is only 4 miles from Logan International Airport.

SCHEDULE: The conference starts Wednesday January 3 at noon and ends Saturday January 6 in the evening. Schedule will be available soon. **PRE-REGISTRATION IS BY THURSDAY NOVEMBER 30TH.**

The organizing committee,

E. Bradley (Colorado), D.K. Campbell (BU), J. Dorignac (BU),
A. Karma (Northeastern), T. Peacock (MIT).

SPECIAL ANNOUNCEMENT:

Human Frontier Science Program Publishing Launches the *HFSP Journal*

A new journal, the *HFSP Journal*, *Frontiers of Interdisciplinary Research in the Life Sciences* has just been launched and is now accepting online submissions through its website at <http://hfspj.aip.org>

The *HFSP Journal* aims to foster communication between scientists publishing high quality, innovative interdisciplinary research at the interface between biology and the physical sciences.

Scientists working in fields at the interface between the life sciences and physics, chemistry, mathematics, engineering, or informatics tend to publish in a wide variety of often specialized, discipline-specific journals and as a result their work may not be read by the professional audience for whom it is most relevant. The *HFSP Journal* will establish a forum that unites and engages researchers from a wide range of backgrounds. By also publishing Commentaries and Perspectives, which provide context to the basic research articles, the *HFSP Journal* will encourage broader understanding and synthesis of the exciting work being done across different scientific fields of research.

An increasing number of scientists have been involved in interdisciplinary research in recent years, fair review of which presents particular challenges and requires appropriate reviewing procedures. In contrast to the editorial decision-making at several multidisciplinary journals, which is often divided between disciplines, the peer-review process of articles submitted for consideration by the *HFSP Journal* is truly interdisciplinary because every member of the

Editorial Board is actively involved in interdisciplinary research, and will consult with colleagues on the Board to take advantage of their distinct scientific backgrounds.

Examples of studies relevant for the *HFSP Journal* include but are not restricted to the following:

- computational approaches to gene, protein or signal transduction networks
- physical studies of the structure and dynamics of the molecular machinery of the cell
- mathematical, chemical and physical approaches to biological processes (e.g. morphogenesis, growth, genotype/phenotype relationship)
- novel chemical and physical approaches to studying biological phenomena (such as from synthetic chemistry and materials science)
- single molecule approaches to biological systems
- new ways of studying intracellular processes (e.g. novel methods from non-linear optics)
- novel physical and computational approaches to understanding brain and cognitive functions
- new methods in experimental and theoretical sciences that open up new approaches to understanding biological systems
- mathematical and computational approaches to evolutionary studies

The Editorial Board of the *HFSP Journal* represents 5 distinguished scientists from different

disciplines but each with a strong focus on living systems:

- Arturo Falaschi (International Centre for Genetic Engineering and Biotechnology, Trieste and Scuola Normale of Pisa).
- Marcelo Magnasco (Department of Physics, Rockefeller University),
- Peter Seeberger (Department of Chemistry, ETH Zurich),
- Dan Kiehart (Department of Biology, Duke University) and
- Mitsuo Kawato (ATR Computational Neuroscience Laboratories, Kyoto University)

The Editorial Board is supported by a panel of Reviewing Editors covering a broad variety of fields relevant for the journal. It includes scientists from different countries and a combination of senior investigators and talented young scientists.

The *HFSP Journal* offers its authors the option to pay a fee to make their research articles Open Access immediately upon publication. For other

articles, access is limited to subscribers for the first 6 months after publication, and access will be free thereafter. The *HFSP Journal* will be published online and in print. The first articles will appear online in December 2006 and the first issue will be published in March 2007.

The *HFSP Journal* is operated by HFSP Publishing a not-for-profit publisher started with support from the leading international funding agency the Human Frontier Science Program Organization (HFSP). This international funding agency has been supporting innovative research at the frontier of biology since its establishment in 1989.

Contact:

Dr. Valerie Ferrier
Managing Editor
Tel + 33 (0) 3 88 21 52 83
info@hfsp-publishing.org

HFSP Journal homepage <http://hfspj.aip.org>

SPECIAL ANNOUNCEMENT:

**DBP Members win Honorable Mention in
2006 Science Magazine Visualization Challenge**

Special congratulations go out to DBP members
Elizabeth Cherry and Flavio Fenton
of Cornell University.

**They won an Honorable Mention in the Science Magazine 2006 Visualization Challenge
(Interactive Multimedia Category) for their website**

Cardiac Bioelectricity and Arrhythmias

<http://www.vet.cornell.edu/news/FentonCherry/Media/main.html>

The website provides an introduction to cardiac rhythms and arrhythmias for not only the general public, but also for scientists, who will appreciate the beautiful and detailed simulations of spiral waves, wave breakup, and other aspects of cardiac dynamics.

For details on the competition and other awardees, see the Science Magazine website
<http://www.sciencemag.org/cgi/content/full/313/5794/1730#article14>.

Assistant or Associate Professor of Physics University of Missouri-St. Louis

The Department of Physics & Astronomy, UM-St. Louis, seeks applications for a tenured or tenure-track faculty appointment as Associate or Assistant Professor of Physics. The candidate must have a Ph.D. in physics or a closely related field. He/she will be expected to teach physics at the introductory and advanced levels and conduct an active research program in computational/theoretical physics, preferably in an area that overlaps with existing research programs in astrophysics, biophysics, or materials physics (<http://www.umsl.edu/~physics/>). The candidate will have the opportunity for collaboration with the campus' Center for Molecular Electronics (nanoscience) and Center for Neurodynamics (nonlinear dynamics in neural systems).

Applicants should have a strong track record of research and scholarly activities and will be expected to direct research projects at the Ph.D., M.S., and undergraduate levels. Submit curriculum vitae, statement of teaching philosophy, research plan, and arrange for three letters of recommendation to be sent to: **Prof. Bruce Wilking, Chair, Dept. of Physics & Astronomy, University of Missouri-St. Louis, One University Blvd., St. Louis, MO 63121, FAX : (314) 516-6152, email: bwilking@umsl.edu**. Consideration of applications will begin **November 15, 2006** and continue until the position is filled.

The University of Missouri-St. Louis is an Affirmative Action, Equal Opportunity employer committed to excellence through diversity.

EXPERIMENTAL BIOLOGICAL PHYSICS Northeastern University, Boston, MA

The Department of Physics at Northeastern University invites applications for a tenure-track position in experimental biological and/or medical physics to begin September 2007. Senior appointments at the tenured level will also be considered for individuals who have a demonstrated track record of outstanding research in this area. The department already has an established program in both experimental and theoretical biological physics and plans to further expand its interdisciplinary research potential across both departmental and college boundaries. The successful candidate is expected to establish (or have) an independent, externally funded research program and to teach effectively at undergraduate as well as graduate levels. Interested candidates should submit a *curriculum vitae* and a description of their research interests, and arrange for at least three letters of recommendation to be sent to: **Experimental Biological Physics Search Committee, Northeastern University, Department of Physics, 110 Forsyth Street, Boston, MA 02115** or via email to EBPsearch@neu.edu.

Northeastern University is an Affirmative Action/Equal Opportunity/Title IX Employer and particularly welcomes applications from minorities, women and persons with disabilities.

ASSISTANT OR ASSOCIATE PROFESSOR OAKLAND UNIVERSITY

The Department of Physics at Oakland University is seeking an Assistant or Associate Professor for a tenure-track or tenured position in Biological or Medical Physics, starting Aug. 15, 2007. A Ph.D. in physics and research experience in medical or biological physics is required. Priority will be given to candidates with existing external funding. The department offers a Medical Physics Ph.D. program, is active in OU's Center for Biomedical Research, and has close ties with local hospitals.

For further information about the department, see <http://www.oakland.edu/physics>. Applicants should submit a curriculum vitae, a description of research interests, a publication list, a statement of teaching philosophy and experience, and arrange for three letters of reference to be sent to: **Dr. Brad Roth, Medical Physics Search Committee, Department of Physics, Oakland University, Rochester, MI 48309**, or by email to roth@oakland.edu. To receive full consideration, applications must be received by January 15, 2007.

*Oakland University is an Equal Opportunity/Affirmative Action Employer.
Women and Minorities are encouraged to apply.*

TENURE-TRACK POSITION IN BIOLOGICAL PHYSICS DEPARTMENT OF PHYSICS, UNIVERSITY OF OTTAWA

The Department of Physics of the University of Ottawa invites applications for a tenure track position in experimental or theoretical biological physics. The appointment will normally be at the Assistant Professor level, but applications for higher ranks will also be considered. The Department is continuing to build its strength in areas such as, but not limited to, biological modeling and computation, neurophysics, computational biology, cellular interactions, genomics, proteomics, molecular biophysics and biophotonics. More information can be obtained at <http://www.science.uottawa.ca/phy/eng/welcome.html>.

Canadians and permanent residents will be given priority. As the University of Ottawa is a bilingual institution, bilingualism is an asset. Applicants are requested to send a curriculum vitae, the names of at least three referees, and a statement of research interests to:

Search Committee (c/o Dr. André Longtin), Department of Physics,
University of Ottawa, 150 Louis Pasteur, Ottawa, Ont. Canada K1N 6N5.
Applications will be reviewed starting in December 2006 until the position is filled.

FACULTY POSITION IN BIOLOGICAL PHYSICS – DALHOUSIE UNIVERSITY

The Department of Physics & Atmospheric Science (<http://www.physics.dal.ca>), Dalhousie University, invites applications from outstanding candidates for a tenure-track faculty position, beginning July 1, 2007. The successful candidate will have a PhD, a strong background in physics, demonstrated research excellence in biological or medical physics, and the ability to teach effectively. Ideal candidates would demonstrate strong funding potential from CIHR, CFI, and NSERC. Our priority is excellence and all researchers in biological physics (**theory or experiment**) or medical physics are encouraged to apply and will be seriously considered. Applicants should submit a current CV and statements of both proposed research directions and teaching interests, and should arrange for at least three letters of reference to be sent to us directly: Chair of the Search Committee; Department of Physics and Atmospheric Science; Dalhousie University; Halifax, Nova Scotia CANADA; B3H 3J5. The review process will begin **October 15, 2006** but applications will be accepted until the position is filled. For specific inquiries, email physics@dal.ca.

All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority.

Dalhousie University is an Employment Equity/Affirmative Action employer. The University encourages applications from qualified Aboriginal people, persons with a disability, racially visible persons and women.

Indiana University Junior Faculty Position in Biological Physics and Biocomplexity

Indiana University's Department of Physics and Biocomplexity Institute announce a junior faculty position in biological physics, broadly defined, to complement their ongoing expansion in this area under Indiana University's Commitment to Excellence Program. Present areas of interest include developmental biology, microbiology, neuroscience, and networks. To complement these strengths we particularly encourage applications from experimentalists who can take existing areas in novel directions or lead the development of new areas, such as molecular biophysics, subcellular structure and dynamics, tissue mechanics and engineering, bioMEMS and medical microdevices. The successful candidate will have strong interdisciplinary interests, a track record of experimental/theoretical collaboration and will collaborate closely with other faculty associated with the Biocomplexity Institute. The expected primary appointment will be in the Department of Physics. However, joint appointments or primary appointments in other departments are possible. Laboratory space will be available in the new Simon Multidisciplinary Sciences Building. Indiana University is an EOAAE. Applications from women and minorities are especially encouraged. Applicants should submit a curriculum vitae and statements of research and teaching, preferably online at <http://biocomplexity.indiana.edu/recruit>, and arrange for submission of a minimum of three letters of reference. Should it be impossible to apply online, applications may be sent by email to: glazier@indiana.edu, or by mail to Dr. James A. Glazier, Faculty Search, Biocomplexity Institute and Department of Physics, Swain Hall West 159, 727 E 3rd St., Bloomington IN, 47405-7105, USA. For more information see <http://biocomplexity.indiana.edu/>.

FACULTY POSITION IN BIOLOGICAL PHYSICS AT GMU

The Department of Physics and Astronomy at **George Mason University**, a growing Department of 24 faculty members, is accepting applications for two tenure track positions at the assistant professor level in an area of experimental physics. Although we will consider applicants in any field, we are especially interested in filling one position in biological physics, and the other in the areas of condensed matter, atomic physics or quantum optics. Successful candidates should have some post-doctoral research experience, and be able to develop an independent, externally-funded research program. The Washington DC area offers prospects of collaboration with physicists at nearby federal labs, such as NIH, NIST or NRL.

Successful candidates should be able and interested in teaching at the graduate and undergraduate levels, and play an active role in the department.

Applicants should complete the online faculty application for position F7462z at <http://jobs.gmu.edu> and MAIL a CV, the names and e-mail addresses of three references, and separate statements on their research and teaching interests to: Dr. Karen N. Sauer, Chair of Search Committee, Physics and Astronomy Department (3F3), George Mason University, 4400 University Drive, Fairfax, VA 22030. Deadline for applications is December 20, 2006.

George Mason University is an Affirmative Action, Equal Opportunity Employer committed to excellence through diversity.

POSTDOCTORAL POSITION in BIOLOGICAL PHYSICS

University of California San Francisco

A postdoc position is open immediately in theoretical/computational study of complex biological systems. Candidates with strong background in physical sciences who are interested in working in an interdisciplinary environment at an excellent biological institution are encouraged to apply. There will be access to wet benches if the candidate prefers to also carry out some experimental work.

Applicants please send CV, research interest and names of references to Prof. Chao Tang (Chao.Tang@ucsf.edu).