THE BIOLOGICAL PHYSICIST

The Newsletter of the Division of Biological Physics of the American Physical Society

Vol 9 № 4 October 2009

In this Issue

We asked you to complete the TBP Reader Opinion Survey, and you responded with gusto! Now you can see the opinions of your colleagues, summarized on page 2. This issue of THE BIOLOGICAL PHYSICIST issue also brings you an in-depth interview with Rice University biological physicist (and APS Fellow) Michael Deem. And of course, all the usual suspects – PRE & PRL Highlights, and some important job ads and DBP election announcements.

– SB & CS

FEATURE

WHAT AN APS DBP BIOLOGICAL PHYSICIST NEWSLETTER READER WANTS

The TBP editors would like to express our sincere gratitude to the 161 BP Division members (out of 1800+) who took the effort to complete our Newsletter Reader Survey. The responses to the specific survey questions were not all that surprising, but the written comments were very enlightening and have provided useful suggestions for material that we will attempt to include in future Newsletters. The survey results: ~50% of the respondents read or review at least 50% of the Newsletter on a regular basis, and ~60% are satisfied with the Newsletter. All respondents equally valued the announcements, Table of Contents (TOC) Highlights, feature articles and employment advertisements. In terms of potential new material that respondents would like to see in the Newsletter, the following were preferred (in order of priority): a listing of new DBP members and a listing of new biophysics-related faculty appointments (newly joined or appointed, respectively, since the last TBP issue), expanded biological physics journals TOCs, and expanded employment opportunity (faculty and postdoc fellowship) announcements. Eighty percent of the respondents were from academic institutions, ~9% from National Research Labs, and ~6% from for-profit institutions. And ~56% were faculty/senior researchers, ~19% graduate students, ~14% postdoctoral fellows, and ~6% technical research staff.

Both question responses and specific written comments highlighted reader desire for more interviews of funding agency program officers (e.g., Denise Caldwell, Kamal Shukla and Krastan Blagoev interviews that have appeared in past issues). We attribute this desire to an interest in getting to know our funding officers and what they are looking for in proposals, and what research areas they are expecting to fund in the near-term and down-the-road. We will now make an effort to include interviews of DOE, NIH, HHMI program officers in future issues. These interviews are particularly relevant in that NIH in 2009 initiated a Physical Science-Oncology Centers (U54) program, and NSF's continuing efforts to support the integration of theoretical and applied physical science activities into other disciplinary research (e.g., biology) areas. The editors are also working on including a more comprehensive listing of biophysics journals TOC's into the newsletter. Keep your eye out for these and additional improvements to your The Biological Physicist Newsletter.

In closing, the editors wish to thank all those who expressed kudos for the efforts of the editors and the value of the Newsletter to their research and professional careers. We also want to reiterate to all Biological Physics Division members that this is your Newsletter! And its continued relevance to you is dependent upon the input you provide to the editors. So if you have a particular subject or material that you would like appear in the Newsletter, do not hesitate to contact us:

Christopher Smith, UCSD – csmith@ctbp.ucsd.edu

Sonya Bahar – bahars@umsl.edu

FEATURE

AN INTERVIEW WITH MICHAEL DEEM

Sonya Bahar

Michael Deem, of Rice University, studies problems ranging from protein structure to vaccines and the spread of epidemics. In 2006, he was elected a fellow of the American Physical Society, which cited his "elegant and pioneering work on the connection between spin glass physics and complex phenomena in biology ranging from the immune system response to the dynamics of evolution." Deem recently talked with The Biological Physicist about his research.

How did you become interested in science? Did you always want to be a scientist? How did you become interested in biological physics in particular?

I went to public high school in New Jersey. I enjoyed the math and science classes from my teachers in school. At that time, we had state-wide science competitions (The New Jersey Science League) in biology, chemistry, and physics. I really enjoyed those, even coming in 1st in physics for New Jersey one year. Since I liked science, I decided to go to Caltech, which I also enjoyed.

My interest in biological physics came rather late. I had studied condensed matter for my Ph.D. and felt that I should learn more about biology. So, I worked for a biotech company for a year and began to read widely before beginning my postdoc with David Nelson.

What led you to work on protein structure, and on macromolecules involved in immune responses in particular?

I had a background in Monte Carlo simulation, with an emphasis on collective moves. Protein evolution in the laboratory was very interesting to me because in the 90's people were thinking about how to design more effective strategies to change and evolve protein function, just as we would think about how to design more effective Monte Carlo moves. I heard a very interesting talk by Pim Stemmer, a protein engineer, and his method of 'DNA shuffling,' and this got me thinking about whether we could design other ways to evolve proteins rapidly.

The immune system had always been of general interest to me as an example of a real-time evolving system. I became specifically interested in it when I was getting my annual flu shot at Costco and the nurse told me that if I got the flu shot that year and not the next year, I might have a greater chance of getting the flu the next year. That really fascinated me. I thought about it for about five years before publishing my first paper on the immune system. I think it may have been the first paper in PRL about vaccines.

A major focus of your research is on vaccine design, and you have been interviewed by the popular press a number of times about a topic of great popular concern, the flu vaccine. Has this year's swine flu "epidemic" (or just "scare"?) surprised you in any way from a scientific point of view? What about press coverage of swine flu - do you feel that has been overdone, or has it been accurate?

Yes, very early on I was interviewed by a number of media in Houston. The novel H1N1(2009) ("swine flu") did have a number of peculiarities: it came out in late spring, seemed to have a high mortality, and seemed to infect young adults disproportionately. These were definitely concerning features. And everyone remembers the 1918 flu, which was caused by an H1N1 variant. The 1918 virus is quite different from the other H1N1 strains around now, so much so that only people who were exposed to the 1918 or 1957 viruses are expected to have any immune protection against this new virus. I made an effort in each of my interviews to try to mention that it is normal at the beginning of an epidemic for only the most severe cases to be seen, and for the apparent

mortality to be much higher than it will eventually turn out to be.

After the initial scare, most of the media questions seemed related to the potential evolution of the novel H1N1. This is, to me, also the most scientifically interesting question about the virus. How much is the virus evolving, how does this depend on transmission of the virus and on vaccine usage? Can we predict how long the current vaccine will be efficacious before it needs to be updated due to evolution of the virus?

What do you see as the next major developments to come in vaccine design over the next decade? What role will physics play in those developments?

There will be some technological changes. For example, with influenza, the virus will likely start to be produced in cells rather than in eggs. In addition, it is likely that DNA based vaccines, for which your own body makes the proteins that elicit an antibody response, will be more broadly used. Molecular biology and biotechnology are the main technological drivers for these changes. It is possible that single-molecule physics will contribute, maybe in the context of pathogen sensing or testing.

I hope there will also be some changes to the vaccine design process for those pathogens that evolve rapidly. For influenza: I have a theory for vaccine efficacy and it could supplement or replace some of the animal model studies that are currently used; I and others have theories and models for the pressure of the vaccine on the virus, and this coevolution should probably be taken into account during vaccine design; finally, theories should be developed to predict the consequences of the reassortment that occurs among flu strains, since all the 'new' strains arise by reassortment.

More generally, can we predict patterns of virus evolution, can we predict the probability distribution for the emergence of new viruses, and can we quantify the contribution of reassortment, recombination, and horizontal gene transfer to virus evolution?

Physics can contribute based upon a cornerstone philosophy that emphasizes the importance of randomness, diversity, and correlations. The immune system is finite, and how the space of possible antibodies is searched in pursuit of stochastically evolving pathogens is a question that statistical physics can rather uniquely answer.

One research interest listed in your group's website is "Newton's laws of biology". What do you mean by that? To what extent do you think that clear-cut rules of biology can be established, in the style of basic theories of physics?

I have to thank the DARPA project on Fundamental Mathematical Laws of Biology (FunBio) for inciting my interest in this area. The question is, can we find mathematical expressions for some reasonably fundamental aspects of biology? Describing just a subset of biology in this way would do for a start. One area where we have made some progress is modularity and hierarchy in biology. Biology has perhaps arisen in a symmetry-breaking phase transition out of organic chemistry. The order parameter of this phase transition is modularity, and the driving force is environmental change and horizontal gene transfer. Analyses, by other groups, of evolving bacterial systems seems to support this concept, and development and physiology seems to follow this concept as well. An equation might look something like $p_E - p_0 = M'/R$, where p_E is environmental pressure, M' is the rate of growth of modularity, and R quantifies the ruggedness of the fitness landscape.

What is a zeolite? Could you describe some of your work in this area?

Zeolites are very beautiful, symmetric crystals with large holes, pores, and channels. They are widely used for separation, ion exchange, and energy applications. They are sometimes called molecular sieves, and the word comes from two Greek words that mean boiling stone -- they were first discovered near volcanoes.

There are about 190 known zeolites. I wondered what the space of possible zeolites should look like, and my collaborators and I have found over 2.7M computationally predicted zeolite-like materials so far. The task now is to find materials in this database with potentially interesting properties and then to understand enough about zeolite nucleation to suggest ways of making them.

You are on the Board of Governors of the Institute for Complex Adaptive Matter. Could

you describe the institute, how it was founded, and what its mission is?

I think ICAM was started by the condensed matter physicist David Pines when he was at Los Alamos and UIUC. Daniel Cox at UC Davis is a co-director and helped to set up ICAM as a UC research program to lead the effort forward, and is now CEO. ICAM is now a major, international collaboration network, with regular funding from the National Science Foundation. It supports workshops, student exchange, and junior investigator exchange between participating groups.

A formal history is listed here:
http://icam-i2cam.org/icamnews/?p=113
A mission statement is found here:
http://www.icam-i2cam.org/?page_id=2

ICAM describes itself as "an open distributed experiment-based dynamic multi-institutional partnership whose purpose is to identify major new research themes in complex adaptive matter and to nucleate and conduct collaborative research and scientific training that links together scientists in different fields and different institutions. In so doing, ICAM encompasses chemical, physical and biological perspectives in its research themes." The web site is www.icam-i2cam.org.

Did you always have an interest in evolution, or did you become interested in the broader problem of evolution as an outgrowth of your work on macromolecular structure?

My interest in evolution came through the analogy with statistical mechanics: searching through configuration space for regions of low free energy is analogous to searching through sequence space for regions of high fitness. In some of the simpler physical models, the analogy can be made exact: fitness is like energy, mutation rate is like temperature, and there is an entropic term. Mapping the dynamics of evolution to a bosonic quantum Hamiltonian allows one to derive this exact mapping.

You recently published studies in PRL and in PRE on the emergence of modularity in models of evolution and in networks. Could you describe some of this work, and explain, for readers of the DBP newsletter who may not be familiar with this issue, why modularity is so important?

The question I was interested in is the following: what can be the driving force for modularity in Nature? We know that modularity and hierarchy are pervasive in biology (e.g. atoms, amino acids, secondary structures, protein domains, proteins, multi-protein complexes, pathways, cells, individuals, communities, species, and so on). I wanted to understand what one could say about why this modularity exists. Another way to ask this question is, how did biology nucleate out of organic chemistry?

What we showed is that if one starts with a Hamiltonian that is permutation symmetric and allows the couplings of the Hamiltonian to evolve, there is a symmetry breaking phase transition. The couplings arrange themselves in a modular way. This happens due to environmental fluctuations that force the system to have an efficient response function and to the dynamics of horizontal gene transfer that allows for modules to be exchanged between individuals. What biology is doing is converting the NP complete problem of a search of the full sequence space to a polynomial time problem of searching the reduced, modular subset of sequence space. Even though less advantageous ground states are found in the modular subspace, the dynamics is so much more efficient that on biological time scales, the modular subspace leads to a greater average fitness.

This spontaneous emergence of modularity is a phase transition. The order parameter is modularity. The control variables are environmental pressure, horizontal gene transfer rate, and ruggedness of the fitness landscape.

You had a recent PNAS paper demonstrating the "evolution of evolvability". At the outset of that paper, you mentioned that some people feel this is a controversial issue because of the problem of causality in evolution. Could you briefly explain these issues for the readers?

There was a sort of folk-theorem in evolutionary biology that evolvability, the ability of a system to evolve, was not a selectable trait. The argument was that since evolvability is a property describing future behavior, causality would seem to prevent selection for evolvability in the present. We know, however, many systems that seem to have come into being due to the usefulness of their

evolvability: for example, the immune system with its very high evolution rate that is able to remember pathogens.

What convinced me to write the paper was a correspondence with a smart French evolutionary biologist who, however, seemed convinced that evolvability was not a selectable trait. So, what we showed is that if the environment changes more, and the rates of mutation and horizontal gene transfer can themselves change, then those *a priori* rates of change evolve to higher values when the environment changes more.

Do you feel that the idea of the "evolution of evolvability" has become more accepted over the past few years, based on studies like your PNAS work, other studies of optimization of mutation rate, such as Clune et al., *PLoS Comput. Biol.* 4(9):e1000187, 2008 and Bedeau & Packard, *BioSystems* 69:143-162, 2003, as well as essays by biologists such as Massimo Pigliucci (e.g., *Nature Reviews Genetics* 9:75-82, 2008)?

Yes, there has been a big change in the last five years. One of the early researchers in the area, Susan Rosenberg, even won the NIH Pioneer award this year.

What advice or suggestions do you have for young scientists entering interdisciplinary research?

The wonderful thing about science is that as long as one can secure some modest funding, it is possible to study whatever strikes ones fancy. The new areas are where the least is known. While this can be uncomfortable to some, it means the progress in these areas can be dramatic. Interdisciplinary research is a great opportunity for young scientists.

Do you have any predictions for major new trends in interdisciplinary science, either in terms of new research directions or in terms of the effects of the current economic situation on NSF/NIH funding?

I suspect there may be a bit of retrenchment in support for interdisciplinary work in the short term (an increase of modularity due to the current economic chaos). The general theme of all disciplines paying more attention to and seeking to understand biology is a long term trend. Even some pure mathematicians are now thinking about biology.

Have you experienced a cultural divide between colleagues with a pure physics background and those with a pure biology background? Do you see evidence of scientists being able to speak each other's language across disciplines more easily now than, say, a decade ago?

One big distinction is that in physics, theory is appreciated and an experimentalist gets credit for testing a theoretical prediction. The latter is not the case in biology.

To a biologist, modern theory often means data mining or bioinformatics, rather than, say, statistical physics. Biologists now do measure distributions of many properties, sometimes at the single cell or single molecule scale, so I think there is an opportunity for physics to collaborate to explain these observations.

What are the most exciting problems that you are working on these days?

On the practical side, my group and I are looking at ways to detect the emergence of new viral strains and how environment fluctuations enhance modular structure in a variety of systems. We continue to explore the theory of spontaneous emergence of modularity. We seek a deep understanding of modularity and hierarchy in biology.

Where do you see your work going over the coming decade?

Biology and medicine will probably continue to inspire my work in the future.

DBP ANNOUNCEMENT

November 2009 DBP Elections
CALL FOR Additional NOMINATIONS

Dear DBP Members,

We are in the last leg of the election process to fill three positions for the 2010 Executive Committee of DBP: one Vice-Chair and two Members-at-Large. The Vice-Chair shall serve for one year beginning in March 2010, then for one year as the Chair-Elect in 2011, then for one year as the Chair in 2012, and finally for one year as the Past Chair in 2013. The Members-at-Large shall serve three years beginning in
March 2010. 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 and qualified candidates (who could be yourself) (minimal years of DBP membership required) to the Nomination Committee for further consideration. The Nomination Committee Members are listed on the DBP website: http://www.aps.org/units/dbp/govern.cfm.

Please submit possible candidates for any of the openings with a brief statement why you think certain individual is a good candidate for the respective position to the Committee Chair, Dr. James Glazier at glazier@indiana.edu. If you have any questions, for example, office responsibilities, please direct them to Dr. Tom Nordlund at nordlund@uab.edu .

This invitation is open until November 25, 2009, though late nominations may be accepted. The final slate of candidates will be assembled by the Committee after Nov. 25 and hopefully the elections will take place early December.

Dr. Tom Nordlund
Secretary-Treasurer, DBP

Dr. James Glazier
DBP Nominations Committee

DBP ANNOUNCEMENT

Candidate Statements

While more candidates may be nominated (see announcement on previous page), we present here the biographies and statements of the current candidates for Division of Biological Physics positions.

Statements/Biographical Information: Vice-Chair

Pupa Gilbert

Trained in biophysics at the University of Roma 1 "La Sapienza", Pupa Gilbert has 24-years of experience in this fascinating field. She has been a staff scientist at the Italian CNR in 1988-2000, and at the Swiss Institute of Technology in 1994-1998, until she joined the Physics Department at University of Wisconsin-Madison in 1999 as a full professor. She served as Scientific Director of the Synchrotron Radiation Center in 2002-2006, and on the Scientific Advisory Committee of the Canadian Light Source 2004-2009. Her research in biophysics included structure and dynamics of cell membranes, then brain cancer therapies, and since 2004 biomineralization, and the formation mechanisms of shells, sea urchin biominerals, bones, and teeth. She has been a member of the APS since 1990, and has recently been nominated for APS fellowship. She organized the Spectromicroscopy Symposium at the APS March Meeting in 2005. She won many awards, including the Outstanding Young Persons of the World Award in 1997 for developing synchrotron spectromicroscopies for bio-systems, was knighted by the President of Italy in 2001 for the brain cancer therapy she developed, and received the American Competitiveness and Innovation Award from the NSF in 2008 for her contributions to biomineralization. She published 116 articles in biological physics including several in BJ, JSB, Cancer Research, Science, PRL, PNAS, and JACS.

Statement: As a biophysicist I am often asked: what is Biological Physics? My answer is "Whatever is interesting", to quote the late G. N. Lewis. Any aspect of the life sciences that triggers the interest and contribution of a physicist is biophysics. This is why the field is rapidly evolving and attracting a growing number of physicists, and why DBP is expanding. I look forward to contributing to the DBP growth and success and believe that my 24-year experience in this field and my organizational and management skills will serve the division well.

Physicists young and senior entering biological physics face the challenges of their new field as well as finding funding. If elected, I will work to help the members of DBP learn about cutting-edge research developments as well as funding opportunities through workshops, symposia, and the DBP newsletter.

Qing Nie

Qing Nie is a Professor of Mathematics and Biomedical Engineering at University of California, Irvine (UCI). He received Ph.D. in Applied Mathematics (1995) at The Ohio State University. Prior to joining UCI in 1999, he was at University of Chicago working in the areas of computational fluid and solid mechanics. Since 2001, his research interests have been on systems biology, biophysics, stem cell, and morphogenesis. He is a Chancellor Fellow, the Director of Center for Mathematical and Computational Biology, an associate director of a Ph.D. training program on Systems Biology funded by HHMI and NIH, and one of the principle investigators for the NIH National Center for Systems Biology at UCI. He is also member of NIH study sections and NSF panels, and editorial boards for several journals.

Statement: Biophysics, a relative new discipline within physics, is more established than most of the other emerging disciplines at the interface between biology/medicine and other fields. Such status of biophysics provides challenges as well as ample opportunities in funding, training, and professional development. Promoting DBP members and facilitating their research within physics and the broad scientific community should be the top priority of DBP. New

awards, private endowments, international collaborations, close interactions with societies in medicine/biology, developing niche clusters within DBP, and lobbing funding agencies as a professional organization are a few of possible mechanisms that DBP can utilize to achieve our goals.

Over the past several years my research has been at the nexus of mathematics, physics, and biology and I have been actively participating in interdisciplinary education and promoting interdisciplinary research between biology and physical sciences. If elected, I would do my best to work for the interests of DBP and its members through our successful existing activities and developing initiatives.

Statements/Biographical Information: Member-at-Large

John Bechhoefer

John Bechhoefer is a professor in the Department of Physics at Simon Fraser University. He studied Astronomy and Astrophysics (AB 1982) at Harvard and earned his MSc (1985) and PhD (1988) in Physics from the University of Chicago. Prior to joining SFU in 1991, he spent two years as a postdoc in France, at the Univ. de Paris (Orsay) and the Ecole Normale Supérieure de Lyon. Trained in experimental nonlinear dynamics and soft condensed matter, he began to work on biological systems in 2000. The focus of his research has been on the study of DNA replication and on various single-molecule aspects of DNA. He has also been interested in the relations of control theory to both physics and biological systems. Bechhoefer has served on the Editorial Board for Complex Fluids and Biological Physics of Physical Review E and as Vice Chair / Chair / Past Chair of the Division of Condensed Matter and Materials Physics of the Canadian Association of Physicists. In 2004, he acted as Canadian liaison during the organization of the APS March Meeting in Montreal.
Statement: The Division of Biological Physics has been a model for a successful new division within APS. Its activities and membership have grown rapidly, helping to create and nurture a new subfield of physics. At the same time, the DBP sessions of the APS have consistently managed to field innovative focus sessions that rival the best specialized meetings. Keeping this level of excellence requires work, and I would bring both breadth of scientific background and experience in organizing a meeting program to these tasks.

Margaret Cheung

Margaret Cheung is an Assistant Professor of Physics at the University of Houston. She received her Ph.D. in Physics with specialization in Biophysics from the University of California at San Diego (2003) and studied Chemistry (B.Sci. 1994) at the National Taiwan University. Prior to joining UH in 2006, she spent three years at the University of Maryland Institute for Physical Science and Technology as a Sloan Postdoctoral Fellow with specialization in Computational Biology and Bioinformatics. Her research interests include computer simulation and physical modeling of biomolecular dynamics in a cellular environment. She is a member of the American Physical Society (Biological Physics Division), the Biophysical Society, and the American Chemical Society.

Statement: Biological physics has been part of an interdisciplinary effort to reveal the fundamental principles and mechanisms of how living organisms respond to their surroundings. The first challenge for the Division of Biological Physics is to continue to provide resources for members of the division to explore new science at the forefront of biology and physics, as well as to highlight research opportunities for students in biological physics. The second challenge for the Division of Biological Physics is to provide a core of transformative research, fostering new ideas for solving complex problems with physicists in other APS divisions. The last challenge is to attract students and build a physics workforce for modern biology. My education and research experience in interdisciplinary fields provides me with the skills needed to meet these challenges, and will bring a useful perspective as Member-at-Large of the Division of Biological Physics.

SuPing Lyu

SuPing Lyu is a Principal Scientist and a Technical Fellow of Medtronic Inc. He received his Ph.D. in Chemical Engineering from the University of Minnesota (2000). Dr. Lyu's research focuses on the phenomena at the interface between materials and biological systems, especially at the interface between biomedical devices and the tissues. Biological reactions to the foreign materials and therapeutic actions of the devices are two examples. Dr. Lyu is a member of the American Physical Society (Biological Physics Division and Polymer Physics Division), the American Chemical Society (ACS) and the Society for Biomaterials (SFB). He has chaired a few sessions and symposia at the APS annual meeting (2007), the SFB annual meeting (2007) and the IEEE/EMBC meeting (2009).

Statement: I strongly believe research is not only for the growth of science but also for the development of technology. In the past half century, biotechnology industry has developed many creative products and methods; a lot of them are based on some biophysical principles. Unfortunately, many of them have been poorly understood. I would like to promote the awareness of the great value of biophysics for the biotechnology by facilitating the communications between the biophysical community and the medical device industry.

Jianpeng Ma

Dr. Jianpeng Ma is professor in the Department of Biochemistry and Molecular Biology at Baylor College of Medicine. He also holds a joint appointment in the Department of Bioengineering at Rice University. The fundamental foci of Dr. Ma's research are to develop efficient new computational methods to overcome major bottlenecks in experimental investigations, and to directly address significant and complex biological problems. Supported by voluminous funding from federal and private agencies, Dr. Ma's research group has pioneered a series of novel multiscale computational methods for simulating, refining and modeling flexible biomolecular complexes. Dr. Ma is also active in scientific outreach, and he has organized many national and international scientific conferences. In recognition of his outstanding contributions to biophysics and structural biology, Dr. Ma has received many awards, including the prestigious 2004 Norman Hackerman Award by the Welch Foundation. In 2007, he was elected as a Fellow of the American Physical Society (APS). In 2008, he was elected as a Fellow of the American Association for the Advancement of Science (AAAS) and most recently he was recognized by Michael E. DeBakey Excellence in Research Award.

Statement: Biological physics is a new and active interdisciplinary research field. It covers a wide range of expertise, of which the representative disciplines have little overlap. In this post-genomic era, the fundamental landscape of biological study is much more quantitative. Since biological processes obey the basic laws of physics, biological physics aspires to reveal the molecular mechanisms of biology. However, the term "biological physics" often means different things to a biology-oriented scientist versus a physics-oriented scientist. Thus, it is pressing and vital to integrate the knowledge and training of scientists between these two otherwise remote fields.

Being a young biophysicist himself, Dr. Ma, if elected, will focus on developing the careers of junior scientists. He will also focus on promoting the DBP in the biological and biomedical communities, in which the influence of physically oriented research is traditionally much weaker. In this regard, Dr. Ma's joint faculty appointment between Baylor and Rice is particularly advantageous, as he already works within the life sciences. Thus, Dr. Ma would like to help the DBP in several ways: (1) to personally participate in organizing, or encouraging others to organize, programs in APS annual meetings to promote research at the intersection of biology and physics, (2) to maximize the awareness and participation of young trainees, especially biologically oriented ones, in the activities of the DBP, (3) special emphasis will also be given to under-represented minority students as Houston and South area of the country belong to one of the largest districts with such students in the United States. This last aspect can be integrated into any educational outreach effort in APS. Dr. Ma is heavily involved in training programs ranging from K-12 students, high school teachers, graduate students and postdoctoral fellows.

David Rabson

David Rabson is an associate professor of physics at the University of South Florida. His research interests include statistical analysis of ECIS electrical-cell-substrate-impedance-sensing) data; recently, he and his collaborators have demonstrated that noise correlations of time series can distinguish cancerous from non-cancerous cultures.

Statement: The DBP is one of two main foci for biophysical research in North America and of the two the one, historically and culturally, more closely tied to soft-condensed-matter and statistical physics broadly understood. To flourish, the Division needs to show that this tie and this breadth of background benefit researchers and students. In practical steps, this means maintaining a strong presence at the APS March meeting and keeping open communication with the editors of *Physical Review E*. It is also important to continue the superb efforts of the *Biological Physicist* (the divisional newsletter) in disseminating news and developing a sense of shared purpose.

PRL HIGHLIGHTS

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

7 August 2009

Volume 103, Number 6, Articles (06xxxx)
Articles published 1 August – 7 August 2009
http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=103&Issue=6

Landau-type Order Parameter Equation for Shear Banding in Granular Couette Flow
Priyanka Shukla and Meheboob Alam
Published 7 August 2009 // 068001

Extinction Rate Fragility in Population Dynamics
M. Khasin and M. I. Dykman
Published 4 August 2009 // 068101

Steering Chiral Swimmers along Noisy Helical Paths
Benjamin M. Friedrich and Frank Jülicher
Published 6 August 2009 // 068102

Thymic Selection of T-Cell Receptors as an Extreme Value Problem
Andrej Košmrlj, Arup K. Chakraborty, Mehran Kardar, and Eugene I. Shakhnovich
Published 7 August 2009 // 068103

Analysis of Genetic Toggle Switch Systems Encoded on Plasmids
Adiel Loinger and Ofer Biham
Published 7 August 2009 // 068104

14 August 2009

Volume 103, Number 7, Articles (07xxxx)
Articles published 8 August – 14 August 2009
http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=103&Issue=7

Observation of a Soft Mode of Elastic Instability in Liquid Crystal Elastomers
Andrej Petelin and Martin Čopič
Published 14 August 2009 // 077801

Accumulation of Microswimmers near a Surface Mediated by Collision and Rotational Brownian Motion
Guanglai Li and Jay X. Tang
Published 12 August 2009 // 078101

Wake Tracking and the Detection of Vortex Rings by the Canal Lateral Line of Fish
Jan-Moritz P. Franosch, Hendrik J. A. Hagedorn, Julie Goulet, Jacob Engelmann, and J. Leo van Hemmen
Published 13 August 2009 // 078102

Directional Locking and the Role of Irreversible Interactions in Deterministic Hydrodynamics Separations in Microfluidic Devices
Manuel Balvin, Eunkyung Sohn, Tara Iracki, German Drazer, and Joelle Frechette
Published 11 August 2009 // 078301

Melting of Iron under Earth's Core Conditions from Diffusion Monte Carlo Free Energy Calculations
Ester Sola and Dario Alfè
Published 14 August 2009 // 078501

21 August 2009

Volume 103, Number 8, Articles (08xxxx)
Articles published 15 August – 21 August 2009
http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=103&Issue=8

Hydrodynamic Phase Locking of Swimming Microorganisms
Gwynn J. Elfring and Eric Lauga
Published 17 August 2009 // 088101

28 August 2009

Volume 103, Number 9, Articles (09xxxx)
Articles published 22 August - 28 August 2009
http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=103&Issue=9

No Soft Matter, Biological & Interdisciplinary Physics Articles Published in this Issue

4 September 2009

Volume 103, Number 10, Articles (10xxxx)
Articles published 29 August – 4 September 2009
http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=103&Issue=10

Direct Measurement of the Nonconservative Force Field Generated by Optical Tweezers
Pinyu Wu, Rongxin Huang, Christian Tischer, Alexandr Jonas, and Ernst-Ludwig Florin
Published 1 September 2009 // 108101

Logarithmic Decay in Single-Particle Relaxation of Hydrated Lysozyme Powder
Marco Lagi, Piero Baglioni, and Sow-Hsin Chen
Published 1 September 2009 // 108102

Fisher Waves in the Strong Noise Limit
Oskar Hallatschek and K. S. Korolev
Published 2 September 2009 // 108103

Dynamical Reconnection and Stability Constraints on Cortical Network Architecture
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BRIEF REPORTS

Job Advertisement

Postdoctoral Positions at the

R. D. Berlin Center for Cell Analysis and Modeling

University of Connecticut Health Center

Up to 4 post-doctoral positions in computational cell biology, numerical methods, bioinformatics and data visualization are open for recent Ph.D. graduates in the fields of physics, computer science, mathematics or biophysics. The Berlin Center for Cell Analysis and Modeling (http://www.ccam.uchc.edu/) at the University of Connecticut Health Center is a multi-disciplinary research center focused on development of new photonic, microscopic and computational approaches for the study of cellular systems. It is the home of the *Virtual Cell* project (vcell.org). The research projects that will be pursued by the successful candidates will benefit from strong interactions with the VCell team. Salary will be commensurate with experience and will be at least at standard NIH levels; an outstanding fringe benefit package is also available. Applicants should submit a letter of application, curriculum vitae, and names (with address and e-mail address) of at least three references.

Applications should be e-mailed to les@volt.uchc.edu.

UCHC is an Equal Opportunity Employer M/F/V/PwD

Job Advertisement

Faculty in Cellular Neuroscience

R. D. Berlin Center for Cell Analysis and Modeling

University of Connecticut Health Center

The Berlin Center for Cell Analysis and Modeling (http://www.ccam.uchc.edu/) at the University of Connecticut Health Center is a multi-disciplinary research center focused on development of new photonic, microscopic and computational approaches for the study of cellular systems. In the spring of 2010, we will jointly occupy a new $50 million/117,000 sq. ft research facility with the University's Stem Cell Institute and Department of Genetics and Developmental Biology. Strong synergies with these research groupings are anticipated. We are seeking additional faculty whose research programs elucidate nanoscale processes that control cellular function. Areas of special interest include: synthetic biology, analysis and design of cell regulatory circuits, computational cell biology, nanofabrication, nanomanipulation, micro- and nano-sensors, micro- and nano-fluidics, single molecule microscopy, non-linear optical contrast mechanisms, and new modalities for high resolution live cell imaging. Applications are welcome at any level and investigators with established funded research programs are especially encouraged to apply. Opportunities to participate in training of graduate students in cell biology, physical sciences and engineering disciplines will also be available. Salary and startup package will be commensurate with experience and level of appointment. The closing date for receipt of applications is November 10, 2009. Applicants should submit a letter of application, curriculum vitae, research plan and statement of teaching interests, and names (with address and e-mail address) of at least three references.

Applications should be e-mailed in RTF or PDF format to **nanocell@uchc.edu** or submitted via the University of Connecticut Health Center Employment Services website, https://jobs.uchc.edu.

UCHC is an Equal Opportunity Employer M/F/V/PwD

Job Advertisement

Assistant Professor in Quantitative Biology

at

Oakland University

Rochester, Michigan

Oakland University is seeking an outstanding researcher in Quantitative Biology, starting January 1, 2010. Applicants from a wide variety of disciplines are welcome, including bioinformatics, mathematical modeling, biostatistics, and bioengineering. Applicants should possess a PhD in mathematics, biology, engineering, or a closely related field to the area of Quantitative Biology, and preferably additional postdoc experience. Teaching experience at the college level, or the potential to be an outstanding teacher, and extensive research experience in the area of Quantitative Biology is required. The faculty member will be hired into a department that best fits the background of the applicant, such as mathematics and statistics, biological sciences, or electrical & computer engineering. Candidates for this position must engage in interdisciplinary research that crosses department boundaries, and must use mathematical or numerical methods to solve important biomedical problems. The applicant will initially focus on developing a world-class, externally funded research program. In the long term, the applicant should have the potential to become a researcher/educator who can help establish and lead a planned Quantitative Biology PhD program. The ideal candidate should fit well with several of the established strengths at Oakland University, and should be able to contribute to biomedical research at the new Oakland University William Beaumont School of Medicine.

Applicants should submit a curriculum vitae, a description of research interests, and arrange for three letters of reference to be sent to:

Dr. Brad Roth, Quantitative Biology Search Committee
Dept. Physics, Oakland University, Rochester, MI 48309

or by email to **roth@oakland.edu**. To receive full consideration, applications should be received by October 15.

Oakland University is an Equal Opportunity Employer. Women and Minorities are encouraged to apply.

Job Advertisement

ASSISTANT PROFESSOR OF PHYSICS

at

UNIVERSITY OF ALABAMA at BIRMINGHAM (UAB)

The UAB Department of Physics, www.phy.uab.edu, invites applications for a tenure-track faculty position at the assistant professor level in **Bio Micro- & Nano-Electromechanical Systems (BioMEMS/NEMS) and other nanoscale structures for biomedical applications.**

Preference will be given to candidates with a Ph.D degree in physics, but all related disciplines are invited to apply. The faculty member will be affiliated with the Center for Nanoscale Materials and Biointegration (CNMB – www.uab.edu/cnmb) at UAB and will have access to the core facilities supported by the center. The successful applicant will be expected to seek and obtain extramural research funding and have a strong commitment to excellence in teaching and supervising research at the graduate and undergraduate levels. Applicants should send a CV, a description of their research plans, a statement of teaching interests and philosophy, and the names (inc. address, tel., fax, and email address) of at least three references and arrange for at least one letter of reference to be sent to:

Yogesh K. Vohra, Chair – Search Committee
Department of Physics, 1530 3rd Ave. S., CH 310, UAB, Birmingham, A 35294-1170
ykvohra@uab.edu

Screening of applicants will begin immediately, and continue until the position is filled. Partial support for this faculty position is provided by the National Institute of Biomedical Imaging and Bioengineering (NIBIB) under a P30 grant mechanism with funds from the American Recovery and Reinvestment Act (ARRA) of 2009. The Department of Physics and the University of Alabama at Birmingham are committed to building a culturally diverse workforce and strongly encourage applications from women and individuals from underrepresented groups. UAB has an active NSF-supported ADVANCE program and a Dual Career Assistance Program to support and offer resources to help spouses and partners of newly recruited UAB faculty.

UAB is an Affirmative Action/Equal Employment Opportunity employer

Job Advertisement

ASSISTANT PROFESSOR – CHEMISTRY

at

UNIVERSITY OF ALABAMA at BIRMINGHAM (UAB)

The Department of Chemistry at the University of Alabama at Birmingham seeks candidates for a tenure-track faculty position at the assistant professor level in **NANOMATERIALS** with applications in nanoscale therapeutics and biomedical imaging. We are especially interested in an individual whose research interests involve synthesis of polymeric nanomaterials of biomedical relevance. The faculty member will be affiliated with the Center for Nanoscale Materials and Biointegration (CNMB – www.uab.edu/cnmb) at UAB and will have access to the core facilities supported by the center.

Partial support for this faculty position is provided by the National Institute of Biomedical Imaging and Bioengineering (NIBIB) under a P30 grant mechanism with funds from the American Recovery and Reinvestment Act (ARRA) of 2009. Candidates with research experience that complement existing strengths within the Department and School will be given preference. The University of Alabama at Birmingham (UAB) is a comprehensive research university and medical center with over 1,700 full-time faculty and 16,000 students. UAB is ranked among the top tier research universities in terms of federal grant support. The Department of Chemistry offers B.S. (ACS-Certified), M.S., and Ph.D. degrees and has major research thrust areas in drug discovery, structural biochemistry, biophysical chemistry, and polymer/advanced materials. Applications will be considered beginning November 1, 2009. Applications past that date will be considered until this position is filled. Candidates must have a Ph.D. degree in chemistry, postdoctoral or equivalent experience, and a commitment to teaching excellence at undergraduate and graduate levels.

Qualified applicants should send a letter indicating their interest, detailed curriculum vita, description of research plans, a statement on their teaching experience and philosophy, and the names and contact information of a minimum of four references. At least one reference should be able to address your teaching potential, experience, and ability. Electronic submissions are encouraged and should be sent to Ms. Laura Knighten (knighten@uab.edu), or mailed to the Department of Chemistry, Nanomaterials Faculty Search, University of Alabama at Birmingham, Suite 201, 1530 3rd Avenue South, Birmingham, AL 35294-1240.

The Department of Chemistry and the University of Alabama at Birmingham are committed to building a culturally diverse workforce and strongly encourage applications from women and individuals from underrepresented groups. UAB has an active NSF-supported ADVANCE program and a Dual Career Assistance Program to support and offer resources to help spouses and partners of newly recruited UAB faculty. UAB is an Affirmative Action/Equal Employment Opportunity employer.

Job Advertisement

The Bruno H. Zimm
Biological Physics Postdoctoral Fellowship

The Center for Theoretical Biological Physics (CTBP) at the University of California, San Diego invites applications for the Bruno H. Zimm Postdoctoral Fellowship

Applications are due November 15, 2009

For additional information and application instructions, visit:

http://ctbp.ucsd.edu/zimm_fellowship.html

CTBP is a consortium of researchers from UCSD, the Salk Institute for Biological Studies, and the University of Michigan, involved in research on fundamental problems at the interface between physics and biology. Research encompasses three synergy themes – ***Cellular Tectonics***, the dynamic mesoscale structure of the intracellular milieu; ***Computational Approaches to Intracellular and Intercellular Communication,*** chemical-based reaction-diffusion governed communication across complex spaces; and ***Gene Regulatory Networks***, genetic/signaling networks that exhibit specificity and robustness in the face of intrinsic stochasticity, and yet retain evolvability. The Zimm fellowship is for recent graduates who have demonstrated exceptional research aptitude and are interested in pursuing more independent, semi-autonomous research than is available in a traditional postdoctoral position. Zimm fellows will be expected to pursue intensive research in any area of biological physics related to the CTBP research synergies.

CTBP Faculty include:

Henry Abarbanel, Physics, UCSD
Olga Dudko, Physics, UCSD
Terence Hwa, Physics, UCSD
Bo Li, Mathematics, UCSD
José Onuchic, Physics, UCSD
Terence Sejnowski, Salk Institute
Wei Wang, Chemistry, UCSD
Charles L. Brooks, III, U Michigan
Michael Holst, Mathematics, UCSD
Herbert Levine, Physics, UCSD
J. Andrew McCammon, Chemistry, UCSD
Wouter-Jan Rappel, Physics, UCSD
Tatyana Sharpee, Salk Institute

For more information contact Christopher Smith, PhD., CTBP, Department of Physics, 9500 Gilman Drive, MC0374, University of California, San Diego, CA 92093, csmith@ctbp.ucsd.edu (858) 534-8370

CTBP** is a Physics Frontiers Center of the **National Science Foundation

Job Advertisement

Faculty Position in Computational Biophysics

Wake Forest University invites applications for a tenure track faculty position at the level of Assistant Professor with a joint appointment in the Departments of Computer Science and Physics to begin in the fall semester of 2010. Applicants should have completed a PhD in an appropriate field by the time of appointment. Wake Forest University is a highly ranked, private university with about 4500 undergraduates, 750 graduate students, and 1700 students in the professional schools of medicine, law, divinity and business. The Physics Department has a major concentration in biophysics with approximately one third of the departmental faculty working in that field. Several computer science faculty are actively engaged in scientific computing, computational systems biology, biological modeling and bioinformatics. Interdisciplinary research is highly valued and encouraged by the departments and University.

The successful candidate will have a strong research record in computational biophysics. The candidate should also have demonstrated ability to teach courses relating to topics in physics, biophysics, or computer science. The successful candidate will be expected to teach in both departments at the undergraduate and graduate levels. Excellence in research, teaching, and obtaining external funding will be expected.

Applicants should send a copy of their CV, statements regarding their research interests and teaching philosophy, and the names of three references to the

Computational Biophysics Search Committee,
Box 7507,
Wake Forest University, Winston-Salem,
NC 27109-7507.

Application materials can be sent electronically in the form of a single PDF document to physcscrecruit@lists.wfu.edu. Review of applications will begin November 1, 2009 and will continue through January 15, 2010.

Wake Forest University is an equal opportunity/affirmative action employer.

Conference Announcement

Dynamics Days 2010

International Conference on Chaos and Nonlinear Dynamics

January 4-7, 2010
Northwestern University
Evanston, Illinois

Dynamics Days is an annual conference on chaos and nonlinear dynamics. Sessions will cover a broad range of topics, including granular materials, time series analysis, non-equilibrium statistical physics, pattern formation, self-organization, and fluid dynamics. This year we are especially emphasizing theory and applications related to the dynamics of complex systems and complex networks, ranging from synchronization and cascading processes to the dynamics of biological systems.

Partial financial support will be provided to a selection of students and postdoctoral researchers. Women and researchers from underrepresented groups are strongly encouraged to apply. Seating is limited and registration is required.

Deadlines:

Abstracts: November 10, 2009
Acceptance: November 18, 2009
Registration: December 14, 2009
Lodging: December 14, 2009

For additional information and registration, visit:

http://ddays2010.northwestern.edu/

Dynamics Days 2010 is hosted by the Northwestern Institute on Complex Systems