THE BIOLOGICAL PHYSICIST

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This issue of THE BIOLOGICAL PHYSICIST brings you a feature interview with author and physicist Mark Buchanan. We also have PRE and PRL highlights, and a slew of job ads ranging from postdoctoral positions to program directorships!

– SB

FEATURE

An Interview with Mark Buchanan

Many members of DBP are familiar with Mark Buchanan's coverage of the latest scientific research news in Nature*, as well as his commentaries for the* New York Times *(see http://buchanan.blogs.nytimes.com/author/mbuchanan/, and his blog at http://thesocialatom.blogspot.com/). Buchanan is also the author of the recent books* The Social Atom*,* Ubiquity*, and* Nexus: Small Worlds and the Groundbreaking Science of Networks*.* THE BIOLOGICAL PHYSICIST *talked with him about his background in physics, his current work as a science writer, and his plans for the future.*

What got you interested in science in the first place? What led you to study physics in particular?

Like most scientists, I think, I had the questioning, wondering attitude from a young age. I remember lying in my bed at night, I must have been 7 or 8, and thinking night after night about the universe. If it went on forever, well that just seemed too much to comprehend, so I figured that couldn't be, there must be an edge to it. But then, that wasn't sensible either, because if there's an edge you have to ask what's out there just past the edge? I thought about this a lot, and of course never came to any conclusion, but realized there was a real mystery. So I guess I was fascinated by physics even then. I was never a great student as a child. I found my first course in algebra painful and incomprehensible. I just couldn't do it. But then by some miracle everything changed over one summer. Maybe some transformation took place in my brain -- I suppose in fact that it did, as I was a teenager -- and I suddenly became quite good at both sports (American baseball, in particular) and mathematics. The next year I just sailed through advanced algebra, trigonometry and calculus, all of which seemed easy and infinitely fascinating, and I also got into physics. I suppose I was also drawn to physics by its heroic history, individuals grappling with cosmic mysteries just by thinking very carefully. I couldn't think of anything more exciting.

Describe your experiences in graduate school, and how they shaped your view of science as a career.

I was quite naive entering graduate school. I didn't know anything about the scientific process, research funding etc., and I wanted to study physics whether I could ever get a job or not (which worried my mother). Science for science's sake, that was my thinking. I initially aimed to be a particle physicist, and was interested in the foundations of quantum theory. But in the mid 1980s this wasn't thought of as "real" physics. I had read Dirac's famous book on quantum mechanics, all about the Bohr-Einstein correspondence, and some more recent work by David Bohm and by John Bell, and it seemed clear to me that the logical foundations of the most basic theory of physics really weren't very sound. In particular, I remember coming across David Bohm's famous papers from the 1950s in which he showed by explicit example how to build an interpretation of quantum theory in which particles have well-defined trajectories, as in classical physics. I was shocked because all my professors, and all the textbooks I'd read, had proclaimed how this was impossible. This to me seemed like the most interesting thing to work on, developing Bohm's ideas, but my PhD advisor at the time dismissed my interest in this, mumbling something about how Pauli had settled the matter long ago, and so I eventually dropped it. (Ironically, interest in Bohm's ideas has now flowered again over the past decade or so!) But this disappointment led to good things anyway. I decided to take six months off from my PhD. I had long been interested in literature, so I got a part-time job and

took 6 months trying to write a novel. It turned out really badly, but the final third was much better than the first third, and I also wrote a bunch of short stories, some of which weren't so bad. I took a graduate course in creative writing in the English department, and learned quite a bit about writing. I then went back to my PhD, and forgot all about it.

How did you become interested in the interdisciplinary aspects of physics?

Returning to my PhD, I thought again about what to focus on, and I eventually decided to study chaos and nonlinear dynamics. I had probably read James Gleick's book, *Chaos*. I switched to a new advisor, Jack Dorning at the University of Virginia, and he was a great positive influence on my career. I worked on mathematical problems in plasma physics, but of course nonlinear dynamics is inherently interdisciplinary, and so I think this is where I began being interested in problems outside of physics, like population dynamics, the dynamics of excitable media, pattern formation and so on.

Had you always been interested in writing as a possible career?

At university I suppose I had quite fantastic visions of being a world-changing philosopher or something like that. Usually a few beers helped fuel these visions. But as an undergraduate I studied engineering and physics, plus some philosophy, and never took any practical steps towards a writing career, except for the 6 months I took off during graduate school.

What led you to choose science writing as your career direction?

It was almost an accident. After doing one postdoc, I had a couple offers for others in Europe, but they didn't excite me. Needing a job, I applied for an editorial position at *Nature*, not really having any idea what that entailed, and I eventually got the job. I was actually very ignorant, and had no idea even what *Nature* was. I even threw the job advertisement into the trash once, before fishing it back out after a sleepless night, because I really needed a job. After a grueling competition, I eventually got the job and moved to London. And it was there, after working as an editor for more than a year, that it suddenly dawned on me: I could mix my interest in science and in writing by doing science writing. The possibility had never come to me before. Circumstances had to hit me in the face with it. Pretty soon I went from *Nature* to *New Scientist*, where I worked as a features editor for two years, before going freelance. So it's all quite an accident and shows very little capacity for planning on my part.

What are the most unexpected or surprising things you have learned (about science itself? about the publishing world?) during your writing career?

I think perhaps the most surprising thing is how easily even scientists can be swayed by social pressure. I think science does produce real objective knowledge in some sense, but the way theories become accepted or discarded I think often has a lot to do with social pressure, at least for a time. I had come into science really believing the naive idea that good theories win out over bad by virtue of comparison with experiment. Now I think that while there is some core element of truth to that, the process is hugely more complicated, and social factors have a lot more influence than you'd think. Those ideas of David Bohm's that interested me were dismissed by an entire generation of physicists, even ridiculed, when in fact hardly any of those physicists had examined the ideas first hand. Most had heard that someone at some point, maybe Pauli or Bohr, had definitely shown how

these alternative ways of looking at quantum theory couldn't work, and this was just accepted and passed down with no critical thought. In recent years these ideas have now suddenly been brought back into fashion and we realize that they were dismissed back then for no good reason whatsoever, more or less through ideology. That's a profound thing to realize. We can't learn everything ourselves, and have to trust others in forming our opinions, but this can lead us astray and often does.

There's a similar point about writing. It's nice to think that a science writer writing about recent developments in some field can offer an "objective" point of view. You can try, but this is never really possible because we all bring our own interests and experience to whatever we do. When I write about some area I try to listen to everyone, and be as fair and objective as I can, but naturally I find some ideas and arguments more convincing than others, and that ends up being reflected in what I write. Even if I'm the objective voice of the journalist, I choose what to put into the story and what to leave out, so the objectivity is somewhat of an illusion.

What is it like writing articles for major journals like *Nature*?

I don't think there's anything essentially different about writing for *Nature* than for writing for anyone else. There are basic principles: write an interesting story with drama about something people care about, and make sure you get the science right. Certainly the stakes are higher, but the project is the same.

What led to the ideas of writing the particular books you have published in recent years? Are there any particular stories behind how began to write *Nexus* or *The Social Atom*?

When I was at *Nature*, I got lots of new papers landing on my desk from people applying ideas from the physical science to the social sciences. It's this work that has stimulated all three of my books. It just seems that the time is really ripe to begin understanding social systems in more quantitative detail. In part, this is the influence of statistical physics, and its powerful ideas, and also modern technology both for doing calculations on massive data sets and collecting data in ways we never could before. In regard to *The Social Atom*, I was also drawn to write that because of a long-standing view on the part of some social thinkers than human science just has to be different from physical science. I find that hard to accept, and the book is an exploration of that idea, and why it is indeed not correct.

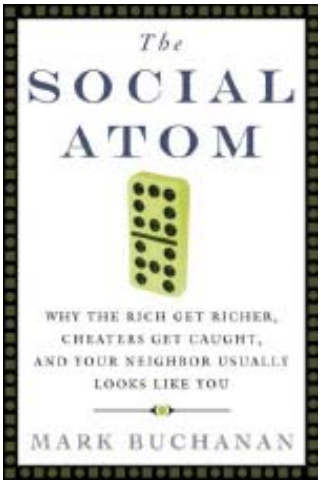
What sparked your interest in networks and criticality?

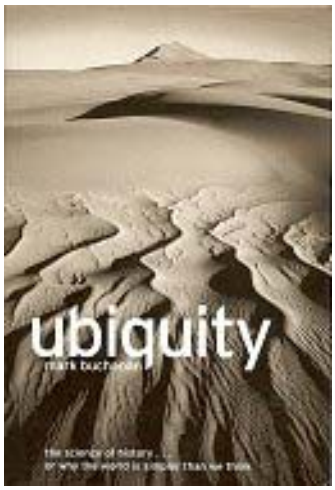
I became interested in critical phenomena after I read a really nice popular article in a book called *The New Physics*, some years ago. In particular the notion of universality really struck me as profound -- that it's possible in some cases to be sure you get the right answer even though you know your model is really wrong, as long as it gets a couple key details (dimensions, etc) right. I'd never studied this before, so I got some books and read about the ideas in more technical detail. My interest was then furthered by the idea of self-organized criticality, and its potential for applications outside of physics. My interest in networks, though it seems close in spirit, is actually quite unrelated. Like many scientists, I was stuck by the elegant simplicity and power of the original *Nature* paper of Watts and Strogatz.

Physicists such as Per Bak have made gigantic claims about how physics can revolutionize studies in the biological sciences. There has been somewhat of a backlash against this attitude on the part of biologists, who perceive it as arrogant. What are your thoughts on the role that physicists can/do/should play in the biological sciences, and on the "sociology" of interdisciplinary collaboration in general?

Biologists are right: this physicists-can-explain-everything attitude is arrogant. But I think that's not

really so much of a problem. Per Bak wanted to provoke a reaction and to disturb what he saw as a complacent point of view. There was some famous American historian – his name now escapes me – who said that any good idea deserves to be overstated at the outset, because otherwise it gets ignored. I think there's some sense in that. Per Bak I think wanted biologists and other scientists to know about and think about the possible implications of some of the best ideas in physics, and one of those is that some apparently complex phenomena may have relatively simple origins, at least conceptually. I think his message in some sense goes deeper than SOC. He was saying, "Look, we know from physics that really simple models, just one step up from trivial models, can have extraordinarily complex behavior. If you saw data from such models, you'd be tempted to think you must be looking at some system influenced by hundreds of complicated factors." But making that deduction, Bak pointed out, is a logical error. So in nature we should always be open to the same possibility – that the origin of the rich complexity in the natural systems around us might, in some case, have quite simple origins. I don't think that should be a contentious idea. Do science by starting with the simplest conceivable models, and only building more complicated ones where you're sure the simple ones fail. There's been some nice work on this recently in understanding fluctuations in financial markets. If one supposes that financial traders have "zero intelligence" and just trade at random, how much of the statistics of market fluctuations can one understand? It turns out quite a lot, and that they originate in the mechanics of the procedures by which orders to buy or sell get matched together. But this isn't the kind of explanation one normally hears about on the news.





There has been a burst of excellent science writing in the past decade or so, with books by Strogatz, Watts, Barabási, etc. in addition to your own books. Do you feel that this sort of science writing has a particular role or "mission" in terms of reaching out to the general public? Or reaching out to other scientists?

I'm not sure there's a mission, but it's true that the massive specialization of science has created a need for science writers. No one can possibly know a lot about everything. In the 1950s physicists like Fermi or Feynman could aspire to such knowledge, but even in physics that is now totally impossible. As a result, there is a demand on the part of me and you and everyone for a way to learn about lots of science quickly and painlessly.

When you write books, do you think of yourself as addressing a "layperson"? Do you envision a particular audience?

Yes, the person who is intelligent and interested in understanding the world. But I think writers also come to realize that the human mind digests stories more easily than it does just facts. Some people will *never* read a science book. You need to write stories and get them to read, and slip the in science almost in a way they don't notice.

What has been the most exciting aspect of writing about science? What has been the most difficult?

The most exciting part is coming in contact with really exciting ideas and fascinating people. This is a really privilege. I certainly never get bored. The hard part is making a living as a freelance writer, and especially balancing the day to day writing of

articles with the need to be doing research about what you're going to write about next, proposing those articles or books to magazines or publishers, etc. It's a complex balancing act, and I don't think I do it particularly well.

What are your plans for the next few years? What's the next book you plan to write?

I'm exploring the idea of writing a book about the history of prediction. Why we are so concerned with and fascinated by predictions, from science-based predictions to all those methods born of superstition. I'm thinking of somehow exploring the history of science as a history of increasingly better methods for prediction, and also as an evolution in what we mean by prediction; nowadays we're used to statistical predictions, for example, but those were once considered very strange. And then there's the question of probing the boundary between what is predictable and what is not, especially in the context of really complex systems such as economies, the global climate, etc. That's the vague idea, anyway. I need to make it more specific.

Do you have any advice for young scientists considering "alternative" careers to academic research?

I guess my advice would be to be open to all opportunities. It's too easy to think there's only one route to a career in science, whereas there are probably lots of different possibilities you don't know about yet, but can only learn about by being involved in some activity. The idea that you sit there and think hard about what you want to do in your long-term career, and then go do it, just isn't how things usually work. Think about it, yes, and takes practical steps towards it, but be open to what you learn along the way.

PRL HIGHLIGHTS

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

1 August 2008

Vol 101, Number 5, Articles (05xxxx)
Articles published 26 Jul - 1 Aug 2008
http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=101&Issue=5

Random Time-Scale Invariant Diffusion and Transport Coefficients
Y. He, S. Burov, R. Metzler, and E. Barkai
Published 28 July 2008 // 058101
See accompanying Viewpoint *Physics **1**, 8 (2008)*

Instability of Spatial Patterns and Its Ambiguous Impact on Species Diversity
Tobias Reichenbach and Erwin Frey
Published 29 July 2008 // 058102

Maximally Informative Stimuli and Tuning Curves for Sigmoidal Rate-Coding Neurons and Populations
Mark D. McDonnell and Nigel G. Stocks
Published 1 August 2008 // 058103

Rate Dependence and Role of Disorder in Linearly Sheared Two-Dimensional Foams
G. Katgert, M. E. Möbius, and M. van Hecke
Published 28 July 2008 // 058301

Restricted Dislocation Motion in Crystals of Colloidal Dimer Particles
S. J. Gerbode, S. H. Lee, C. M. Liddell, and I. Cohen
Published 1 August 2008 // 058302
See Also: Publisher's Note

Finding a Better Immunization Strategy
Yiping Chen, Gerald Paul, Shlomo Havlin, Fredrik Liljeros, and H. Eugene Stanley
Published 31 July 2008 // 058701

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Articles published 2 Aug - 8 Aug 2008
http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=101&Issue=6

Projectile Interactions in Granular Impact Cratering
E. L. Nelson, H. Katsuragi, P. Mayor, and D. J. Durian
Published 8 August 2008 // 068001

Morphogenesis of Growing Soft Tissues
Julien Dervaux and Martine Ben Amar
Published 5 August 2008 // 068101
See Also: Phys. Rev. Focus

Shearing Active Gels Close to the Isotropic-Nematic Transition
M. E. Cates, S. M. Fielding, D. Marenduzzo, E. Orlandini, and J. M. Yeomans
Published 8 August 2008 // 068102

New Dynamics in Cerebellar Purkinje Cells: Torus Canards
M/ A. Kramer, R/ D. Traub, and N. J. Kopell
Published 8 August 2008 // 068103

Insensitivity to Salt of Assembly of a Rigid Biopolymer Aggrecan
F. Horkay, P. J. Basser, A.-M. Hecht, and E. Geissler
Published 5 August 2008 // 068301

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Articles published 9 Aug - 15 Aug 2008
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Disease Extinction in the Presence of Random Vaccination
Mark I. Dykman, Ira B. Schwartz, and Alexandra S. Landsman
Published 11 August 2008 // 078101

When Weak Inhibition Synchronizes Strongly Desynchronizing Networks of Bursting Neurons
Igor Belykh and Andrey Shilnikov
Published 13 August 2008 // 078102

Neutral Clustering in a Simple Experimental Ecological Community
B. Houchmandzadeh
Published 13 August 2008 // 078103

Critical Swelling of Particle-Encapsulating Vesicles
Emir Haleva and Haim Diamant
Published 15 August 2008 // 078104

Phototactic Clustering of Swimming Microorganisms in a Turbulent Velocity Field
Colin Torney and Zoltán Neufeld
Published 15 August 2008 // 078105

Nonequilibrium Fluctuation Relation for Sheared Micellar Gel in a Jammed State
Sayantan Majumdar and A. K. Sood
Published 15 August 2008 // 078301

(Un)detectable Cluster Structure in Sparse Networks
Jörg Reichardt and Michele Leone
Published 13 August 2008 // 078701

Locked Constraint Satisfaction Problems
Lenka Zdeborová and Marc Mézard
Published 15 August 2008 // 078702

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Articles published 16 Aug - 22 Aug 2008
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Isolating Segregation Mechanisms in a Split-Bottom Cell
K. M. Hill and Yi Fan
Published 21 August 2008 // 088001

Oscillation Regularity in Noise-Driven Excitable Systems with Multi-Time-Scale Adaptation
W. H. Nesse, C. A. Del Negro, and P. C. Bressloff
Published 20 August 2008 // 088101

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Articles published 23 Aug - 29 Aug 2008
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Dynamic Mechanism of the Ferroelectric to Antiferroelectric Phase Transition in Chiral Smectic Liquid Crystals
Jang-Kun Song, Atsuo Fukuda, and J. K. Vij
Published 28 August 2008 // 097801

Stress Chain Solutions in Two-Dimensional Isostatic Granular Systems: Fabric-Dependent Paths, Leakage, and Branching
M. Gerritsen, G. Kreiss, and R. Blumenfeld
Published 27 August 2008 // 098001

Repulsion Between Inorganic Particles Inserted Within Surfactant Bilayers
D. Constantin, B. Pansu, M. Impéror, P. Davidson, and F. Ribot
Published 29 August 2008 // 098101

Ranking Vertices or Edges of a Network by Loops: A New Approach
Valery Van Kerrebroeck and Enzo Marinari
Published 26 August 2008 // 098701

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Articles published 30 Aug - 5 Sept 2008
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Starting to Move through a Granular Medium
D. J. Costantino, T. J. Scheidemantel, M. B. Stone, C. Conger, K. Klein, M. Lohr, Z. Modig, and P. Schiffer
Published 3 September 2008 // 108001

Transient Binding and Dissipation in Cross-Linked Actin Networks
O. Lieleg, M. M. A. E. Claessens, Y. Luan, and A. R. Bausch
Published 5 September 2008 // 108101

Soret Motion of a Charged Spherical Colloid
Seyyed Nader Rasuli and Ramin Golestanian
Published 5 September 2008 // 108301

Transport in Charged Colloids Driven by Thermoelectricity
Alois Würger
Published 5 September 2008 // 108302

Conformation and Dynamics of DNA Confined in Slitlike Nanofluidic Channels
D.Jan Bonthuis, C. Meyer, D. Stein, and C. Dekker
Published 5 September 2008 // 108303

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Articles published 6 Sept - 12 Sept 2008
http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=101&Issue=11

Evidence of Rayleigh-Hertz Surface Waves and Shear Stiffness Anomaly in Granular Media
L. Bonneau, B. Andreotti, and E. Clément
Published 9 September 2008 // 118001

Strain Softening in Stretched DNA
Binquan Luan and Aleksei Aksimentiev
Published 10 September 2008 // 118101

Cross-Linking Molecules Modify Composite Actin Networks Independently
K. M. Schmoller, O. Lieleg, and A. R. Bausch
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Nonlinear Elasticity of Composite Networks of Stiff Biopolymers with Flexible Linkers
C. P. Broedersz, C. Storm, and F. C. MacKintosh
Published 11 September 2008 // 118103

Exact Solution of a Model DNA-Inversion Genetic Switch with Orientational Control
P. Visco, R. J. Allen, and M. R. Evans
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Accurate Coarse-Grained Modeling of Red Blood Cells
Igor V. Pivkin and George Em Karniadakis
Published 12 September 2008 // 118105

Single-Molecule Observation of Anomalous Electrohydrodynamic Orientation of Microtubules
M. G. L. van den Heuvel, R. Bondesan, M. Cosentino Lagomarsino, and C. Dekker
Published 9 September 2008 // 118301

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Random Very Loose Packings
Massimo Pica Ciamarra and Antonio Coniglio
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Self Assembly Modulated by Interactions of Two Heterogeneously Charged Surfaces
R. Brewster, P. A. Pincus, and S. A. Safran
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Actin Bundling: Initiation Mechanisms and Kinetics
P. Kraikivski, B. M. Slepchenko, and I. L. Novak
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Fluctuation Analysis of Mechanochemical Coupling Depending on the Type of Biomolecular Motors
M. Nishikawa, H. Takagi, T. Shibata, Atsuko H. Iwane, and T. Yanagida
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Cluster Formation of Transmembrane Proteins Due to Hydrophobic Mismatching
U. Schmidt, G. Guigas, and M. Weiss
Published 19 September 2008 // 128104

Influence of Nonconservative Optical Forces on the Dynamics of Optically Trapped Colloidal Spheres: The Fountain of Probability
Y. Roichman, B. Sun, A. Stolarski, and D. G. Grier
Published 16 September 2008 // 128301

Price of Anarchy in Transportation Networks: Efficiency and Optimality Control
H. Youn, M. T. Gastner, and H. Jeong
Published 17 September 2008 // 128701

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Mechanisms for Acoustic Absorption in Dry and Weakly Wet Granular Media
Th. Brunet, X. Jia, and P. Mills
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Compression and Stretching of a Self-Avoiding Chain in Cylindrical Nanopores
S. Jun, D. Thirumalai, and B.-Y. Ha
Published 22 September 2008 // 138101

Direct Observation of Correlated Interdomain Motion in Alcohol Dehydrogenase
R. Biehl, B. Hoffmann, M. Monkenbusch, P. Falus, S. Préost, R. Merkel, and D. Richter
Published 26 September 2008 // 138102

First-Principles Constitutive Equation for Suspension Rheology
J. M. Brader, M. E. Cates, and M. Fuchs
Published 22 September 2008 // 138301
See accompanying Viewpoint *Physics **1**, 22 (2008)*

Free Energy Evaluation in Field-Theoretic Polymer Simulations
Er. M. Lennon, K. Katsov, and G. H. Fredrickson
Published 24 September 2008 // 138302

PRE HIGHLIGHTS

Biological Physics Articles from

Physical Review E

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RAPID COMMUNICATIONS

Complex dynamics of human red blood cell flickering: Alterations with *in vivo* aging
M. Costa, I. Ghiran, C.-K. Peng, A. Nicholson-Weller, and A. L. Goldberger
Published 1 August 2008 // 020901(R)

ARTICLES

Negative lens concept for photoacoustic tomography
Changhui Li, Geng Ku, and Lihong V. Wang
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Pinpointing connectivity despite hidden nodes within stimulus-driven networks
Duane Q. Nykamp
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Correlated diffraction and fluorescence in the backscattering iridescence of the male butterfly Troides magellanus (Papilionidae)
J. P. Vigneron, K. Kertész, Z. Vértesy, M. Rassart, V. Lousse, Z. Bálint, and L. P. Biró
Published 8 August 2008 // 021903

Charge density coordination and dynamics in a rodlike polyelectrolyte
Won Kyu Kim and Wokyung Sung
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Role of pulling direction in understanding the energy landscape of proteins
R. Rajesh, D. Giri, I. Jensen, and S. Kumar
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Converting genetic network oscillations into somite spatial patterns
K. I. Mazzitello, C. M. Arizmendi, and H. G. E. Hentschel
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How rigid are viruses
R. D. Hartschuh, S. P. Wargacki, H. Xiong, J. Neiswinger, A. Kisliuk, S. Sihn, V. Ward, R. A. Vaia, and A. P. Sokolov
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Membrane lipid segregation in endocytosis
Sarah A. Nowak and Tom Chou
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Optimum size of a molecular bond cluster in adhesion
Yuan Lin and L. B. Freund
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Optimal optical trap for bacterial viability
U. Mirsaidov, W. Timp, K. Timp, M. Mir, P. Matsudaira, and G. Timp
Published 25 August 2008 // 021910

Driving neural oscillations with correlated spatial input and topographic feedback
A. Hutt, C. Sutherland, and A. Longtin
Published 26 August 2008 // 021911

Electro-osmotic screening of the DNA charge in a nanopore
Binquan Luan and Aleksei Aksimentiev
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Characterization of multiple spiral wave dynamics as a stochastic predator-prey system
N.F. Otani, A. Mo, S. Mannava, F.H. Fenton, E.M. Cherry, S. Luther, and R.F. Gilmour, Jr.
Published 29 August 2008 // 021913

Solutions of the Maxwell viscoelastic equations for displacement and stress distributions
S. Hodis and M. Zamir
Published 29 August 2008 // 021914

BRIEF REPORTS

Cancer growth: Predictions of a realistic model
S. A. Menchón and C. A. Condat
Published 8 August 2008 // 022901

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RAPID COMMUNICATIONS

No many-scallop theorem: Collective locomotion of reciprocal swimmers
Eric Lauga and Denis Bartolo
Published 29 September 2008 // 030901(R)

ARTICLES

Coherence, collective rhythm, and phase difference distribution in populations of stochastic genetic oscillators with cellular communication
Z. Yuan, J. Zhang, and T. Zhou
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Toward a thermodynamically consistent picture of the phase-field model of vesicles: Curvature energy
D. Jamet and C. Misbah
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Influence of correlations on molecular recognition
Hans Behringer and Friederike Schmid
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Multistability of synthetic genetic networks with repressive cell-to-cell communication
E. Ullner, A. Koseska, J. Kurths, E. Volkov, H. Kantz, and J. García-Ojalvo
Published 5 September 2008 // 031904

Epistasis and the selective advantage of sex and recombination
V. M. de Oliveira, J. K. da Silva, and P. R. A. Campos
Published 5 September 2008 // 031905

Three- and four-state rock-paper-scissors games with diffusion
Matti Peltomäki and Mikko Alava
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JOB AD

Program Director
Physics of Living Systems
National Science Foundation

The Physics Division at the National Science Foundation is seeking qualified applicants to fill the position of Program Director for Physics of Living Systems. This position involves responsibility for the planning, coordination, and management of programs for research and human resource development in the physics of living systems. Applicants must have a Ph.D. or equivalent experience in a scientific discipline supported by NSF. In addition, applicants must have six or more years of successful research, research administration, and/or managerial experience pertinent to the program. We are especially interested in applicants with a Ph.D. or equivalent experience in biological physics or a closely related field.

Appointment to this position is intended to be on a permanent basis. Applications for these positions should be submitted through the NSF Talent Inventory Announcements that can be found on the NSF web page at http://www.nsf.gov/about/career_opps/ .

Applicants for permanent appointments should apply according to instructions on the page http://www.nsf.gov/about/career_opps/ad_talent_inventory.jsp

The position will be open through November 21, 2008, or until filled.

A full description of the Physics of Living Systems program can be found on the NSF Physics web page at http://www.nsf.gov/div/index.jsp?div=PHY.

Interested applicants are also invited to communicate with Dr. Denise Caldwell at dcaldwel@nsf.gov or 703-292-7371 for additional information about the duties of the Program Director.

JOB AD

Job Opportunity: Program Manager for Photosynthetic Systems or Physical Biosciences

The Office of Basic Energy Sciences (http://www.sc.doe.gov/bes/bes.html), Office of Science, US Department of Energy, is seeking qualified applicants for a career federal position managing either the Photosynthetic Systems Program or the Physical Biosciences Program. Both programs fund mission-oriented, basic science on plant and non-medical microbial systems at universities and national laboratories.

The *Photosynthetic Systems Program* supports fundamental research on the biological conversion of solar energy into chemically stored forms of energy. This entails studies on light harvesting, exciton transfer, charge separation, transfer of reductant to carbon dioxide, as well as the biochemistry of carbon fixation and carbon storage. Areas where biological sciences intersect heavily with energy-relevant chemical sciences and physics, such as in self-assembly of nanoscale components, efficient photon capture and charge separation, predictive design of catalysts, and self-repairing systems, are accentuated.

The *Physical Biosciences Program* combines experimental and computational tools from the physical sciences with biochemistry and molecular biology. The interdisciplinary approach provides a fundamental understanding of the complex processes that convert and store energy in living systems. Research supported includes studies that investigate the mechanisms by which energy transduction systems are assembled and maintained, the processes that regulate energy-relevant chemical reactions within the cell, the underlying biochemical and biophysical principals that determine the architecture of biopolymers and the plant cell wall, and active site protein chemistry that provides a basis for highly selective and efficient bioinspired catalysts.

Announcements and on-line application instructions can be found via the BES website: http://www.sc.doe.gov/bes/BESjobs.html. This is an interdisciplinary position that can be filled by either a Chemist or a Biologist. To apply as a Chemist, please see the USA Jobs announcement at: http://jobsearch.usajobs.gov/ftva.asp?seeker=1&JobID=76441021. To apply as a Biologist, please see the USA Jobs announcement at: http://jobsearch.usajobs.gov/ftva.asp?seeker=1&JobID=76440917.

Applications must be submitted on or before **December 1, 2008.**

The complementary Photosynthetic System and Physical Biosciences Programs are described at: http://www.sc.doe.gov/bes/eb/ebhome.html. These programs also intersect with other research programs of the BES Division of Chemical Sciences, Geosciences, and Biosciences Division, described at http://www.sc.doe.gov/bes/chm/chmhome.html. For questions about this position and working at BES, please contact Richard Greene, richard.greene@science.doe.gov or Eric Rohlfing, eric.rohlfing@science.doe.gov.

JOB AD

TENURE-TRACK POSITION IN THE LABORATORY OF CHEMICAL PHYSICS AT THE NATIONAL INSTITUTES OF HEALTH (NIH), BETHESDA, MARYLAND

A tenure track position is available for an experimental biophysical scientist to establish an independent research program in the Laboratory of Chemical Physics, NIDDK, NIH. All areas of biophysics and biophysical chemistry will be considered for this position. Current research in this Laboratory is primarily concerned with experimental, theoretical and computational problems in the structure, dynamics, and function of biological macromolecules, using techniques that include solution and solid-state nuclear magnetic resonance spectroscopy, Raman and infrared imaging spectroscopies, time-resolved X-ray crystallography and optical spectroscopy, and single molecule spectroscopy. The theoretical and computational studies closely complement the experimental work. Development of fundamental aspects of experimental and theoretical techniques is an active area in the Laboratory.

The Laboratory is located on the main intramural campus of the NIH in Bethesda, Maryland, just outside Washington, D.C. The Principal Investigators in the Laboratory are: Artur Adib, Philip A. Anfinrud, Adriaan Bax, G. Marius Clore, William A. Eaton, Gerhard Hummer, James Hofrichter, Ira W. Levin, Attila Szabo, and Robert Tycko (Scientists Emeritus: Edwin D. Becker and Robert W. Zwanzig).

Interested applicants should send a Curriculum Vitae and list of publications, copies of selected publications, a summary of research accomplishments, a plan for future research, and three letters of reference by e-mail to eaton@helix.nih.gov, or by mail to:

Dr. William A. Eaton,
Chief, Laboratory of Chemical Physics,
Building 5, Room 116,
National Institutes of Health,
Bethesda, MD 20892-0520.

E-mail is highly preferred. Deadline for receipt of applications is December 1, 2008.

HHS and NIH are Equal Opportunity Employers.

JOB AD

University of California, Irvine

Tenured or Tenure-track Faculty Position in Systems Biology

The University of California, Irvine has embarked on a recruiting initiative in Systems Biology intended to fill seven faculty positions over three years. One position is available this year, for which candidates will be considered from all areas of Systems Biology, including biological networks, regulatory dynamics and control, spatial dynamics and morphogenesis, synthetic biology, and mathematical and computational biology. Applications are being solicited at the Assistant, Associate and Full Professor level, and appointment can be made in any of several departments, including Developmental and Cell Biology, Molecular Biology and Biochemistry, Ecology and Evolutionary Biology, Biomedical Engineering, Mathematics, Physics and Astronomy, Computer Science, and Statistics.

The successful applicant is expected to conduct a strong research program and to contribute to the teaching of undergraduate and graduate students. Systems Biology research and training at UCI is fostered by several interdisciplinary research units, an NIGMS National Center for Systems Biology, and Ph.D. training programs in Bioinformatics, and Mathematical and Computational Biology (for more information, visit our website at http://ccbs.bio.uci.edu). Applicants should submit a letter of application, curriculum vitae, bibliography, three letters of reference, and statements of research and teaching interests using the on-line recruitment system (see instructions at http://ccbs.bio.uci.edu or https://recruit.ap.uci.edu). To receive full consideration, material should be received by December 10, 2008.

The University of California, Irvine is an equal opportunity employer committed to excellence through diversity, and strongly encourages applications from all qualified applicants, including women and minorities. UCI is responsive to the needs of dual career couples, is dedicated to work-life balance through an array of family-friendly policies, and is the recipient of an NSF ADVANCE Award for gender equity.

JOB AD

Princeton University
Postdoctoral Research Associate

The successful candidate will undertake joint experimental/theoretical research into how bacterial cells establish, maintain, and change their shapes. This is a fundamental open question in the biology of bacteria. While the chemical composition of the cell wall that gives these cells their shape is well characterized, the way in which the cell wall is organized and rearranged to achieve the wide variety of observed shapes and permit continuous growth remains unclear. To begin to address these questions, we have developed a computational, biophysical model for cell-wall organization. We envision extending these studies by combining experimental microscopy and molecular genetics approaches with computational data analysis and additional theoretical modeling of cell-wall structure. Important new areas of focus include the cell-wall dynamics during cell growth and division. The research will provide opportunities for learning both experimental and computational/modeling approaches as it will be conducted as a close collaboration between the Gitai and Wingreen labs, exploiting the Gitai lab's experimental expertise with advanced live-cell imaging and molecular genetics and the Wingreen lab's expertise in data analysis and modeling. The position is available immediately. All interested candidates should submit a CV, cover letter, and three letters of recommendation.

A Ph.D. in Physics, Applied Physics, Biophysics or a closely related field is required, as is experience in computer programming.

A strong interest in biology and the desire to pursuing a career in research at the interface of physics and biology is preferred.

Princeton University is an equal opportunity employer and complies with applicable EEO and affirmative action regulations. You may apply online at http://jobs.princeton.edu (search on requisition number 0800330) or for general application information and information on how to self-identify, please see http://www.princeton.edu/dof/ApplicantsInfo.htm. We strongly request that all interested candidates use the online application process.

JOB AD

Postdoctoral Research Position in Computational Modeling of Morphogenesis

The group of Professor Timothy Newman at Arizona State University has an opening for a post-doctoral research associate funded by the Human Frontier Science Program. The successful applicant will join our efforts in computational modeling of developmental systems, in particular large-scale coherent cell movements during early embryogenesis. Applicants must have a PhD in the physical or life sciences. Ideal candidates will demonstrate a strong interest in developmental biology and expertise in large-scale computations. Funding for this position is held collaboratively with the laboratory of Prof. Cornelis Weijer at the University of Dundee Biocentre. There will be opportunities for the successful applicant to spend several weeks each year in the Weijer laboratory.

The position can begin as early as fall 2008. Although the initial appointment will be for one year, an extension to a second or third year may be made by mutual agreement and based on availability of funds.

Applicants must submit their applications online at http://phy.asu.edu/employment.php. Please upload separate PDF files for the cover letter, CV, statement of research experience (including a section on experience with computation), and contact details of three references. Review of applications has begun and will continue every two weeks until the successful applicant has been recruited.

Arizona State University is an affirmative action, equal opportunity employer, committed to excellence through diversity.

JOB AD

Tenure-Track
Assistant and Associate Professor
in Biological Physics

The University of Miami (UM) invites applications for two positions, a tenure-track Assistant and an Associate Professor to develop innovative experimental research programs in Biological Physics. The initiative is part of UM's current drive to develop novel research collaborations at the frontiers of Physics, the Life Sciences and Medicine. The successful candidate(s) will develop a novel line of research within Physics while helping the Department strengthen its connections to UM's research activities across the Life and Medical Sciences. Candidates for the Assistant Professor position must have a Ph.D. in Physics or a similar field, postdoctoral experience, a demonstrated record of research, and a strong commitment to quality undergraduate teaching in Physics and its applications. Candidates for the Associate Professor position must have a Ph.D. in Physics or similar field, postdoctoral experience, a demonstrated record of research and external funding as well as a strong commitment to quality undergraduate and graduate teaching in Physics and its applications.

The Physics Department is located within the university's highly attractive Coral Gables campus in the greater Miami area, and has wide-ranging research expertise as well as an established PhD program. UM is a young and vibrant private institution, and an equal opportunity/affirmative action employer.

Applications should arrange for a CV, a statement of research interests, and three letters of recommendation, to reach the following address by December 15, 2008: Prof. Neil Johnson, Search Committee Chair for Biological Physics, Department of Physics, University of Miami, Knight Physics Building, Coral Gables, FL 33124. Email: njohnson@physics.miami.edu.

JOB AD

COMPUTATIONAL MODELING OF MOLECULAR MOTORS AND INTRACELLULAR TRANSPORT POSTDOCTORAL POSITION

The University of California, Irvine anticipates the availability of 1 or 2 postdoctoral positions in theoretical biological physics beginning as early as 2009. The successful candidate will model intracellular transport, e.g., motor proteins carrying cargos along filaments. The successful applicant will have a strong theoretical physics background and computer skills, as well as an interest in understanding biology. Further, they must work well with others, as significant collaboration with experimentalists will be necessary. Experience with Monte Carlo simulations and C++ is useful. The minimum qualification is a Ph.D. in physics or a closely related field. Applications (including a CV, list of publications, and three reference letters) should be sent to Prof. Clare Yu, Department of Physics and Astronomy, University of California, Irvine, CA 92697-4575. For full consideration, applications should be submitted by January 5, 2009. UCI is an equal opportunity employer committed to excellence through diversity.

JOB AD

EXPERIMENTAL POSTDOCTORAL POSITION MOLECULAR MOTORS AND INTRACELLULAR TRANSPORT

The University of California, Irvine anticipates the availability of a postdoctoral position in experimental biophysics beginning as early as 2009. The successful candidate will do in vitro (and in vivo) experiments on molecular motors, looking at a variety of issues related to how multiple motors function together. While a strong background in biology is not required, the successful applicant will be expected to have an interest in understanding biology, and will need to learn a great deal of biology to be successful. Experimentally, some knowledge of optics, electronics, and computer control of instrumentation is important, since the project involves optical traps and advanced instrumentation. Because the project will be multi-disciplinary, a desire to learn new approaches is critical. The applicant will be expected to work well as part of a group, and collaborate with theorists. The minimum qualification is a Ph.D. in physics, biomedical engineering, chemistry, or a closely related field. Applications (including a CV, list of publications, and three reference letters) should be sent to Prof. Steven Gross, Department of Dev. and Cell Biology, University of California, Irvine, CA 92697. For full consideration, applications should be submitted by January 5, 2009. UCI is an equal opportunity employer committed to excellence through diversity.

JOB AD

Postdoctoral Position Available in Single Molecule Biophysics

A position is available in the group of Professor Lori Goldner at the Department of Physics at the University of Massachusetts, Amherst, for an individual interested in studying molecular folding and/or interactions in crowded or confining environments using single molecule optical techniques. Existing or planned projects include a study of protein aggregation or polymerization one-molecule-at-a-time; the measurement of structural changes during transient nucleic acid/protein complex formation; or the triggering and observation of irreversible transformation on a single protein or complex.

The use of confining environments – such as subfemtoliter water droplets, liposomes, or cell compartments – both facilitates these studies and enhances their relevance to biological systems. The use of single molecule measurement techniques permits us to understand in detail the dynamics and kinetics of biological molecular interactions. The use of techniques that involve single molecule manipulation permits us to construct complex systems from their individual building blocks, and to study and control the emergence of new collective properties and behaviors.

The successful candidate will work as part of an exciting and growing effort at the University of Massachusetts in single molecule techniques, cytoskeletal biophysics, protein folding and membrane biophysics. There is considerable opportunity for a sufficiently motivated and talented individual to forge new collaborations and propose related projects.

Interested individuals should contact Professor Goldner at lgoldner@physics.umass.edu or call 413 545 0594, and send a CV and contact information for 3 references.

JOB AD

Postdoctoral Position at the National Institutes of Health

A postdoc position is available in Dr. Robert Tycko's group in the Laboratory of Chemical Physics of the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), located on the main NIH campus in Bethesda, Maryland. Research involves the development of novel nuclear magnetic resonance techniques and technology, and applications to problems in biophysics and biology. Recent projects and publications are described at http://www.niddk.nih.gov/intram/people/rtycko.htm. Candidates should have a strong record of achievements in experimental physical science, preferably with experience in magnetic resonance or related fields. To apply, please send your CV and publication list to robertty@mail.nih.gov, along with a cover letter that briefly describes your background, motivations for applying, and professional goals.

JOB AD

Postdoc in Physical Biology of Bacteria

Postdoctoral position to study the physical biology of bacterial mechanisms such as self-organization of division proteins (subcellular Min oscillations), export and motility apparatus (pili), and growth and division (peptidoglycan). My general interest is in developing computational models of spatial and temporal structure formation within bacteria, see http://www.physics.dal.ca/~adr

You should have a quantitative PhD and experience in computational modeling. The position is available from now until Sept 2009; however, the ideal start date is April 2009. Please submit your CV and up to three letters of recommendation to andrew.rutenberg@dal.ca The position is for one year, though additional funding should become available.