

THE BIOLOGICAL PHYSICIST

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

Vol 9 No 2 Jun 2009

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In this Issue

DBP ANNOUNCEMENT	
Welcoming Assistant Newsletter Editor.....	2
PRL HIGHLIGHTS	3
PRE HIGHLIGHTS	7
JOB ADS	11

This issue of THE BIOLOGICAL PHYSICIST welcomes our new Assistant Editor, Dr. Christopher Smith of UCSD. We also bring you all the usual suspects – PRE & PRL Highlights, and some important job ads and announcements. Be sure to visit www.aps.org/units/dbp/governance/minutes/index.cfm for the minutes of the DBP Business Meeting at the APS March Meeting.

– SB

DBP ANNOUNCEMENT

THE BIOLOGICAL PHYSICIST **Welcomes Assistant Editor Christopher Smith**

With this issue, THE BIOLOGICAL PHYSICIST is pleased to welcome Dr. Christopher Smith as the new Assistant Editor.

A self-described “recovering biochemist/bioinformaticist”, Christopher M. Smith, PhD., joined the Center for Theoretical Biological Physics (CTBP) at the University of California, San Diego (UCSD), in 2004, to oversee the Center’s education, outreach and training activities.

After completing his doctoral work in plant biochemistry/molecular biology at the University of Nebraska, Smith did postdoctoral work with Phil Bourne (Co-Director, Protein DataBank) and Michael Gribskov (Purdue University), then with the San Diego Supercomputer Center at UCSD, developing scientific data resources and pursuing his research interests in protein sequence and structure-function relationships. Subsequently, he assumed more research administration

responsibilities (National Biomedical Computation Resource, and the Integrative Bioscience and Integrated Computational Science Divisions at SDSC) and pursued another of his passions – promoting education and scientific literacy. He made the full jump to “education and outreach” in Physics when Professors Herbert Levine and José Onuchic recruited him to lead efforts of the new NSF Physics Frontiers Center, “Center for Theoretical Biological Physics”, to broaden education and training opportunities in biological physics, promote the nascent discipline of biological physics, and foster interdisciplinary and multi-institutional efforts to advance discovery using approaches from the biological physics world. According to Chris, his new TBP editorial duties will be “just an extension of his outreach efforts to support and promote biological physics to the national/international research and education communities”.

PRL HIGHLIGHTS

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

3 April 2009

**Vol 102, Number 13, Articles (13xxxx)
Articles published 28 Mar - 3 Apr 2009**

<http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=102&Issue=13>

**Critical Scaling and Aging in Cooling
Systems Near the Jamming Transition**

David A. Head

Published 1 April 2009 // 138001

**Prediction of Spatiotemporal Patterns of
Neural Activity from Pairwise
Correlations**

O. Marre, S. El Boustani, Y. Frégnac, and A.
Destexhe

Published 2 April 2009 // 138101

**Hybrid Elastic and Discrete-Particle
Approach to Biomembrane Dynamics
with Application to the Mobility of
Curved Integral Membrane Proteins**

A. Naji, P. J. Atzberger, and F. L. H. Brown

Published 3 April 2009 // 138102

**Simulation of Elastic Rupture in
Extension of Entangled Monodisperse
Polymer Melts**

Anders Lyhne, Henrik Koblitz Rasmussen,
and Ole Hassager

Published 2 April 2009 // 138301

Granular Character of Particle Rafts

Pietro Cicutta and Dominic Vella

Published 3 April 2009 // 138302

**Core-Hole Screening as a Probe for a
Metal-to-Nonmetal Transition in Lead
Clusters**

V. Senz, T. Fischer, P. Oelßner, J.
Tiggesbäumker, J. Stanzel, C. Bostedt, H.
Thomas, M. Schöffler, L. Foucar, M. Martins,

J. Neville, M. Neeb, Th. Möller, W. Wurth, E.
Rühl, R. Dörner, H. Schmidt-Böcking, W.
Eberhardt, G. Ganteför, R. Treusch, P.
Radcliffe, and K.-H. Meiwes-Broer
Published 3 April 2009 // 138303

**Emergence and Size of the Giant
Component in Clustered Random Graphs
with a Given Degree Distribution**

Yakir Berchenko, Yael Artzy-Randrup, Mina
Teicher, and Lewi Stone

Published 30 March 2009 // 138701

10 April 2009

**Vol 102, Number 14, Articles (14xxxx)
Articles published 4 Apr - 10 Apr 2009**

<http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=102&Issue=14>

**Coexistence of Melting and Growth
during Heating of a Semicrystalline
Polymer**

Chuanfu Luo and Jens-Uwe Sommer

Published 7 April 2009 // 147801

**Unusual Dielectric and Electrical
Switching Behavior in the de Vries
Smectic A Phase of Two Organosiloxane
Derivatives**

S. Krishna Prasad, D. S. Shankar Rao, S.
Sridevi, Chethan V. Lobo, B. R. Ratna, Jawad
Naciri, and R. Shashidhar

Published 8 April 2009 // 147802

Polarizable Ions at Interfaces

Yan Levin

Published 8 April 2009 // 147803

**Inversion of Band Patterns in Spherical
Tumblers**

Pengfei Chen, Bryan J. Lochman, Julio M.
Ottino, and Richard M. Lueptow

Published 6 April 2009 // 148001

**Cooling and Aggregation in Wet
Granulates**

Stephan Ulrich, Timo Aspelmeier, Klaus Roeller, Axel Fingerle, Stephan Herminghaus, and Annette Zippelius
Published 10 April 2009 // 148002

Funnel Landscape and Mutational Robustness as a Result of Evolution under Thermal Noise

A. Sakata, K. Hukushima, and K. Kaneko
Published 6 April 2009 // 148101

Vesicles in Poiseuille Flow

Gerrit Danker, Petia M. Vlahovska, and Chaouqi Misbah
Published 10 April 2009 // 148102

Amplification of Tension in Branched Macromolecules

Sergey V. Panyukov, Sergei S. Sheiko, and Michael Rubinstein
Published 7 April 2009 // 148301

Dynamics of Polymer Decompression: Expansion, Unfolding, and Ejection

Takahiro Sakaue and Natsuhiko Yoshinaga
Published 7 April 2009 // 148302

17 April 2009

**Vol 102, Number 15, Articles (15xxxx)
Articles published 11 Apr - 17 Apr 2009**

<http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=102&Issue=15>

Polymer Dimensions in Good Solvents: Crossover from Semidilute to Concentrated Solutions

G. Cheng, W. W. Graessley, and Y. B. Melnichenko
Published 14 April 2009 // 157801

Diagrammatic Expansion of Pulse-Coupled Network Dynamics

Aaditya V. Rangan
Published 13 April 2009 // 158101

Learning of Spatiotemporal Patterns in Ising-Spin Neural Networks: Analysis of Storage Capacity by Path Integral Methods

Masahiko Yoshioka
Published 13 April 2009 // 158102

Separation of Microscale Chiral Objects by Shear Flow

Marcos, Henry C. Fu, Thomas R. Powers, and Roman Stocker
Published 15 April 2009 // 158103

Control of DNA Replication by Anomalous Reaction-Diffusion Kinetics

Michel G. Gauthier and John Bechhoefer
Published 16 April 2009 // 158104

Pulling Helices inside Bacteria: Imperfect Helices and Rings

Jun F. Allard and Andrew D. Rutenberg
Published 17 April 2009 // 158105

Emergence of Collective Behavior in Groups of Excitable Catalyst-Loaded Particles: Spatiotemporal Dynamical Quorum Sensing

Mark R. Tinsley, Annette F. Taylor, Zhaoyang Huang, and Kenneth Showalter
Published 17 April 2009 // 158301

24 April 2009

**Vol 102, Number 16, Articles (16xxxx)
Articles published 18 Apr - 24 Apr 2009**

<http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=102&Issue=16>

Direct Measurement of Surface-Induced Orientational Order Parameter Profile above the Nematic-Isotropic Phase Transition Temperature

Ji-Hoon Lee, Timothy J. Atherton, Valentin Barna, Antonio De Luca, Emanuela Bruno, Rolfe G. Petschek, and Charles Rosenblatt
Published 24 April 2009 // 167801

Dancing Volvox: Hydrodynamic Bound States of Swimming Algae

Knut Drescher, Kyriacos C. Leptos, Idan Tuval, Takuji Ishikawa, Timothy J. Pedley, and Raymond E. Goldstein
Published 20 April 2009 // 168101

High-Resolution Probing of Cellular Force Transmission

D. Mizuno, R. Bacabac, C. Tardin, D. Head, and C. F. Schmidt
Published 20 April 2009 // 168102

Structure of a Tubular Membrane Confining Spherical Particles

Jeff Z. Y. Chen, Yuan Liu, and H.-J. Liang
Published 24 April 2009 // 168103

Arrest of Flow and Emergence of Activated Processes at the Glass Transition of a Suspension of Particles with Hard Spherelike Interactions

W. van Megen, V. A. Martinez, and G. Bryant
Published 23 April 2009 // 168301

Origin and Nonuniversality of the Earthquake Interevent Time Distribution

Sarah Touati, Mark Naylor, and Ian G. Main
Published 24 April 2009 // 168501

1 May 2009

Vol 102, Number 17, Articles (17xxxx)

Articles published 25 Apr - 1 May 2009

<http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=102&Issue=17>

Multiscale Force Networks in Highly Polydisperse Granular Media

C. Voivret, F. Radjaï, J.-Y. Delenne, and M. S. El Youssoufi
Published 29 April 2009 // 178001

Versatile Approach to Access the Low Temperature Thermodynamics of Lattice Polymers and Proteins

Thomas Wüst and David P. Landau
Published 29 April 2009 // 178101

Twist- and Tension-Mediated Elastic Coupling between DNA-Binding Proteins

Elena F. Koslover and Andrew J. Spakowitz
Published 30 April 2009 // 178102

Slowly Replicating Lytic Viruses: Pseudolysogenic Persistence and Within-Host Competition

Jingshan Zhang and Eugene I. Shakhnovich
Published 1 May 2009 // 178103

Markov Analysis of Sleep Dynamics

J. W. Kim, J.-S. Lee, P. A. Robinson, and D.-U. Jeong

Published 1 May 2009 // 178104

See Also: Phys. Rev. Focus

Period Doubling and Spatiotemporal Chaos in Periodically Forced CO Oxidation on Pt(110)

Dagmar Krefting, Prabha Kaira, and Harm Hinrich Rotermund
Published 29 April 2009 // 178301

Two-Dimensional to Three-Dimensional Transition in Soap Films Demonstrated by Microrheology

V. Prasad and Eric R. Weeks

Published 29 April 2009 // 178302

Activated Surface Diffusion in a Simple Colloid System

M. Kim, S. M. Anthony, and S. Granick

Published 30 April 2009 // 178303

8 May 2009

Vol 102, Number 18, Articles (18xxxx)

Articles published 2 May - 8 May 2009

<http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=102&Issue=18>

Quantifying Hopping and Jumping in Facilitated Diffusion of DNA-Binding Proteins

C. Loverdo, O. Bénichou, R. Voituriez, A. Biebricher, I. Bonnet, and P. Desbiolles
Published 4 May 2009 // 188101

Structural Observation and Kinetic Pathway in the Formation of Polymeric Micelles

Reidar Lund, Lutz Willner, Michael Monkenbusch, Pierre Panine, Theyencheri Narayanan, Juan Colmenero, and Dieter Richter

Published 5 May 2009 // 188301

Noise Induces Partial Annihilation of Colliding Dissipative Solitons

Orazio Descalzi, Jaime Cisternas, Daniel Escaff, and Helmut R. Brand

Published 6 May 2009 // 188302

Microrheology of Microtubule Solutions and Actin-Microtubule Composite Networks

Vincent Pelletier, Naama Gal, Paul Fournier, and Maria L. Kilfoil

Published 7 May 2009 // 188303

Breaking of an Emulsion under an ac Electric Field

Abdou R. Thiam, Nicolas Bremond, and Jérôme Bibette

Published 7 May 2009 // 188304

Anomalous Diffusion of Symmetric and Asymmetric Active Colloids

Ramin Golestanian

Published 8 May 2009 // 188305

15 May 2009

Vol 102, Number 19, Articles (19xxxx)

Articles published 9 May - 15 May 2009

<http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=102&Issue=19>

Monte Carlo Simulation of Coarse Grain Polymeric Systems

François A. Detcheverry, Darin Q. Pike, Paul F. Nealey, Marcus Müller, and Juan J. de Pablo

Published 12 May 2009 // 197801

Theory of Ferroelectric Nanoparticles in Nematic Liquid Crystals

Lena M. Lopatina and Jonathan V. Selinger

Published 15 May 2009 // 197802

E. Coli and Oxygen: A Motility Transition

C. Douarche, A. Buguin, H. Salman, and A. Libchaber

Published 12 May 2009 // 198101

Nonequilibrium Assembly, Retroviruses, and Conical Structures

Artem Levandovsky and Roya Zandi

Published 13 May 2009 // 198102

Transformation from Spots to Waves in a Model of Actin Pattern Formation

Stephen Whitelam, Till Bretschneider, and Nigel J. Burroughs

Published 13 May 2009 // 198103

Queueing Phase Transition: Theory of Translation

M. Carmen Romano, Marco Thiel, Ian Stansfield, and Celso Grebogi

Published 15 May 2009 // 198104

Low-Density Ordered Phase in Brownian Dipolar Colloidal Suspensions

Amit K. Agarwal and Anand Yethiraj

Published 11 May 2009

198301

Experimental Evidence for Two-Step Nucleation in Colloidal Crystallization

J. R. Savage and A. D. Dinsmore

Published 15 May 2009 // 198302

Structure Dynamics of the Proton in Liquid Water Probed with Terahertz Time-Domain Spectroscopy

K. J. Tielrooij, R. L. A. Timmer, H. J. Bakker, and M. Bonn

Published 15 May 2009 // 198303

22 May 2009

Vol 102, Number 20, Articles (20xxxx)

Articles published 16 May - 22 May 2009

<http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=102&Issue=20>

Pinwheel Stabilization by Ocular Dominance Segregation

Lars Reichl, Siegrid Löwel, and Fred Wolf

Published 18 May 2009 // 208101

Charge Transport through Biomolecular Wires in a Solvent: Bridging Molecular Dynamics and Model Hamiltonian Approaches

R. Gutiérrez, R. A. Caetano, B. P. Woiczikowski, T. Kubar, M. Elstner, and G. Cuniberti

Published 22 May 2009 // 208102

Manipulation of Colloids by a Nonequilibrium Depletion Force in a Temperature Gradient

Hong-Ren Jiang, Hirofumi Wada, Natsuhiko Yoshinaga, and Masaki Sano

Published 20 May 2009 // 208301

29 May 2009

Vol 102, Number 21, Articles (21xxxx)

Articles published 23 May - 29 May 2009

<http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=102&Issue=21>

Mutual Information between Input and Output Trajectories of Biochemical Networks

Filipe Tostevin and Pieter Rein ten Wolde

Published 27 May 2009 // 218101

Kinematics of the Swimming of Spiroplasma

Jing Yang, Charles W. Wolgemuth, and Greg Huber

Published 28 May 2009 // 218102

Noise-Induced Breakdown of the Michaelis-Menten Equation in Steady-State Conditions

R. Grima

Published 29 May 2009 // 218103

Temperature Dependence of Normal Mode Reconstructions of Protein Dynamics

Francesco Piazza, Paolo De Los Rios, and Fabio Cecconi

Published 29 May 2009 // 218104

Stability of a Surface-Bound Oligonucleotide Duplex Inferred from Molecular Dynamics: A Study of Single Nucleotide Defects Using DNA

Microarrays

Thomas Naiser, Jona Kayser, Timo Mai, Wolfgang Michel, and Albrecht Ott
Published 26 May 2009 // 218301

Lattice Model of Diffusion-Limited Bimolecular Chemical Reactions in Confined Environments

Jeremy D. Schmit, Ercan Kamber, and Jané Kondev

Published 26 May 2009 // 218302

Jamming Transition as Probed by Quasistatic Shear Flow

Claus Heussinger and Jean-Louis Barrat
Published 26 May 2009 // 218303

PRE HIGHLIGHTS

Biological Physics Articles from
Physical Review E

April 2009

Vol 79, Number 4, Articles (04xxxx)

<http://scitation.aip.org/dbt/dbt.jsp?KEY=PLEEE8&Volume=79&Issue=4>

RAPID COMMUNICATIONS

Tracking and control of neuronal Hodgkin-Huxley dynamics

Ghanim Ullah and Steven J. Schiff

Published 13 April 2009 // 040901(R)

ARTICLES

Particle motion in unsteady two-dimensional peristaltic flow with application to the ureter

J. Jiménez-Lozano, M. Sen, and P. F. Dunn

Published 1 April 2009 // 041901

Theory of possible effects of the Allee phenomenon on the population of an epidemic reservoir

Niraj Kumar, M. N. Kuperman, and V. M. Kenkre

Published 2 April 2009 // 041902

Synchronization and clustering of synthetic genetic networks: A role for cis-regulatory modules

Jiajun Zhang, Zhanjiang Yuan, and Tianshou Zhou

Published 2 April 2009 // 041903

Cable theory of protein receptor trafficking in a dendritic tree

Paul C. Bressloff

Published 3 April 2009 // 041904

Phase diagram for the Eigen quasispecies theory with a truncated fitness landscape

D. B. Saakian, C. K. Biebricher, and C.-K. Hu

Published 6 April 2009 // 041905

Thermodynamic origin of cooperativity in actomyosin interactions: The coupling of short-range interactions with actin bending stiffness in an Ising-like model

Adriano M. Alencar, James P. Butler, and Srbojub M. Mijailovich

Published 7 April 2009 // 041906

Rigorous treatment of electrostatics for spatially varying dielectrics based on energy minimization

O. I. Obolensky, T. P. Doerr, R. Ray, and Yi-Kuo Yu

Published 7 April 2009 // 041907

Dry and wet interfaces: Influence of solvent particles on molecular recognition

Johannes Taktikos and Hans Behringer

Published 8 April 2009 // 041908

Conformational change path between closed and open forms of C2 domain of coagulation factor V on a two-dimensional free-energy surface

S. Wu, C. J. Lee, and L. G. Pedersen

Published 8 April 2009 // 041909

Assessment of the antireflection property of moth wings by three-dimensional transfer-matrix optical simulations

Olivier Deparis, Nadia Khuzayim, Andrew Parker, and Jean Pol Vigneron

Published 8 April 2009 // 041910

Single-molecule DNA dynamics in tapered contraction-expansion microchannels under electrophoresis

Xin Hu, Shengnian Wang, and L. James Lee

Published 9 April 2009 // 041911

Velocity convergence of free energy surfaces from single-molecule measurements using Jarzynski's equality

Nolan C. Harris and Ching-Hwa Kiang

Published 10 April 2009 // 041912

Directional dependent dynamics of protein molecules on DNA

Rajamanickam Murugan

Published 14 April 2009 // 041913

Nonlinear denoising of functional magnetic resonance imaging time series with wavelets

Sven Stausberg and Klaus Lehnertz

Published 15 April 2009 // 041914

Biomolecular motion characterization by a self-distribution-function procedure in elastic incoherent neutron scattering

Salvatore Magazù, Giacomo Maisano, Federica Migliardo, and Antonio Benedetto

Published 16 April 2009 // 041915

Numerical simulation of rheology of red blood cell rouleaux in microchannels

T. Wang, T.-W. Pan, Z. W. Xing, and R. Glowinski

Published 17 April 2009 // 041916

Adhesion-induced lateral phase separation of multicomponent membranes: The effect of repellers and confinement

Mesfin Asfaw and Hsuan-Yi Chen

Published 20 April 2009 // 041917

Relations between Shannon entropy and genome order index in segmenting DNA sequences

Yi Zhang

Published 21 April 2009 // 041918

Braided bundles and compact coils: The structure and thermodynamics of hexagonally packed chiral filament assemblies

Gregory M. Grason

Published 21 April 2009 // 041919

Levels of complexity in scale-invariant neural signals

Plamen Ch. Ivanov, Qianli D. Y. Ma, Ronny P. Bartsch, Jeffrey M. Hausdorff, Luís A. Nunes Amaral, Verena Schulte-Frohlinde, H. Eugene Stanley, and Mitsuru Yoneyama

Published 21 April 2009 // 041920

Investigation of the elasticity of a cisplatin-DNA adduct via single-molecule measurements and bimodal modeling

Nam-Kyung Lee, Jin-Sung Park, Albert Johner, Sergei Obukhov, Ju-Yong Hyon, Kyoung J. Lee, and Seok-Cheol Hong

Published 22 April 2009 // 041921

Fluctuations and oscillations in a simple epidemic model

G. Rozhnova and A. Nunes

Published 23 April 2009 // 041922

Global noise and oscillations in clustered excitable media

X. L. Liao, P. Jung, and J. W. Shuai
Published 24 April 2009 // 041923

Violation of the single-parameter scaling hypothesis in human chromosome 22 with charge transfer models

Ai-Min Guo and Shi-Jie Xiong
Published 24 April 2009 // 041924

Past-future information bottleneck in dynamical systems

F. Creutzig, A. Globerson, and N. Tishby
Published 27 April 2009 // 041925

Temperature dependence of circular DNA topological states

Hu Chen, Yanhui Liu, Zhen Zhou, Lin Hu, Zhong-Can Ou-Yang, and Jie Yan
Published 29 April 2009 // 041926

Path integral method for DNA denaturation

Marco Zoli
Published 29 April 2009 // 041927

Nonlinear elasticity of stiff biopolymers connected by flexible linkers

K. E. Kasza, G. H. Koenderink, Y. C. Lin, C. P. Broedersz, W. Messner, F. Nakamura, T. P. Stossel, F. C. MacKintosh, and D. A. Weitz
Published 29 April 2009 // 041928

Low-dimensional dynamical model for the diversity of pressure patterns used in canary song

Leandro M. Alonso, Jorge A. Allende, F. Goller, and Gabriel B. Mindlin
Published 30 April 2009 // 041929

May 2009

Vol 79, Number 5, Articles (05xxxx)

<http://scitation.aip.org/dbt/dbt.jsp?KEY=PLEEE8&Volume=79&Issue=5>

RAPID COMMUNICATIONS

Protein fluorescence decay: A gamma function description of thermally induced interconversion of amino acid rotamers

Olaf J. Rolinski, Katherine Scobie, and David J. S. Birch

Published 28 May 2009 // 050901(R)

ARTICLES

Diffusion, dimensionality, and noise in transcriptional regulation

Gašper Tkačik and William Bialek
Published 4 May 2009 // 051901
See accompanying Viewpoint Physics 2, 36 (2009)

Trapping probability analysis of a DNA trap using electric and hydrodrag force fields in tapered microchannels

Yuichi Tomizawa, Eiichi Tamiya, and Yuzuru Takamura
Published 8 May 2009 // 051902

Stochastic model for tumor growth with immunization

Thomas Bose and Steffen Trimper
Published 11 May 2009 // 051903

Self-organization of feed-forward structure and entrainment in excitatory neural networks with spike-timing-dependent plasticity

Y. K. Takahashi, H. Kori, and N. Masuda
Published 11 May 2009 // 051904

Linking topology of tethered polymer rings with applications to chromosome segregation and estimation of the knotting length

John F. Marko
Published 11 May 2009 // 051905

Quantifying stochastic effects in biochemical reaction networks using partitioned leaping

Leonard A. Harris, Aaron M. Piccirilli, Emily R. Majusiak, and Paulette Clancy
Published 12 May 2009 // 051906

Comparing the growth kinetics of cell populations in two and three dimensions

M. Radszuweit, M. Block, J. G. Hengstler, E. Schöll, and D. Drasdo
Published 12 May 2009 // 051907

Partial independence of bioelectric and biomagnetic fields and its implications for encephalography and cardiography
Andrei Irimia, Kenneth R. Swinney, and John P. Wikswo
Published 13 May 2009 // 051908

Data assimilation for heterogeneous networks: The consensus set
Timothy D. Sauer and Steven J. Schiff
Published 13 May 2009 // 051909

Mapping of spatiotemporal heterogeneous particle dynamics in living cells
Michael H. G. Duits, Yixuan Li, Siva A. Vanapalli, and Frieder Mugele
Published 13 May 2009 // 051910

Theory of tunneling across hydrogen-bonded base pairs for DNA recognition and sequencing
Myeong H. Lee and Otto F. Sankey
Published 18 May 2009 // 051911

Formation of DNA toroids inside confined droplets adsorbed on mica surfaces
Xi-Miao Hou, Wei Li, Shuo-Xing Dou, Ling-Yun Zhang, Ping Xie, Wei-Chi Wang, and Peng-Ye Wang
Published 18 May 2009 // 051912

Allosteric role of the large-scale domain opening in biological catch-binding
Yuriy V. Pereverzev, Oleg V. Prezhdo, and Evgeni V. Sokurenko
Published 18 May 2009 // 051913

Neural complexity and structural connectivity
L. Barnett, C. L. Buckley, and S. Bullock
Published 19 May 2009 // 051914

Ising model for neural data: Model quality and approximate methods for extracting functional connectivity
Yasser Roudi, Joanna Tyrcha, and John Hertz
Published 19 May 2009 // 051915

Ratio control in a cascade model of cell differentiation

Hidetsugu Sakaguchi
Published 19 May 2009 // 051916

Spike propagation in driven chain networks with dominant global inhibition
Wonil Chang and Dezhe Z. Jin
Published 20 May 2009 // 051917

Nonlinear dynamics of cilia and flagella
Andreas Hilfinger, Amit K. Chattopadhyay, and Frank Jülicher
Published 21 May 2009 // 051918

Conformation and translational diffusion of a xanthan polyelectrolyte chain: Brownian dynamics simulation and single molecule tracking
M.-S. Chun, C. Kim, and D. E. Lee
Published 27 May 2009 // 051919

Thermal activation and ATP dependence of the cytoskeleton remodeling dynamics
R. Sunyer, F. Ritort, R. Farré, and D. Navajas
Published 27 May 2009 // 051920

Stochastic and coherence resonance in feed-forward-loop neuronal network motifs
Daqing Guo and Chunguang Li
Published 27 May 2009 // 051921

Thermodynamic stability of small-world oscillator networks: A case study of proteins
Jie Ren and Baowen Li
Published 27 May 2009 // 051922

DNA unzipping phase diagram calculated via replica theory
C. Brian Roland, Kristi Adamson Hatch, Mara Prentiss, and Eugene I. Shakhnovich
Published 28 May 2009 // 051923

Shape deformation and fission route of the lipid domain in a multicomponent vesicle
Kai Yang, Xi Shao, and Yu-qiang Ma
Published 29 May 2009 // 051924

JOB AD

Graduate student position

at Texas A&M

University Health Science Center /

Biomedical Engineering Health Science Center / Biomedical Engineering

Experimental Biophysics

A PhD student/graduate research assistant position is available immediately in the laboratory of Prof. Andreea Trache at Texas A&M Health Science Center, College Station, TX. The student will be enrolled in the Biomedical Engineering PhD program at Texas A&M University and will do their PhD thesis work at Texas A&M Health Science Center. The position will involve the study of molecular dynamics at the cellular level, focusing on mechanotransduction at cell adhesions and its connection with the cytoskeleton. These interdisciplinary studies will involve instrumentation development and calibration, and will use an atomic force microscope combined with total internal reflection fluorescence and fast confocal microscopy.

The successful candidate should have a BS/MS in Physics, Biophysics or Engineering with basic training in optics or microscopy. No cell biology knowledge is necessary at this time; however acquiring general cell biology skills and knowledge will be required to carry on live-cell experiments. Experience with MatLab is a plus.

Interested applicants please send your CV to trache@tamu.edu.

Lab website:

<http://medicine.tamhsc.edu/basic-sciences/sbtm/homepages/trache/>

JOB AD

Postdoctoral Position 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 physics PhD and experience in computational modeling. The start date is Sept 1 2009. Please email your CV as a pdf file, and provide the contact details for three references, to andrew.rutenberg@dal.ca. The position is for one year, though additional funding should become available.

JOB AD

Biophysics/Soft Matter Postdoc Dept. of Physics Georgetown University, Washington, DC

Applications are invited for a postdoctoral research position to study the physical properties of biopolymer networks using optical and rheological techniques. The successful candidate will join the collaborative soft matter research effort at Georgetown with Profs. Dan Blair and Jeff Urbach (for more information, see <http://softmatter.georgetown.edu/> and <http://physics.georgetown.edu/~urbach/dil.html>) and interact with other groups and Georgetown and NIH. Candidates should have a strong background in soft matter rheology or optical biophysics, and experience with in vitro biopolymer networks is preferred but not essential. To apply, please send your CV and the names of three references to blair@physics.georgetown.edu and urbach@physics.georgetown.edu.

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 in

Biological Physics

Applications are due October 15, 2009

For additional information and application instructions:
http://ctbp.ucsd.edu/zimm_fellowship.html

CTBP is a consortium of researchers from UCSD and the Salk Institute for Biological Studies, involved in research on fundamental problems at the interface between physics and biology. Research revolves around 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 exhibit specificity and robustness in the face of intrinsic stochasticity, and yet retain evolvability. This 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 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

Peter Wolynes, Chemistry, UCSD

<http://ctbp.ucsd.edu>



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CTBP is a Physics Frontiers Center of the National Science Foundation

