

THE BIOLOGICAL PHYSICIST

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

Vol 9 N° 7 April 2010

DIVISION OF BIOLOGICAL PHYSICS EXECUTIVE COMMITTEE

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In this issue we continue with our highlights of federal programs and interviews with program directors who oversee biological physics research initiatives. In this and the June issue are overviews of two NSF Physics Frontiers Centers mentioned in the interviews of Denise Caldwell, Krastan Blagoev and Kamal Shukla (the last TBP issue).

– CS



National Science Foundation Physics Frontiers Centers Program

Continuing with our theme (over the course of the next few issues) to highlight program directors at major federal funding agencies that oversee programs directly and/or indirectly involved in biological physics research, and on-going large-scale programs sponsored by these federal programs, this issue will highlight one of the NSF Physics Frontiers Centers, the Center for Theoretical Biological Physics at the University of California, San Diego. The next issue will highlight another NSF PFC, the Center for the Physics of Living Cells at the University of Illinois, Urbana-Champaign. We will follow-up with additional interviews in the August issue.

The Center for Theoretical Biological Physics University of California, San Diego ctbp.ucsd.edu



Established in 2002, The Center for Theoretical Biological Physics (CTBP) at the University of California San Diego (UCSD), is one of nine NSF Physics Frontiers Centers (PFC), and the first of two PFC's dedicated to research in the realm of biological physics. CTBP

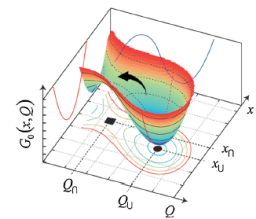
represents a consortium of investigators at UCSD, the Salk Institute for Biological Studies and the University of Michigan, with close collaborations with researchers at the University of California, Davis and Tel Aviv University, Israel. Under the co-direction of Professors José N. Onuchic, PhD., and Herbert Levine, PhD., CTBP senior investigators include faculty in Mathematics, Chemistry and Biochemistry, Physics, Neuroscience and Biology; and encompasses theoretical and experimental research work. Although the research efforts within CTBP are highly interdisciplinary, research occurs within in three thrust areas: **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.

Cellular Tectonics. We have come a long way from the time when the biological cell could be

thought of as a nucleus floating in a featureless cytoplasmic fluid, all surrounded by a uniform lipid membrane.

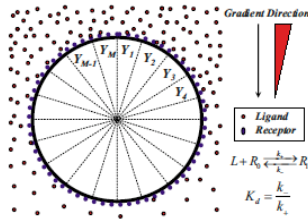
As recent studies using approaches ranging from cryo electron microscopy to fluorescence correlations to dynamical rheology have all shown, the correct conceptual picture is much more interesting, consisting of a high-level of functional complexity involving cytoskeletal gridwork, organelles, membranes, ribosomes, compartments, scaffolds ... all of which are in constant flux that can be dynamically modulated in response to changing conditions. Research in this CTBP thrust area focuses on cellular-scale structure and mechanics, and on how the interactions of biomolecules (especially motors that utilize

chemical energy to affect conformational change) leads to the flexible, functional architecture of, for example, the actin cytoskeleton. This research integrates molecular biophysics with insights from soft condensed-matter and from nonlinear dynamics, and aims to develop a better understanding of higher-level organization in living systems. Specific cellular tectonics research projects include: molecular motors, coarse-grained actin simulations, cytoskeletal elasticity, and cytoskeletal waves.



Computational Approaches to Intracellular and Intercellular Communication.

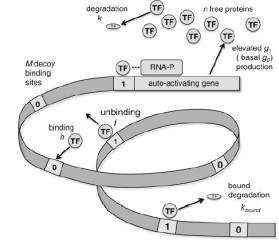
One of the hallmarks of living cells is their ability to gather information from the environment and, especially in the case of multicellular organisms, from other cells. In addition to this intercellular communication, cells often need to engage in intracellular communication whereby information gathered at one location (typically receptors on the cell membrane) is passed on so as to effect functional changes elsewhere in the cell. Since this transport is often accomplished by the diffusive motion of chemical messengers, understanding and the concomitant modeling of the physics of diffusion coupled to reactions (localized or bulk, and often nonlinear) is essential for future progress in the quantitative study of biological matter. Hence, research in this thrust area focuses on quantitatively



delineating the reaction and diffusion mechanisms that enable the passing of information-rich chemical messages both within and between individual cells. Due to the intrinsic nature of developing sophisticated computational algorithms in concert with a deeper understanding of how to match method to model, all of these endeavors involve close collaborations between biologists (experimentalists), physical scientists and applied mathematicians. Specific research projects include: calcium dynamics in the presynaptic cell, neurotransmitter reaction-diffusion, compartmentalization in cell signaling, and exploring Ryanodine conductivity - bridging phenomenology and microscopic molecular physics.

Gene Regulatory Networks. The CTBP thrust areas described above focus on some of the specific machinery that cells use to gather and transport information arising from the environment and from other cells. The purpose of this data flow is, of course, to enable the cell (and by extension, any higher level structure of which the cell is part) to adapt itself to survive and prosper under varying conditions. Thus, external information needs to be processed and then used to make decisions and take action accordingly. Some of the most interesting of these decisions concern gene expression, ultimately the production rate of various proteins that are needed in differing amounts for differing actions. The information processing is

carried out by reaction networks of interacting biomolecules, leading to the notion of gene regulatory networks as being a fundamental aspect of living matter. The dissection and elucidation of gene regulatory networks in cells has been an area of intense research in systems biology. It is also an area where theoretical physicists have contributed important ideas and methods, including dictionary-based methods for motif search, programmable schemes of combinatorial control, characterization of stochastic gene expression, analysis of Boolean networks, etc. The aim of the CTBP gene regulatory network research thrust is to extend knowledge of individual genetic switches (and the underlying protein-DNA interactions) towards an understanding of more extensive networks, and ultimately how these networks become part of genetic strategies in developmental and evolutionary biology. Although many of these research directions parallel what one may find in systems biology, CTBP researchers are taking a quantitative approach towards building coarse-grained networks from molecular scale events. Special research projects within this thrust area includes the choice between sporulation and competence in *Bacillus*, the mating pathway in budding yeast (*Saccharomyces*), and the cellular decisions made in time and space during *Drosophila* embryogenesis.



The Center currently encompasses 15 faculty senior investigators (Profs. Henry Abarbanel, Charles Brooks, III (U Michigan), Olga Dudko, Michael Holst, Terence Hwa, Bo Li, Andy McCammon, Wouter-Jan Rappel, Terrence Sejnowski (Salk), Tatyana Sharpee (Salk), Wei Wang, and Peter Wolynes), 3 faculty research fellows, over 50 post-doctoral fellows and graduate students, and other UCSD faculty experimentalist collaborators. The Center also provides research internships to about a dozen undergraduates from community colleges to research universities each year, and hosts an 1-2 week school/conference for students, fellows and junior faculty on a biological physics leading-edge topic each summer. The Center is always recruiting junior or senior researchers. If you have any questions or are interested in CTBP research and training activities, contact Christopher M. Smith, PhD., csmith@ctbp.ucsd.edu, (858) 534-8370.

DBP ANNOUNCEMENT

Award for Outstanding Doctoral Thesis Research in Biological Physics

Background

At this year's March Meeting, the first DBP Outstanding Doctoral Thesis awards will be presented. The competition is now open for next year's awards!

Description

To recognize doctoral thesis research of outstanding quality and achievement in any area of experimental, computational, engineering, or theoretical Biological Physics, broadly construed, and to encourage effective written and oral presentation of research results, the Division of Biological Physics will present an award, to be given annually, consisting of \$1,500, a certificate citing the contribution made by the Awardee, and a \$500 travel allowance (\$1000 international) and fee waiver to attend the subsequent March meeting and to present an invited talk based on the thesis work or an extension of that work. Award and travel monies will be presented following the talk. The two runners-up will receive certificates of merit citing their contributions.

Establishment & Support

The award was established in 2009 by the Division of Biological Physics and is sponsored by members and friends of the Division of Biological Physics.

Rules & Eligibility

Doctoral students at any university in the United States or abroad who have passed their thesis defense for the Ph.D. in any areas of experimental, computational, engineering, or theoretical Biological Physics, broadly construed, any time from October 1st two years before the year in which the award is to be presented until September 30th in the year before the award is to be presented, are eligible for the award, except for those whose thesis advisors serve on the current Selection Committee. To recognize the fundamentally interdisciplinary nature of biological physics, the applicant, advisor and degree awarded need not be in Physics, but may also be in any appropriate related area, including, but not limited to, Biomedical Engineering, Applied Mathematics, Applied Physics or Biological Physics, Biophysics, Biology, Mathematics, Biochemistry, Chemistry or Chemical Engineering. In the event that the Committee judges no submitted theses to be of sufficient quality, the Committee may elect not to present the award.

Nomination & Selection Process

Nominations must be received by the Chair of the 2009 Biological Physics Thesis Award Selection Committee prior to the deadline for

nominations: **the first Monday in October each year (October 4th, 2010)**. Nominations **must** be submitted as a single PDF file to the Chair of the Selection Committee in an email attachment.

The nomination process is initiated by the thesis advisor. The nomination package consists of the following materials:

1. A letter from the thesis advisor citing the specific contributions of the nominee and the significance of those contributions.
2. A letter from the department chair and/or relevant program director certifying the date of the thesis defense.
3. Two letters seconding the nomination.
4. A manuscript prepared by the nominee describing the thesis research; the manuscript may not exceed 1,500 words (excluding figures and references).
5. An abstract prepared by the nominee suitable for publication in the Bulletin of the American Physical Society; the abstract may not exceed

1,300 characters. The name of the thesis supervisor and the institution should be indicated in a footnote.

6. A full curriculum vitae of the nominee including a publication list.

Nominations are limited to one per year per nominator. Writers of seconding letters may only submit one seconding letter per year.

Timeline

September 30th—Deadline for thesis defenses for consideration by the Selection Committee.

First Monday in October (October 4th, 2010)—Deadline for nominations.

November 10th—Selection of Awardee and runners up.

November 17th—Notification of Awardee and invitation to March Meeting.

December 2nd—Deadline for acceptance of invitation by Awardee.

March Meeting—Awarding of Prize.

For the 2010/2011 Award, Nominations must be sent to:

Chair: Prof. Stephen Quake
quake@stanford.edu

PRL HIGHLIGHTS

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

5 February 2010

Volume 104, Number 5, Articles (05xxxx)
<http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=104&Issue=5>

Origins of Elasticity in Intermediate Filament Networks

Yi-Chia Lin, Norman Y. Yao, Chase P. Broedersz, Harald Herrmann, Fred C. MacKintosh, and David A. Weitz
Published 1 February 2010 // 058101

Correlations and Synchrony in Threshold Neuron Models

Tatjana Tchumatchenko, Aleksey Malyshev, Theo Geisel, Maxim Volgushev, and Fred Wolf
Published 4 February 2010 // 058102

Survival of the Aligned: Ordering of the Plant Cortical Microtubule Array

Simon H. Tindemans, Rhoda J. Hawkins, and Bela M. Mulder
Published 5 February 2010 // 058103

Long-Time Dynamics of Concentrated Charge-Stabilized Colloids

Peter Holmqvist and Gerhard Nägele
Published 2 February 2010 // 058301

Orbital Motion of Spiral Waves in Excitable Media

V. N. Biktashev, D. Barkley, and I. V. Biktasheva
Published 3 February 2010 // 058302

Noise Bridges Dynamical Correlation and Topology in Coupled Oscillator Networks

Jie Ren, Wen-Xu Wang, Baowen Li, and Ying-Cheng Lai
Published 4 February 2010 // 058701

12 February 2010

Volume 104, Number 6, Articles (06xxxx)
<http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=104&Issue=6>

Triclinic Fluid Order

Nattaporn Chattham, Eva Korblova, Renfan Shao, David M. Walba, Joseph E. MacLennan, and Noel A. Clark
Published 9 February 2010 // 067801

Depolarization Induced Suppression of Excitation and the Emergence of Ultraslow Rhythms in Neural Networks

J. Hlinka and S. Coombes
Published 8 February 2010 // 068101

Effects of Interparticle Attractions on Colloidal Sedimentation

A. Moncho-Jordá, A. A. Louis, and J. T. Padding
Published 11 February 2010 // 068301

19 February 2010

Volume 104, Number 7, Articles (07xxxx)
<http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=104&Issue=7>

Inelastic Tunneling Spectroscopy of Alkanethiol Molecules: High-Resolution Spectroscopy and Theoretical Simulations

Norio Okabayashi, Magnus Paulsson, Hiromu Ueba, Youhei Konda, and Tadahiro Komeda
Published 18 February 2010 // 077801

Unusual Features of Depletion Interactions in Soft Polymer-Based Colloids Mixed with Linear Homopolymers

Manuel Camargo and Christos N. Likos
Published 16 February 2010 // 078301

Flow-Induced Agitations Create a Granular Fluid

Kiri Nichol, Alexey Zanin, Renaud Bastien, Elie Wandersman, and Martin van Hecke
Published 17 February 2010 // 078302

26 February 2010

Volume 104, Number 8, Articles (08xxxx)
<http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=104&Issue=8>

Concentration Dependent Diffusion of Self-Propelled Rods

Arshad Kudrolli
Published 23 February 2010 // 088001

Adhesion of Soft Membranes Controlled by Tension and Interfacial Polymers

Kheya Sengupta and Laurent Limozin
Published 25 February 2010 // 088101

Induced Charge Electro-osmosis over Controllably Contaminated Electrodes

Andrew J. Pascall and Todd M. Squires
Published 22 February 2010 // 088301

Self-Connected 3D Architecture of Microwires

Jean-Baptiste Fleury, David Pires, and Yves Galerne
Published 30 December 2009 // 67801

5 March 2010

Volume 104, Number 9, Articles (09xxxx)
<http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=104&Issue=9>

Orientational Quenched Disorder of a Nematic Liquid Crystal

Mathieu Nespoulous, Christophe Blanc, and Maurizio Nobili
Published 4 March 2010 // 097801

Ion-Specific Excluded-Volume Correlations and Solvation Forces

Immanuel Kalcher, Julius C. F. Schulz, and Joachim Dzubiella
Published 5 March 2010 // 097802

Dynamical Transition of Protein-Hydration Water

W. Doster, S. Busch, A. M. Gaspar, M.-S. Appavou, J. Wuttke, and H. Scheer
Published 2 March 2010 // 098101

Effective Viscosity of Microswimmer Suspensions

Salima Rafaï, Levan Jibuti, and Philippe Peyla
Published 3 March 2010 // 098102

Circularization, Photomechanical Switching, and a Supercoiling Transition of Actin Filaments

T. Sanchez, I. M. Kulic, and Z. Dogic
Published 5 March 2010 // 098103

12 March 2010

Volume 104, Number 10, Articles (10xxxx)
<http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=104&Issue=10>

Self-Ratcheting Stokes Drops Driven by Oblique Vibrations

Karin John and Uwe Thiele
Published 8 March 2010 // 107801

Force Attractor in Confined Comminution of Granular Materials

O. Ben-Nun, I. Einav, and A. Tordesillas
Published 8 March 2010 // 108001

Cholesterol-Phospholipid Interactions: New Insights from Surface X-Ray Scattering Data

Andrey Ivankin, Ivan Kuzmenko, and David Gidalevitz
Published 8 March 2010 // 108101

Model Accounting for the Effects of Pulling-Device Stiffness in the Analyses of Single-Molecule Force Measurements

Arijit Maitra and Gaurav Arya
Published 12 March 2010 // 108301

Nonadiabatic Response Model of Laser-Induced Ultrafast π -Electron Rotations in Chiral Aromatic Molecules

Manabu Kanno, Hirohiko Kono, Yuichi Fujimura, and Sheng H. Lin
Published 12 March 2010 // 108302

Necessary Condition for Frequency Synchronization in Network Structures

Fumito Mori
Published 10 March 2010 // 108701

Entropic Origin of Disassortativity in Complex Networks

Samuel Johnson, Joaquín J. Torres, J. Marro, and Miguel A. Muñoz
Published 11 March 2010 // 108702

19 March 2010

Volume 104, Number 11, Articles (11xxxx)
<http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=104&Issue=11>

Model for Dissipative Highly Nonlinear Waves in Dry Granular Systems

Lautaro Vergara
Published 16 March 2010 // 118001

Lipid Microdomains: Structural Correlations, Fluctuations, and Formation Mechanisms

Jun Fan, Maria Sammalkorpi, and Mikko Haataja
Published 17 March 2010 // 118101

Confining Potential when a Biopolymer Filament Reptates

Bo Wang, Juan Guan, Stephen M. Anthony, Sung Chul Bae, Kenneth S. Schweizer, and Steve Granick
Published 16 March 2010 // 118301

Crystalline Phases of Polydisperse Spheres

Peter Sollich and Nigel B. Wilding
Published 16 March 2010 // 118302

Internal Wave Interferometry

Manikandan Mathur and Thomas Peacock
Published 15 March 2010 // 18501

Shape of Fair Weather Clouds

Yong Wang and Giovanni Zocchi
Published 18 March 2010 // 118502

Functional Modularity of Background Activities in Normal and Epileptic Brain Networks

M. Chavez, M. Valencia, V. Navarro, V. Latora, and J. Martinerie
Published 18 March 2010 // 118701

26 March 2010

Volume 104, Number 12, Articles (12xxxx)
<http://scitation.aip.org/dbt/dbt.jsp?KEY=PRLTAO&Volume=104&Issue=12>

Marginal Nature of DNA Solutions

Eyal Shafran, Alon Yaniv, and Oleg Krichevsky
Published 23 March 2010 // 128101

Shear Induced Drainage in Foamy Yield-Stress Fluids

J. Goyon, F. Bertrand, O. Pitois, and G. Ovarlez
Published 22 March 2010 // 128301

Capacitance of the Double Layer Formed at the Metal/Ionic-Conductor Interface: How Large Can It Be?

Brian Skinner, M. S. Loth, and B. I. Shklovskii
Published 24 March 2010 // 128302

Drying of Complex Suspensions

Lei Xu, Alexis Berges, Peter J. Lu, André R. Studart, Andrew B. Schofield, Hidekazu Oki, Simon Davies, and David A. Weitz
Published 24 March 2010 // 128303

Brushlike Interactions between Thermoresponsive Microgel Particles

Frank Scheffold, Pedro Díaz-Leyva, Mathias Reufer, Nasser Ben Braham, Iseult Lynch, and James L. Harden
Published 26 March 2010 // 128304

Testing Hypotheses about Sun-Climate Complexity Linking

M. Rypdal and K. Rypdal
Published 25 March 2010 // 128501

PRE HIGHLIGHTS

Biological Physics Articles from
Physical Review E

February 2010

Volume 81, Number 2, Articles (02xxxx)
<http://scitation.aip.org/dbt/dbt.jsp?KEY=PLEEE8&Volume=81&Issue=2>

RAPID COMMUNICATIONS

Mismatch of bulk viscosity reduces interfacial diffusivity at an aqueous-oil system

Makiko Negishi, Takahiro Sakaue, and Kenichi Yoshikawa
Published 4 February 2010 // 020901(R)

Treecode algorithm for pairwise electrostatic interactions with solvent-solute polarization

Zhenli Xu
Published 9 February 2010 // 020902(R)

Experimental evidence of strong anomalous diffusion in living cells

Naama Gal and Daphne Weihs
Published 11 February 2010 // 020903(R)

ARTICLES

Switch of encoding characteristics in single neurons by subthreshold and suprathreshold stimuli

Toshiaki Omori, Toru Aonishi, and Masato Okada
Published 1 February 2010 // 021901

Thermal noise due to surface-charge effects within the Debye layer of endogenous structures in dendrites

Roman R. Poznanski
Published 2 February 2010 // 021902

Spectra of secondary electrons generated in water by energetic ions

Emanuele Scifoni, Eugene Surdutovich, and Andrey V. Solov'yov
Published 2 February 2010 // 021903

Statics and dynamics of the wormlike bundle model

Claus Heussinger, Felix Schüller, and Erwin Frey
Published 3 February 2010 // 021904

Conversion of graded to binary response in an activator-repressor system

Rajesh Karmakar
Published 3 February 2010 // 021905

How double-stranded DNA breathing enhances its flexibility and instability on short length scales

O-chul Lee, Jae-Hyung Jeon, and Wokyung Sung
Published 5 February 2010 // 021906

Nucleation dynamics in two-dimensional cylindrical Ising models and chemotaxis

C. Bosia, M. Caselle, and D. Corá
Published 8 February 2010 // 021907

Evolution of Boolean networks under selection for a robust response to external inputs yields an extensive neutral space

Agnes Szejká and Barbara Drossel
Published 8 February 2010 // 021908

Increased accuracy of ligand sensing by receptor internalization

Gerardo Aquino and Robert G. Endres
Published 8 February 2010 // 021909

Nucleation process in the folding of a domain-swapped dimer

Zhiqiang Yan, Jun Wang, Yujie Zhang, Meng Qin, and Wei Wang
Published 8 February 2010 // 021910

Analytical method to determine the orientation of rigid spin labels in DNA

Andriy Marko, Dominik Margraf, Pavol Cekan, Snorri Th. Sigurdsson, Olav Schiemann, and Thomas F. Prisner
Published 9 February 2010 // 021911

Overcharging below the nanoscale: Multivalent cations reverse the ion selectivity of a biological channel

Elena García-Giménez, Antonio Alcaraz, and Vicente M. Aguilera
Published 11 February 2010 // 021912

Linear dielectric response of clustered living cells

Titus Sandu, Daniel Vranceanu, and Eugen Gheorghiu
Published 11 February 2010 // 021913

Terahertz response of dipolar impurities in polar liquids: On anomalous dielectric absorption of protein solutions

Dmitry V. Matyushov
Published 12 February 2010 // 021914

Molecular modeling of proteinlike inclusions in lipid bilayers: Lipid-mediated interactions

Richard A. Kik, Frans A. M. Leermakers, and J. Mieke Kleijn
Published 18 February 2010 // 021915

Network algorithmics and the emergence of the cortical synaptic-weight distribution

Andre Nathan and Valmir C. Barbosa
Published 19 February 2010 // 021916

Mobility and asymmetry effects in one-dimensional rock-paper-scissors games
Siddharth Venkat and Michel Pleimling

Published 19 February 2010 // 021917

Atomistic modeling of the low-frequency mechanical modes and Raman spectra of icosahedral virus capsids

Eric C. Dykeman and Otto F. Sankey
Published 19 February 2010 // 021918

Mean-field methods in evolutionary duplication-innovation-loss models for the genome-level repertoire of protein domains

A. Angelini, A. Amato, G. Bianconi, B. Bassetti, and M. Cosentino Lagomarsino
Published 22 February 2010 // 021919

Introducing the scanning air puff tonometer for biological studies

Vincent Fleury, Alia Al-Kilani, Olena P. Boryskina, Annemiek J. M. Cornelissen, Thi-Hanh Nguyen, Mathieu Unbekandt, Loïc Leroy, Georges Baffet, Ferdinand le Noble, Olivier Sire, Elodie Lahaye, and Vincent Burgaud
Published 22 February 2010 // 021920

Microscopic formulation of the Zimm-Bragg model for the helix-coil transition

A. V. Badasyan, A. Giacometti, Y. Sh. Mamasakhlisov, V. F. Morozov, and A. S. Benight
Published 23 February 2010 // 021921

Distributed self-regulation of living tissue: Beyond the ideal limit

Wassily Lubashevsky, Ihor Lubashevsky, and Reinhard Mahnke
Published 24 February 2010 // 021922

Bounded-noise-induced transitions in a tumor-immune system interplay

Alberto d'Onofrio
Published 24 February 2010 // 021923

Evaluation of biological cell properties using dynamic indentation measurement

Guoxin Cao and Namas Chandra
Published 26 February 2010 // 021924

BRIEF REPORTS

Polarizability of red blood cells with an anisotropic membrane

José Luis Sebastián, Sagrario Muñoz, Miguel Sancho, Genoveva Martínez, and Karan V. I. S. Kaler
Published 1 February 2010 // 022901

March 2010

Volume 81, Number 3, Articles (03xxxx)
<http://scitation.aip.org/dbt/dbt.jsp?KEY=PLLEE8&Volume=81&Issue=3>

RAPID COMMUNICATIONS

Basins of attraction for species extinction and coexistence in spatial rock-paper-scissors games

Hongjing Shi, Wen-Xu Wang, Rui Yang, and Ying-Cheng Lai
Published 1 March 2010 // 030901(R)

Role of anisotropy for protein-protein encounter

Jakob Schluttig, Christian B. Korn, and Ulrich S. Schwarz
Published 10 March 2010 // 030902(R)

Coarse-grained protein-protein stiffnesses and dynamics from all-atom simulations

Stephen D. Hicks and C. L. Henley
Published 11 March 2010 // 030903(R)

Influence of secondary structure on recovery from pauses during early stages of RNA transcription

A. V. Klopper, J. S. Bois, and S. W. Grill
Published 18 March 2010 // 030904(R)

ARTICLES

Dynamics of biomembranes with active multiple-state inclusions

Hsuan-Yi Chen and Alexander S. Mikhailov
Published 1 March 2010 // 031901

Local site preference rationalizes disentangling by DNA topoisomerases

Zhirong Liu, Lynn Zechiedrich, and Hue Sun Chan
Published 4 March 2010 // 031902

Diffusing proteins on a fluctuating membrane: Analytical theory and simulations

Ellen Reister-Gottfried, Stefan M. Leitenberger, and Udo Seifert
Published 4 March 2010 // 031903

Multiscale simulation of erythrocyte membranes

Zhangli Peng, Robert J. Asaro, and Qiang Zhu
Published 4 March 2010 // 031904

Discrete and continuous invariance in phyllotactic tilings

Patrick D. Shipman
Published 5 March 2010 // 031905

Phenomenological approach to eukaryotic chemotactic efficiency

Bo Hu, Danny Fuller, William F. Loomis, Herbert Levine, and Wouter-Jan Rappel
Published 8 March 2010 // 031906

Voltage-induced bending and electromechanical coupling in lipid bilayers

Ben Harland, William E. Brownell, Alexander A. Spector, and Sean X. Sun
Published 9 March 2010 // 031907

All-atom normal-mode analysis reveals an RNA-induced allostery in a bacteriophage coat protein

Eric C. Dykeman and Reidun Twarock
Published 10 March 2010 // 031908

Dynamics of electroencephalogram entropy and pitfalls of scaling detection

M. Ignaccolo, M. Latka, W. Jernajczyk, P. Grigolini, and B. J. West
Published 10 March 2010 // 031909

Microtubule length distributions in the presence of protein-induced severing

Simon H. Tindemans and Bela M. Mulder
Published 11 March 2010 // 031910

Self-consistent approach for neutral community models with speciation

Bart Haegeman and Rampal S. Etienne
Published 11 March 2010 // 031911

Effective zero-thickness model for a conductive membrane driven by an electric field

Falko Ziebert, Martin Z. Bazant, and David Lacoste
Published 11 March 2010 // 031912

Vibron-phonon coupling strength in a finite size lattice of H-bonded peptide units

Vincent Pouthier
Published 17 March 2010 // 031913

Effects of molecular-scale processes on observable growth properties of actin networks

J. Zhu and A. E. Carlsson
Published 22 March 2010 // 031914

Solvent-induced backbone fluctuations and the collective librational dynamics of lysozyme studied by terahertz spectroscopy

K. N. Woods
Published 23 March 2010 // 031915

Estimating input parameters from intracellular recordings in the Feller neuronal model

Enrico Bibbona, Petr Lansky, and Roberta Sirovich
Published 25 March 2010 // 031916

Effect of solvation-related interaction on the low-temperature dynamics of proteins

Guanghong Zuo, Jun Wang, Meng Qin, Bin Xue, and Wei Wang
Published 25 March 2010 // 031917

Electrophoresis of end-labeled DNA: Theory and experiment

Henry W. Lau and Lynden A. Archer
Published 25 March 2010 // 031918

Generalized fundamental measure theory for atomistic modeling of macromolecular crowding

Sanbo Qin and Huan-Xiang Zhou
Published 26 March 2010 // 031919

Averaged implicit hydrodynamic model of semiflexible filaments
Preethi L. Chandran and Mohammad R. K. Mofrad
Published 26 March 2010 // 031920

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Employment Opportunities

American Physical Society Career Center



Employers and employment opportunities are available through our APS Career Center by visiting:

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BIOPHYSICAL SOCIETY JOB BOARD



Finding a job in this tough economy can be hard. That is why you should take advantage of the Biophysical Society Job Board whose focus is on jobs specifically related to the field of biophysics. Currently, employers are looking for postdoctoral, faculty and research candidates. Visit the Job Board today by going to:

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Joint Postdoctoral Positions Johns Hopkins University and the University of Pennsylvania

Applications are solicited for one or more postdoctoral fellows to conduct interdisciplinary research on **cell mechanics and cellular mechanotransduction** using micro- and nanofabricated systems as part of a collaboration between Prof. D. H. Reich of the Johns Hopkins University Department of Physics and Astronomy, and Prof. C. S. Chen of the University of Pennsylvania Department of Bioengineering. Applicants should have a background in biological physics, biophysics, biomedical engineering, biology, or a related field. Applicants should submit a CV, publication list, statement of research interests, and the names of three references as PDF attachments to reich@jhu.edu and cschen2@seas.upenn.edu.

Johns Hopkins University and the University of Pennsylvania are Affirmative Action/Equal Opportunity employers, and actively encourage applications from women and minority candidates

Postdoctoral Position in Biological Physics Oakland University, Rochester, Michigan

Mathematical Modeling of Collective Phenomena in Biological Systems

Applications are invited for a postdoctoral position (starting October 2010) with Dr. Evgeniy Khain at Oakland University, Rochester, MI. We are working on theoretical modeling of collective cell behavior in the context of growth of malignant brain tumors and wound healing. The research is done in a close collaboration with experimental groups. We use methods of statistical physics and nonlinear dynamics to study collective phenomena (cell clustering, cell invasion, pattern formation). More information can be found at: <https://files.oakland.edu/users/khain/web/index.html>

The successful candidate should have a PhD or equivalent in physics or a related field. A solid background in statistical and nonlinear physics and in mathematical modeling is required. Additional knowledge of biology is an advantage. This is an excellent opportunity for a creative and highly motivated person to participate in an exciting interdisciplinary research project.

Oakland University is located in suburban Rochester, Michigan, which boasts one of the most picturesque campuses in the country. OU is 40 minutes drive from the Detroit International Airport and one hour drive from the city of Ann Arbor. The position is for one year with a possibility of extension if funding is available; tentative starting date is October 1, 2010. Applications will be accepted until the position is filled.

Conferences, Meetings, Workshops, Summer Schools

If you would like to post an announcement for a workshop or conference in this Newsletter, send your notice (text) or a PDF document (resized to a maximum size of 7 inches x 10 inches) to the editors.

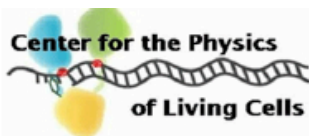
The Physics of Evolution

Center for Theoretical Biological Physics
August 29 – September 2, 2010
University of California San Diego

For Information:

<http://ctbp.ucsd.edu/workshops/index.php?id=29>

CTBP is currently accepting applications for our annual Summer School/Workshop. Applications will be reviewed in June and invitations sent in late June/early July. Invited applicants will be provided housing, meals, and registration. Travel awards may be provided to graduate student and post-doctoral invitees. For additional information, contact: Christopher M. Smith, PhD, CTBP/UCSD, cmith@ctbp.ucsd.edu, 858-534-8370.

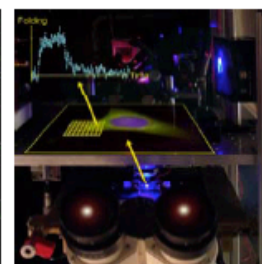
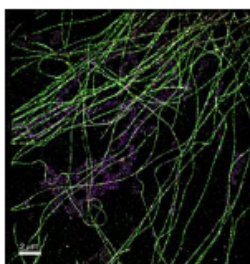
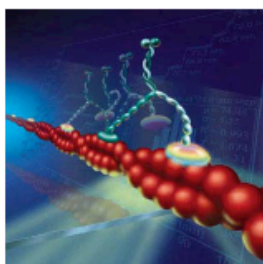
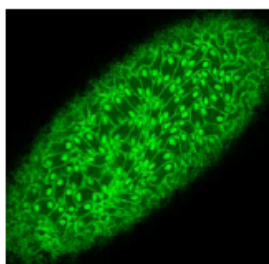
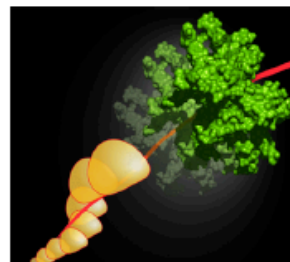
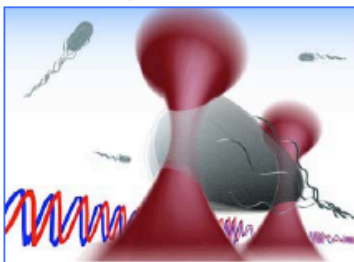
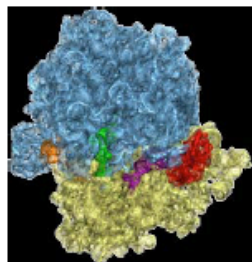


Welcome to the

PHYSICS OF LIVING CELLS SUMMER SCHOOL

An NSF Physics Frontier Center at the
University of Illinois at Urbana-Champaign (UIUC)

July 19 – 24, 2010



The Center for the Physics of Living Cells (CPLC) laboratories at the University of Illinois are using the latest single-molecule, live-cell experimental and computational biophysical tools to investigate biological processes such as mechanisms of protein motor translocation, mechanics of genome maintenance and translation machinery, and dynamics of protein folding and gene expression in living cells.

The 2010 CPLC Summer School will offer training in the following areas:

- ❖ *Single-molecule Fluorescence: TIR-FRET & FIONA*
- ❖ *Single-molecule Force: Optical Traps*
- ❖ *Fast Relaxation Imaging (FRel): protein folding dynamics in living cells*
- ❖ *Single-event detection in living cells*
- ❖ *Super-resolution fluorescence microscopy (PALM/STORM)*
- ❖ *Tracking cell surface growth in living fruit fly embryos*
- ❖ *Molecular dynamics simulations of single molecule sensors*
- ❖ *Observing biomolecular interactions with atomic resolution*
- ❖ *Dynamical networks in protein:RNA assemblies*

This summer school is designed for graduate students, postdoctoral fellows, and researchers in chemical and life sciences, biophysics, physics and engineering who would like to expand their research skills into these areas. The workshop will consist of an initial period of 'basic training' on technique fundamentals followed by a four day 'advanced laboratory module' on a selected topic which integrates both experimental and theoretical components.

Registration Fee*: \$75 students; \$150 non-student academics; \$250 all others
Housing and all course materials will be provided.

Application Deadline: April 1, 2010

Selection and notification of Participants to be completed by April 15, 2010

*Registration Fee is due from Selected Participants by May 1, 2010.

PARTICIPATING FACULTY

UIUC

Taekjip Ha
Paul Selvin
Yann Chemia
Martin Gruebele
Klaus Schulten
Zan Luthey-Schulten
Aleks Aksimentiev

Baylor College of Medicine

Ido Golding
Anna Sokac

CONTACTS

Center for the Physics
of Living Cells
Department of Physics, UIUC
Urbana, Illinois
Phone: 217/333-3393;
<http://www.cplc.illinois.edu/>

Questions:

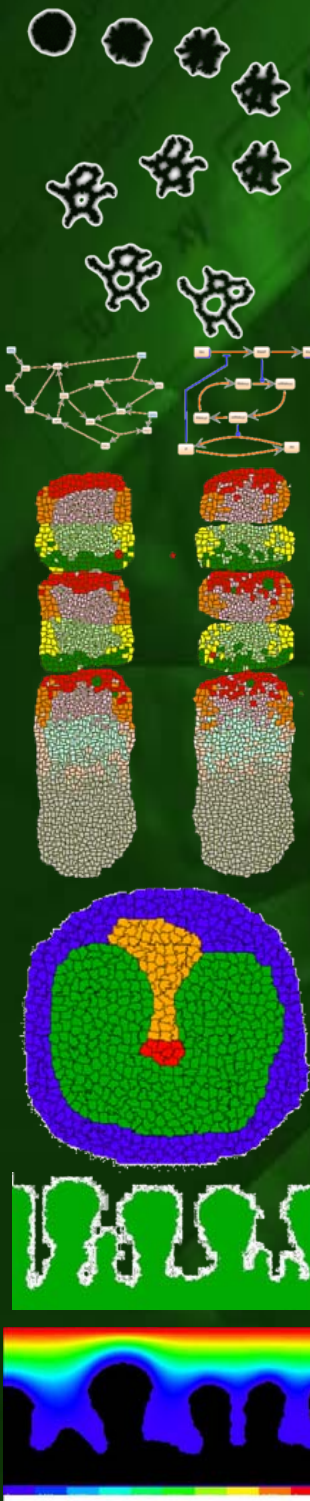
summerschool@cplc.illinois.edu

Joint Training Workshop

Developing Multi-Scale, Multi-Cell Developmental and Biomedical Simulations with CompuCell3D and SBW

August 2nd-13th 2010

Indiana University, Biocomplexity Institute, Bloomington, IN, USA



Background: Modeling is becoming an integral part of contemporary bioscience. The Glazier-Graner-Hogeweg (GGH) model as implemented in the modeling environment, CompuCell3D allows researchers to rapidly build complex models of multi-cell processes in development and disease with user-selectable resolution, from sub-cellular compartmental models to continuum models of tissues. To efficiently link to sub-cellular scale users build biochemical reaction models using SBW and use exported models in the SBML format to control properties of simulated cells in CompuCell3D. CompuCell3D and SBW are simulation environments that target complementary areas of biological modeling. By combining the capabilities of both frameworks users can build truly multi-scale models of tissues, organs or organisms with minimal amount of hardcoded, heuristic rules. CompuCell3D and SBW are open source, allowing users to extend, improve, validate, modify and share the core software. For more information please visit: <http://www.compuCell3d.org/> (CompuCell3D and GGH) or <http://www.sys-bio.org/> (SBW)

Goal: By the end of the two week course, participants will have implemented a basic simulation of the particular biological problem they work on. Post-course support and collaboration will be available to continue simulation development.

Topics: Introduction to Reaction-Kinetics (RK) models. Introduction to SBW, Jarnac, Network design tools and SBML. Introduction to GGH modeling. Applications of GGH modeling. Introduction to CompuCell3D. Python scripting. Basics of model building. Extending CompuCell3D. Building a basic simulation of your system.

Format: The workshop will consist of a limited number of lectures and extended hands-on computer tutorials. Each attendee will present a 30 minute lecture on her/his field of research.

Instructors: Herbert Sauro, Frank Bergman (University of Washington, Seattle), James A. Glazier, Maciej Swat, Randy Heiland (Indiana University)

Target Audience: Experimental Biologists, Medical Scientists, Biophysicists, Mathematical Biologists and Computational Biologists from advanced undergraduates to senior faculty, who have an interest in developing multi-cell, multi-scale computational models, or learning how such models might help their research. No specific programming or mathematical experience is required, though familiarity with some modeling environment (e.g. Mathematica®, Maple®, Matlab®) and how to represent basic concepts like diffusion and chemical reactions mathematically, would be helpful.

Fees and Support: There is no registration fee and partial support for travel and hotel costs may be available. We will provide lunches and workshop materials.

Application and Registration: Enrollment is limited and by application only. To apply, please send a c.v., a brief statement of your current research interests and of the specific problem you would like to model. Students and postdocs should also include a letter of support from their current advisor. If travel support is being requested, please include a statement documenting need and amounts requested. Please submit all application materials electronically to Maciej Swat (mswat@indiana.edu) by June 1st, 2010.

Facilities: Participants will have access to an OSX cluster and will be able to connect to the Internet using their own laptops.

For More Information, Please Contact: Maciej Swat (mswat@indiana.edu).

Or visit: www.compuCell3d.org

Supported and funded by:

