BIOGRAPHICAL SKETCH

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NAME	POSITION TITLE
Scot C. Kuo	Associate Professor of Biomedical Engineering and Cell Engineering Physiology
eRA COMMONS USER NAME (credential, e.g., agency login) scotckuo	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
Harvard University, Cambridge, MA	B.A.	05/1982	Biochemistry
University of California, Berkeley, CA	Ph.D.	08/1988	Biochemistry
Duke University, Durham, NC (moved with mentor from Washington University, Saint Louis, MO)	Postdoc	05/1993	Cell Biology

A. Personal Statement

By developing new technologies/methodologies and by using a multidisciplinary approach, my research goal has been to understand the mechanical functions of cells. As a graduate student studying bacterial chemotaxis, I used both molecular analysis of a fla operon and video-tracking hardware/software that I built to analyze switching statistics of the flagellar motor complex. As a post-doctoral fellow, I used biochemical purification/reconstitution and optical tweezers that I built, achieving the first force measurements of the microtubule motor, kinesin, as individual molecules. As faculty, I've built other optical instruments, including laser-deflection particle-tracking microrheology, to understand reconstituted actin-based motility and mechanics of cultured cells. For example, laser-based nano-tracking within infected host cells led to the discovery of molecule-sized step-like motions of Listeria during actin-based motility, disproving prevailing Brownian ratchet models. Current projects include developing instrumentation and biochemical methodology for single-molecule (TIRF) and super-resolution (PALM) imaging of reconstituted actin-based motility.

In addition to my own research, I've been directing the School of Medicine Microscope Facility since 2006. My expertise in cell biology, biophysics, and optical instrumentation has been critical for advising and collaborating with Facility researchers. These associations provided the basis for multiple shared instrumentation grants, growing the Facility so that it is the largest in the Mid-Atlantic region, both in staffing and in equipment.

B. Positions and Honors

Research and Professional Experience

1982 - 88	Graduate: Research project with Dr. Daniel E. Koshland, Jr. of the Biochemistry Department at U.C. Berkeley was elucidating the mechanism of information processing in bacterial chemotaxis.
1988 - 93	Post-Doctoral: Research project with Dr. Michael P. Sheetz of the Department of Cell Biology at Duke University Medical Center was studying the interactions between cytoskeleton and membrane components and studying the biophysics of microtubule-dependent motility.
1993 - 01	Assistant Professor of Biomedical Engineering, Johns Hopkins University
2001 - present	Associate Professor of Biomedical Engineering, Johns Hopkins University
2006 - present	Associate Professor of Cell Biology, Johns Hopkins University
2006 - present	Director, School of Medicine Microscope Facility, Johns Hopkins University The goal of the research is understanding cell and subcellular motility and develop novel optical techniques.

Other Experience and Professional Memberships

1988	Member, Biophysical Society
1989	Member, American Society for Cell Biology
1999	Member, Biomedical Engineering Society
Review Panels	Ad hoc: DOE Biosciences; NSF BIO/Molecular and Cellular Biosciences; NSF MPS/Materials Research; miscellaneous NIH special study sections

Editorial Peer Review: Annals of Biomedical Engineering, Biophysical Journal, Cell Motility and Cytoskeleton, Journal of Cell Biology, Science, Nature

Conferences Program Committee, Biomedical Engineering Society Meeting, 2000, 2006

Honors and Awards

1982	Phi Beta Kappa, Harvard University chapter
1982	Magna cum laude with Highest Honors in Biochemistry
1982-85	Pre-doctoral Fellow: National Science Foundation
1989-92	Fellow, Jane Coffin Childs Memorial Fund for Medical Research
1991	Keynote Speaker, Annual Meeting of American Society for Biomechanics
2001	Robert B. Pond, Sr. Excellence in Teaching Award, Whiting School of Engineering, JHU
2005	Plenary Speaker, Annual Meeting of Danish Physical Society

C. Selected Peer-reviewed Publications

Most relevant to the current application

1. Kucik, D. F., Kuo, S. C., Elson, E. L., and Sheetz, M. P. Preferential attachment of membrane glycoproteins to the cytoskeleton at the leading edge of lamella. J. Cell Biol 1991;114, 1029-1036.
2. Edidin, M., Kuo, S. C., and Sheetz, M. P. Lateral movements of membrane glycoproteins restricted by dynamic cytoplasmic barriers. Science 254, 1991; 1379-1382.
3. Kuo, S.C., and Sheetz, M.P. Force of single kinesin molecules measured with optical tweezers. Science 1993; 260, 232-234.
4. Mason, T.G., Ganesan, K., van Zanten, J.H., Wirtz, D., and Kuo, S.C. Particle tracking microrheology of complex fluids. Phys Rev Lett 1997; 79, 3282-3285.
5. Palmer, A., T. G. Mason, X. J., Kuo, S. C., and D. Wirtz. Diffusing wave spectroscopy microrheology of actin filament networks. Biophys. J. 1999; 76, 1063-71.
6. Yamada, S., Wirtz, D., and Kuo, S.C. Local mechanics of living cells measured by laser tracking microrheology (LTM). Biophys. J. 2000; 78, 1736-47.
7. McGrath, J. L., Hartwig, J. H., and Kuo, S.C. The mechanics of F-actin microenvironments depends on the chemistry of probing surfaces. Biophys. J. 2000; 79, 3258-66.
8. Kuo, S.C., and McGrath, J. L. Steps and fluctuations of Listeria monocytogenes during actin-based motility. Nature 2000; 407, 1026-9.
9. Boustany, N.N., Kuo, S.C., and Thakor, N.V. Optical Scatter Imaging: subcellular morphometry in situ with Fourier filtering. Optics Letters 2001; 26, 1063-5.
10. Kuo, S.C. Using optics to measure biological forces and mechanics. Traffic 2001; 2, 757-63.
11. McGrath, J.L., Eungdamrong, N.J., Fisher, C.I., Peng, F., Mahadevan, L., Mitchison, T.J., and Kuo, S.C. The force-velocity relationship for the actin-based motility of Listeria monocytogenes. Curr Biol 2003; 13, 329-332.
12. Girard, K.D., Chaney, C., Delannoy, M., Kuo, S.C., and Robinson, D.N. Dynacortin contributes to cortical viscoelasticity and helps define the shape changes of cytokinesis. EMBO J. 2004; 23(7), 1536-46.
13. Girard, K.D., Kuo, S.C., and Robinson, D.N. Dictyostelium myosin-II mechanochemistry promotes active behavior of the cortex on long time-scales. PNAS 2006; 103, 2103-2108.
14. Reichl, E.M., Ren, Y., Morphew, M.K., Delannoy, M., Effler, J.C., Girard, K.D., Divi, S., Iglesias, P.A., Kuo, S.C., and Robinson, D.N. Interactions between myosin and actin crosslinkers control cytokinesis contractility dynamics and mechanics. Curr Biol 2008; 18, 471-480 PMCID2361134.
15. Fisher, C.I., and Kuo, S.C. Filament rigidity causes F-actin depletion from nonbinding surfaces. PNAS 2009; 106, 133-138 PMC Journal - In Process.

D. Research Support

Ongoing Research Projects

2P50CA103175-06A2 (Bhujwalla) 09/22/11 - 07/31/16

NCI JHU ICMIC Program

This center grant funds an *in vivo* Cellular and Molecular Imaging Center at Johns Hopkins. The program consists of four research components, four developmental projects, one career development award and four resources.

Completed Projects Within Last Three Years

5R01GM059285 (Kuo) 05/01/06-04/30/11
NIH
Surface-Bound Regulation of Actin Polymerization
Our long-term goals are to understand the interplay of competing biochemical processes responsible for actin-based protrusion of motile cells. Using fluorescently tagged proteins, novel microscopy and nanofabrication to mimic membrane-bound activators, we will develop methods to visualize cortical dynamics in real-time. Initial candidates include ARP2/3 and Ena/VASP-dependent reactions that cause actin protrusion within cells, and capping protein, which has paradoxical effects on protrusive forces.

National Science Foundation #6661333 (Hoh) 02/01/08-01/31/09
MRI: Acquisition of an Atomic Force Microscope for Research and Education in Cellular and Molecular Biophysics at Johns Hopkins University
Through the Major Research Instrumentation program, funding was requested to acquire a state-of-the-art atomic force microscope (Picoforce AFM with closed-loop force-clamp capabilities and precise temperature control) with simultaneous fluorescence imaging capabilities (Bioscope SZ imaging system). The AFM will be located in the microscope core facility at the Johns Hopkins School of Medicine.

R01 GM59285 (Kuo) 02/01/00-08/31/04
NIH
Control of Cytoskeletal Mechanics in D. Discoideum
Request for Zeiss LSM 510MP Multiphoton Imaging System
The aims of this proposal is to obtain a Zeiss LSM Multiphoton imaging system with an automated pre-chirp laser system, state-of-the-art high-efficiency microscope objectives, and customized with high-sensitivity extended range photomultiplier detectors. The features are critical for monitoring the development of living tissue, particularly when developmentally regulated fluorescence first starts to be expressed. The Multiphoton System will be located in the core Microscope Facility at the Johns Hopkins School of Medicine, and will initially be used by five major and two minor users. As part of an established core facility, policies for balancing the needs of these users and of other users are already in place.