## BIOGRAPHICAL SKETCH

| NAME | POSITION TITLE |
|---|---|
| Roland Raymond Kaunas, Ph.D. | Associate Professor |
| eRA COMMONS USER NAME<br>RKAUNAS | |

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

| INSTITUTION AND LOCATION | DEGREE *(if applicable)* | YEAR(s) | FIELD OF STUDY |
|---|---|---|---|
| University of Wisconsin, Madison | BS | 1992 | Chemical Engineering |
| Northwestern University | MS | 1997 | Biomedical Engineering |
| University of California, San Diego | PhD | 2003 | Bioengineering |
| University of California, San Diego | Post Doc | 2005 | Bioengineering |

### A. Personal Statement

I have a broad background in bioengineering, with specific training and expertise in cell mechanobiology. As a graduate student and postdoctoral fellow at UCSD, I carried out studies on the effects of cyclic stretch and fluid shear stress on endothelial cell mechanotransduction and cytoskeletal remodeling. As PI on grants funded by AHA and NSF, I have experimentally characterized the effects of cyclic stretch on endothelial and U2OS osteosarcoma cell actin stress fiber reorganization and developed a computational model of actomyosin-based stress fiber adaptation to describe the results. I am a co-PI on two NIH R01 grants, in which my role in the first is studying the effects of shear stress on the invasion of human umbilical vein endothelial cells into 3-D collagen matrices and in the other is studying the effects of shear stress on NO synthesis in lymphatic endothelial cells.

### B. Positions and Honors

**Positions and Employment**

1997-2003 Research Fellow. Department of Bioengineering. University of California, San Diego.
2003-2005 Postdoctoral Fellow. Department of Bioengineering. University of California, San Diego.
2005-2011 Assistant Professor. Department of Biomedical Engineering. Texas A&M University.
2011-present Associate Professor. Department of Biomedical Engineering. Texas A&M University.

**Honors**

1997 Whitaker Graduate Fellowship
2003 National Institutes of Health Postdoctoral Training Grant
2009 Commitment to Students Award, Biomedical Engineering Society Student Chapter

**Other Experience and Professional Memberships**

1999- Member, Biomedical Engineering Society
2009- Biophysical Society
2008- North American Vascular Biology Organization
2008- Society of Engineering Science
2008- American Heart Association, Bioengineering & Biotechnology – Basic Science Study Section

### C. Publications

**Book Chapters**

1. Kaunas, R. Modeling cellular adaptation to mechanical stress. In Bioengineering in Cell and Tissue Research, G.M. Artmann and S. Chien eds., Springer, 2008.

**Papers**

1. Katsumi, A., Milanini, J., Kiosses, W., del Pozo, M. A., **Kaunas, R.**, Chien, S., Hahn, K. and M. A. Schwartz. Effects of cell tension on the small GTPase Rac, *J Cell Biol*, 2002;158(1):153-64
2. Miao, H., Shiu, Y.-T., Hu, Y.-L., Yuan, S., Zhao, Y., **Kaunas, R.**, Wang, Y., Jin, G., Usami, S. and S. Chien, Effects of flow patterns on the localization and expression of vascular endothelial cell junction proteins: In vivo and in vitro investigations, *J Vasc Res*, 2005;42(1):77-89.
3. **Kaunas, R**., Nguyen, P., Usami, S. and S. Chien, Cooperative effects of Rho and mechanical stretch on stress fiber organization, *PNAS* 102(44):15895-15900, 2005.
4. **Kaunas, R.**, Usami, S. and S. Chien, Regulation of stretch-induced JNK activation by stress fiber orientation, *Cell Signal*, 2006; 18(11):1924-31.
5. Wu, C. C., Li, Y. S., Haga, J. H., **Kaunas, R.**, Chiu, J. J., Su, F. C., Usami, S., and S. Chien, Directional shear flow and Rho activation prevent the endothelial cell apoptosis induced by micropatterned anisotropic geometry, *PNAS*, 2007; 104(4):1254-9.
6. Haga, J. H., **Kaunas, R.**, Radeff-Huang, J., Weems, J. M., Estrada, K. D., Chien, S., Brown, J. H., and T. M. Seasholtz, Pulsatile equibiaxial stretch inhibits thrombin-induced RhoA and NF-kappaB activation. *Biochem Biophys Res Commun.* 2008; 372(1):216-20.
7. Kang, H., Bayless, K. J., and **R. Kaunas**, Fluid shear stress modulates endothelial cell invasion into three-dimensional collagen matrices, *Am J Physiol*, 2008; 295(5):H2087-97.
8. **Kaunas, R.**, and H. J. Hsu, A kinematic model of stretch-induced stress fiber turnover and reorientation. *J Theo Biol* 2009; 257(2):320-30.
9. Hsu, H. J., Lee, C. F., and **R. Kaunas**, A dynamic stochastic model of frequency-dependent stress fiber alignment induced by cyclic stretch. *PLoS ONE* 2009; 4(3):e4853.
10. Matsui, T.S., Ito, K., **Kaunas, R**., Sato, M., and S. Deguchi, Actin stress fibers are at a tipping point between conventional shortening and rapid disassembly at physiological levels of MgATP. *Biochem Biophys Res Commun*. 2010; 395(3):301-6.
11. **Kaunas, R.**, Z. Huang, Z., and J. Hahn, A kinematic model coupling stress fiber dynamics with JNK activation in response to matrix stretching. *J Theor Biol*. 2010; 264(2):593-603.
12. Hsu, H-J., Locke, A., Lee, C-F., Vanderzyl, S. Q., and **R. Kaunas**, Involvement of cytoskeletal tension, but not FAK, in cyclic stretch-induced phosphorylation of JNK, p38 and ERK, *PLoS ONE* 2010; 5(8):e12470.
13. Lee, C-F., Haase, C., Deguchi, S. and **R. Kaunas**, Cyclic Stretch-Induced Stress Fiber Dynamics - Dependence on Strain Rate, Rho-kinase and MLCK. *Biochem Biophys Res Commun*. 2010; 401(3):344-9.
14. **Kaunas, R.**, Hsu, H-J., and S. Deguchi, Sarcomeric model of stretch-induced stress fiber reorganization, *Cell Health and Cytoskeleton* 2011; 3:13–22.
15. **Kaunas, R.** and S. Deguchi, Multiple roles for myosin II in tensional homeostasis under mechanical loading, *Cell Mol Bioeng* 2011; 4(2):182–91.
16. Matsui, T.S., **Kaunas, R.**, Kanzaki, M., Sato, M. and S. Deguchi, Non-muscle myosin II induces disassembly of actin stress fibres independently of myosin light chain dephosphorylation, *Interface Focus* 2011; 1:754-66.
17. Kaunas, R., Kang, H. and K. J. Bayless, Synergistic regulation of angiogenic sprouting by biochemical factors and wall shear stress, *Cell Mol Bioeng* (in press).
18. Kang, H., Kwak, H.-I., **Kaunas, R.** and K. J. Bayless, Fluid shear stress and sphingosine 1-phosphate activate calpain to promote membrane type 1 matrix metalloproteinase (MT1-MMP) membrane translocation and endothelial invasion into three-dimensional collagen matrices, *J Biol Chem* (in press).
19. Tondon, A., Hsu, H.-J. and **R. Kaunas**, Dependence of cyclic stretch-induced stress fiber reorientation on stretch waveform, *J Biomech.* (in press)

## D. Research Support

### Ongoing Support

CBET-0854129 (PI - Kaunas) 8/1/09 – 7/31/12
National Science Foundation
"Theoretical and Experimental Studies of Cell Reorganization on Deformable Materials"
The major goals of this project are to develop, test and refine a computational model of stretch-induced actin stress fiber reorganization.
Role: PI

R01 HL094269 (PI – Moore) 10/1/09-9/30/13
National Institutes of Health
"Lymphatic Fluid Flow Modeling with Active Network Components"
Develop, test and refine multi-scale models of transport in the lymphatic system.
Role: Co-Investigator

R01 HL095786 (PI – Bayless) 4/01/09-3/31/14
National Institutes of Health
"Mechanisms of angiogenic switch activation during wound repair"
Characterize how signals generated in a wound initiate angiogenic responses in 3D tissues.
Role: Co-Investigator

### Completed Support

SDG-0730238N (PI – Kaunas) 07/01/07-12/31/10
American Heart Association (National Affiliate)
"Endothelial Cell Adaptation to Mechanical Strain"
Development of a novel hydrogel-based system to estimate the interactive effects of thrombin and stretch on Rho activation, stress generation, and endothelial monolayer permeability.
Role: PI