Alexander R. Dunn

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Academic Appointments

Associate Professor of Chemical Engineering, Stanford University, Sept. 2016 – present
Assistant Professor of Chemical Engineering, Stanford University, January 2009 – Sept. 2016
Member, Stanford Neurosciences Institute, 2013 – present
Fellow, Stanford ChEM-H, 2012 – present
Member, Stanford Cardiovascular Institute, 2010 – present

Education

Postdoctoral Scholar, Stanford University Biochemistry Department, July 2003 – Dec. 2008
Advisor: Prof. James Spudich

Ph.D. California Institute of Technology, February 1999 – June 2003
Thesis Title: Sensitizer-Linked Substrates as Probes of Heme Enzyme Structure and Catalysis
Thesis Advisor: Prof. Harry Gray

Graduate Student, Cornell University, September 1998 – January 1999

B.S. in Chemistry (Honors), Caltech, June 1998

Honors and Fellowships

Tau Beta Pi Teaching Award, Stanford University 2018
HHMI Faculty Scholar Award 2016 – present
NIH Director's New Innovator Award 2010 – 2015
Terman Faculty Fellowship (Stanford), June 2008
James H. Clark Faculty Fellowship (Stanford), June 2008
Burroughs Wellcome Career Award at the Scientific Interface, Jan. 2008 – present
NIH K99/R00 Pathway to Independence (declined), June 2008
American Heart Association Postdoctoral Fellowship, July 2007 – Dec. 2007
Jane Coffin Childs Fellowship, July 2003 – July 2006
Herbert Newby McCoy Award (Caltech, outstanding chemistry Ph.D. thesis), June 2003
Fannie and John Hertz Fellowship, 1998 – 2003

Society Memberships

American Institute of Chemical Engineers
Biophysical Society
American Society for Cell Biology

Publications

67. Mamerow, D., Hariri, A., Newman, S., ***Dunn, A. R.** & *Soh, H. T. Single-molecule immuno-colocalization assay (SIMCA) discriminates between specific and non-specific binding for accurate molecular detection. *Manuscript in preparation*.
66. Michalaki, E., Surya, V. N., Fuller, G. G., **Dunn, A. R.** Response of lymphatic endothelial cells to combined spatial and temporal variations in fluid flow. Submitted for publication (2020).
65. Majzner, R., Rietberg, S., Sotillo, E., Dong, R., Vachharajani, V., Labanieh, L., Myklebust, J. Kadapakkam, M., Weber, E., Tousley, A., Richards, R., Heitzeneder, S., Nguyen, S., Wiebking, V.,

Theruvath, J., Lynn, R., Xu, P., **Dunn, A. R.**, Vale, R. & Mackall, C. Tuning the Antigen Density Requirement for CAR T Cell Activity. *Cancer Discov. in press* (2020).
64. Cui, K, W., Engel, L., Dundes, C. E., Nguyen, T., **Loh, K. M**. & **Dunn, A. R.** Spatially controlled stem cell differentiation via morphogen gradients: a comparison of static and dynamic microfluidic platforms. *J. Vac. Sci. Technol. A in press* (2020)
63. Vasquez, C. G., Vachharajani, V. T., Garzon-Coral, C. & **Dunn, A. R.** A geometry-based model describes lumen stability in epithelial cells. *BioRχiv* https://doi.org/10.1101/746792
62. Tan, S. J., Chang, A. C., Miller, C. M., Anderson, S. M., Prahl, L. S., Odde, D. J. & **Dunn, A. R**. Regulation and dynamics of force transmission at individual cell-matrix adhesion bonds. *Sci. Adv. in press* (2020).
61. Michalaki, E., Surya, V. N., Fuller, G. G., **Dunn, A. R.** Perpendicular alignment of lymphatic endothelial cells in response to spatial gradients in wall shear stress. *Commun. Biol. in press* (2020).
60. Broussard, J. A., Jaiganesh, A., Zarkoob, H., Conway, D. E., **Dunn, A. R.**, Espinosa, H.D., Janmey, P. A. & Green, K. J. Scaling up single cell mechanics to multicellular tissues: role of the intermediate filament-desmosome network. J. Cell Sci. *manuscript in press* (2020).
59. Terekhova K., Pokutta S., Kee Y. S., Li, J., Tajkhorshid, E., Fuller, G., **Dunn, A. R.** &Weis, W. I. Binding partner- and force-promoted changes in αE-catenin conformation probed by native cysteine labeling *Sci. Rep*. **9**, 15375 (2019).
58. Ellefsen, K. L., Holt, J. R., Chang, A. C., Nourse, J. L., Janahan, A., Mekhdjian, A. H., Abuwarda H., Tombola, F., Flanagan L. A., **Dunn A. R.**, Parker I. & Pathak M. M. Myosin-II Mediated Traction Forces Evoke Localized Piezo1-dependent Ca^{2+} Flickers *Commun. Biol.* **2**, 298 (2019).
57. Surya, V. N., Michalaki, E., Fuller, G. G. & **Dunn, A. R.** Lymphatic endothelial cell calcium pulses are sensitive to spatial gradients in wall shear stress. *Mol. Biol. Cell* **30**, 923-931 (2019).
56. Price, A. J., Cost, A.-L., Ungewiß, H., Waschke, J., **Dunn, A. R.*** & Grashoff C.* Mechanical loading of desmosomes depends on the magnitude and orientation of external stress. *Nature Comm.* **11**, 5284 (2018).
55. **Dunn**, A. R. Mechanobiology: Ubiquitous and useful. *Mol. Biol. Cell.* **29**, 1917-1918 (2018).
54. Huang, D. L. Bax, N. A., Buckley, C. D., Weis, W. I. & **Dunn**, A. R. Vinculin forms a directionally asymmetric catch bond with F-actin. *Science*, **357**, 703-706 (2017).
53. Chang, A. H., Raftrey, B. C., D'Amato, G., Surya, V. N., Poduri, A., Chen, H. I., Goldstone, A. B., Woo, J., Fuller, G. G., **Dunn,** A. R. & Red-Horse, K. DACH1 stimulates shear stress-guided endothelial cell migration and coronary artery growth through the CXCL12-CXCR4 signaling axis. *Genes Dev.* **31**, 1308-1324 (2017).
52. Owen, L. M., Adhikari, A. S., Patel, M., Grimmer, P., Leijnse, N., Kim, M. C,, Notbohm, J., Franck, C. & **Dunn** A.R. A cytoskeletal clutch mediates cellular force transmission in a soft, 3D extracellular matrix. *Mol. Biol. Cell,* **28**, 1959-1974 (2017).

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51. Mekhdjian, A. H., Rubashkin, M. G., Kai, F., Prahl, L. S., Bell, E. S., McGregor, A. L., Przybyla, L. M., Barnes M. J., Dufort, C. C., Ou, G., Chang, A. C., Cassereau, L., Tan, S. J., Pickup, M. W., Lakins, J. N., Yex, X., Davidson, M. W., Lammerding, J., Odde, D. J., **Dunn**, A. R.*, Weaver, V. M.* Integrin-mediated traction force enhances paxillin molecular associations and adhesion dynamics that increase the invasiveness of tumor cells into a three dimensional extracellular matrix. *Mol. Biol. Cell*, **28**, 1467-1488 (2017).
50. Krieg, M., Stühmer, J., Cueva, J.G., Fetter, R., Spilker, K., Cremers, D., Shen, K., **Dunn**, A. R. & Goodman, M.B. Genetic defects in β-spectrin and tau sensitize C. elegans axons to movement-induced damage via torque-tension coupling. *Elife*, **6**, e20172 (2017)
49. Price, A. J., Huang, E. Y., Sebastiano, V. & **Dunn**, A. R. A semi-interpenetrating network of polyacrylamide and recombinant basement membrane allows pluripotent cell culture in a soft, ligand-rich microenvironment. *Biomaterials,* **121**, 179-192 (2016)

48. Surya, V. N., Michalaki, E., Huang, E. Y., Fuller, G. G. & **Dunn**, A. R. Sphingosine 1-phosphate receptor 1 regulates the directional migration of lymphatic endothelial cells in response to fluid shear stress. *J. R. Soc. Interface*, **13**, 20160823 (2016).

47. Chang, A. C., Mekhdjian, A. H., Morimatsu, M., Denisin, A. K., Pruitt, B. L. & **Dunn**, A. R. Single molecule force measurements in living cells reveal a minimally tensioned integrin state. *ACS Nano,* **10**, 10745-10752 (2016).

46. Lockhead, D., Schwarz, E. M., O'Hagan, R., Bellotti, S., Krieg, M., Barr, M. M., **Dunn**, A. R., Sternberg, P. W. & Goodman M. B. The tubulin repertoire of *C. elegans* sensory neurons and its context-dependent role in process outgrowth. *Mol. Biol. Cell.* advance copy available online.

45. Sun Z., Tseng, H.-Y., Tan, S., Senger, F., Kurzawa, L., Dedden, D., Mizuno, N., Wasik, A. A., Thery, M., **Dunn**, A. R. & Reinhard Fässler, Kank2 activates talin, reduces force transduction across integrins and induces central adhesion formation. *Nat. Cell Biol.*, **18**, 941-953 (2016).

44. A.R. **Dunn** How *Hydra* eats. *Biophys. J.* **110**, 1467-1468 (2016).

43. Nakayama, K. H., Surya, V. N., Gole, M., Walker, T., Yang, W., Lai, E. S., Ostrowski, M. A., Fuller, G. G., **Dunn**, A. R. & Huang, N. F. Nanoscale patterning of extracellular matrix alters endothelial function under shear stress. *Nano Lett.*, **16**, 410-419 (2016).

42. Ostrowski, M. A, Huang, E., Surya, V., Poplawski, C., Huang, N. F., Barakat, J., Lin, G. L, Cooke, J. P., Fuller, G. G. & **Dunn**, A. R. Multiplexed fluid flow device to study cellular response to tunable shear stress gradients. *Ann. Biomed. Eng.* **44**, 2261-2272 (2016).

41. Sim, J.Y., Moeller, J., Hart K. C., Ramallo, D., Vogel, V., **Dunn**, A. R., Nelson, W. J. & Pruitt, B. L. Spatial distribution of cell-cell and cell-ECM adhesions regulates force balance while maintaining E-cadherin molecular tension in cell pairs. *Mol. Biol. Cell* **26***,* 2456-2465 (2015).

40. Chai, J., Hamilton, A. L., Riedel-Kruse, I. H. & **Dunn** A. R. Cable constriction tension coordinates local and global cell movements during zebrafish epiboly. *Biophys J.* **109**, 407-414 (2015).

39. Morimatsu, M., Mekhdjian, A. H., Chang, A. C., Tan, S. J. & **Dunn**, A. R. Visualizing the interior architecture of focal adhesions with high-resolution traction maps. *Nano Letters* **15**, 2220-2228 (2015).

38. **Dunn**, A. R. and Price, A. J. Energetics and forces in living cells. *Physics Today* **68** (2), 27-32 (2015).

37. Krieg, M., **Dunn**, A. R. & Goodman, M. B. Mechanical systems biology of *C. elegans* touch sensation. *BioEssays* **37**, 335-44 (2015).

36. Pruitt, B. L., **Dunn**, A. R., Weis, W. I. & Nelson, W. J. Mechano-transduction: from molecules to tissues. *PLoS Biol.* **12**, e1001996 (2014).

35. Buckley, C. D., Tan, J., Pruitt, B. L., Weis, W. I., Nelson, W. J. & **Dunn**, A. R. Force-dependent interactions between actin filaments and a minimal adherens junction complex. *Science* **346**, 1254211 (2014).

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34. Rolland, Y., Marighetti, P., Malinverno, C., Confalonieri, S., Luise, C., Ducano, N., Palamidessi, A., Bisi, S., Kajiho, H., Troglio, F., Shcherbakova, O. G., **Dunn**, A. R., Oldani, A., Lanzetti, L., Di Fiore, P. P., Disanza, A. & Scita, G. The CDC42-interacting protein 4 controls epithelial cell cohesion and tumor dissemination. *Dev. Cell* **30**, 553-568 (2014).

33. Xu, A.M., Aalipour, A., Leal-Ortiz, S., Mekhdjian, A. H., Xie, X., **Dunn**, A. R., Garner, C. C. & Melosh, N.A. Quantification of nanowire penetration into living cells. *Nat. Commun.* **5**, 3613 (2014).

32. Krieg, M., **Dunn**, A. R. & Goodman, M. B. Mechanical control of the sense of touch by β-spectrin. *Nat. Cell Biol.* **16**, 224–233 (2014).

Press coverage:

Futurity.org: “Why Bendy Nerves In Worms Sometimes Break”

Medicalxpress.com: “Researchers find elastic-like protein matrix that keeps nerves resilient”

31. Ostrowski, M. A., Huang, N. F., Walker, T., Vervijlen, T., Khoo, A. S., Poplawski, C., Cooke, J. P., Fuller, G. G., & **Dunn**, A. R. Microvascular endothelial cells migrate upstream and align against the shear stress field created by impinging flow. *Biophys. J.* **106**, 366-374 (2014).

30. Morimatsu, M., Mekhdjian, A. H, Adhikari, A. S. & **Dunn**, A. R. Molecular tension sensors report forces generated by single integrin molecules in living cells. *Nano Letters,* **13**, 3985-3989 (2013).

29. Borghi, N., Sorokina, M., Shcherbakova, O. G., Weis, W. I., Pruitt, B. L., Nelson, W. J., & **Dunn**, A. R. E-cadherin is under constitutive actomyosin-generated tension that is increased at cell-cell contacts upon externally applied stretch. *Proc. Natl. Acad. Sci. U. S. A.* **109**, 12568-12573 (2012).

Press coverage:

Three citations in Faculty of 1000.

“Cadherin-catenin-actin structure exerts force inside and between cells in living tissues, study shows” Phys.org (July 16, 2012).

28. Adhikari, A. S., Glassey, E. & **Dunn**, A. R. Conformational dynamics accompanying the proteolytic degradation of trimeric collagen I by collagenases. *J. Am. Chem. Soc.* **134**, 13259-13265 (2012).

27. Adhikari, A. S., Chai, J., & **Dunn**, A. R. Multiplexed single-molecule force proteolysis measurements using magnetic tweezers. *J. Visualized Exp.* **65**, 3520 (2012).

26. Adhikari, A. S., Mekhdjian, A. H. & **Dunn**, A. R., Strain tunes proteolytic degradation and diffusive transport in fibrin networks. *BioMacromolecules* **13***,* 499-506 (2012).

25. Adhikari, A. S., Chai, J., & **Dunn**, A. R., Mechanical force induces a 100-fold increase in the rate of collagen proteolysis by MMP-1. *J. Am. Chem. Soc.* **133**, 1686-1689 (2011).

Press coverage:

Chemical and Engineering News **89,** 45. (January 31, 2011).

24. Purcell, T. J., Naber, N., Franks-Skiba, K., **Dunn**, A. R., Eldred, C. C., Berger, C. L., Málnási-Csizmadia, A., Spudich, J. A., Swank, D. M., Pate, E. & Cooke, R. Nucleotide Pocket Thermodynamics Measured by EPR Reveal How Energy Partitioning Relates Myosin Speed to Efficiency. *J. Mol. Biol.* **407**, 79-91 (2011).

23. Sung, J., Sivaramakrishnan, S., **Dunn**, A. R. & Spudich, J. A. Single-molecule dual-beam optical trap analysis of protein structure and function. *Methods Enzymol.* **475**, 321-375 (2010).

22. Chuan, P.-Y., Spudich, J. A. & **Dunn**, A. R. Robust mechanosensing and tension generation by myosin VI. *J. Mol. Biol.* **405**, 105-112 (2010).

21. **Dunn,** A. R., Chuan, P.-Y., Bryant, Z. & Spudich, J. A. Contribution of the myosin VI tail domain to processive stepping and intramolecular tension sensing. *Proc. Natl. Acad. Sci U. S. A.* **107** 7746-7750 (2010).

20. Pierobon, P., Achouri, S., Courty, S., **Dunn,** A. R**.**, Spudich, J. A., Dahan, M., Cappello, G. Velocity, processivity, and individual steps of single myosin V molecules in live cells. *Biophys J.* 96, 4268-4275 (2009).

19. Whited, C. A., Belliston-Bittner, W., **Dunn,** A. R., Winkler, J. R., Gray, H. B. Nanosecond photoreduction of inducible nitric oxide synthase by a Ru-diimine electron tunneling wire bound distant from the active site. *J. Inorg. Biochem.* **103**, 906-911 (2009).

18. Whited, C. A., Belliston-Bittner, W., **Dunn,** A. R., Winkler, J. R., Gray, H. B. Probing the heme-

thiolate oxygenase domain of inducible nitric oxide synthase with Ru(II) and Re(I) electron tunneling wires. *J. Porphyrins Phthalocyanines* **12**, 971-978 (2008).

17. **Dunn**, A. R. & Spudich, J. A. Single-molecule gold-nanoparticle tracking with high temporal and spatial resolution and without an applied load. *Laboratory Manual for Single Molecule Studies*, (Cold Spring Harbor Laboratory Press, Woodbury, NY; 2007).

16. Tang, S., Liao, J.-C., **Dunn**, A. R., Altman, R. B., Spudich, J. A. & Schmidt, J. P. Predicting allosteric communication in myosin via a pathway of conserved residues. *J. Mol. Biol.* **373**, 1361-1373 (2007).

15. **Dunn**, A. R. & Spudich, J. A. Dynamics of the unbound head during myosin V processive translocation. *Nat. Struct. Mol. Biol.* **14**, 246-248 (2007).

14. Rock, R. S., Ramamurthy, B., **Dunn**, A. R., Beccafico, S., Rami, B. R., Morris, C., Spink, B. J., Franzini-Armstrong, C., Spudich, J. A. & Sweeney, H. L. A flexible domain is essential for the large step size and processivity of myosin VI. *Mol. Cell* **17**, 603-609 (2005).

13. Contakes, S. M., Juda, G. A., Langley, D. B., Halpern-Manners, N. W., Duff, A. P., **Dunn**, A. R., Gray, H. B., Dooley, D. M., Guss, J. M. & Freeman, H. C. Reversible inhibition of copper amine oxidase activity by channel-blocking ruthenium(II) and rhenium(I) molecular wires. *Proc. Natl. Acad. Sci. U.S.A.* **102**, 13451-12456 (2005).

12. Belliston-Bittner, W., **Dunn**, A. R., Nguyen, Y. H. L., Stuehr, D. J., Winkler, J. R. & Gray, H. B. Picosecond photoreduction of inducible nitric oxide synthase by rhenium(I)-diimine wires. *J. Am. Chem. Soc.* **127**, 15907-15915 (2005).

11. **Dunn**, A. R., Belliston-Bittner, W., Winkler, J. R., Getzoff, E. D., Stuehr, D. J. & Gray, H. B. Luminescent ruthenium(II)- and rhenium(I)-diimine wires bind nitric oxide synthase. *J. Am. Chem. Soc.* **127**, 5169-5173 (2005).

10. Rucker, V. C., **Dunn**, A. R., Sharma, S., Dervan, P. B. & Gray, H. B. Mechanism of sequence-specific fluorescent detection of DNA by N-methyl-imidazole, N-methyl-pyrrole, and β-alanine linked polyamides. *J. Phys. Chem. B* **108**, 7490-7494 (2004).

9. Hays, A.-M. A., **Dunn**, A. R., Chiu, R., Gray, H. B., Stout, C. D. & Goodin, D. B. Conformational states of cytochrome P450cam revealed by trapping of synthetic molecular wires. *J. Mol. Biol.* **2**, 455-469 (2004).

8. **Dunn**, A. R., Dmochowski, I. J., Winkler, J. R. & Gray, H. B. Nanosecond photoreduction of cytochrome P450cam by channel-specific electron tunneling Ru-diimine wires. *J. Am. Chem. Soc.* **41**, 12450-12456 (2003).

7. **Dunn**, A. R., Hays, A.-M. A., Goodin, D. B., Stout, C. D., Chiu, R., Winkler, J. R. & Gray, H. B. Fluorescent probes for cytochrome P450 structural characterization and inhibitor screening. *J. Am. Chem. Soc.* **124**, 10254-10255 (2002).

6. Dmochowski, I. J., **Dunn**, A. R., Wilker, J. J., Crane, B. R., Green, M., Dawson, J. H., Sligar, S. G., Winkler, J. R. & Gray, H. B. Ruthenium probes of P450 structure and mechanism. *Meth. Enzymol.* **357**, 120-133 (2002).

5. **Dunn**, A. R., Dmochowski, I. J., Bilwes, A. M., Gray, H. B. & Crane B. R. Probing the open state of cytochrome P450cam with ruthenium-linker substrates. *Proc. Natl. Acad. Sci. U.S.A*. **98**, 12420-12425 (2001).

4. Weck, M., **Dunn**, A. R., Matsumoto, K., Coates, G. W., Lobkovsky, E. B. & Grubbs R. H. Influence of perfluoroarene-arene interactions on the phase behavior of liquid crystalline and polymeric materials. *Angew. Chem. Int. Ed. Engl.* **38**, 2741-2745 (1999).

3. Coates, G. W., **Dunn**, A. R., Henling, L. M., Ziller, J. W., Lobkovsky, E. B. & Grubbs, R. H. Phenyl-perfluorophenyl stacking interactions: Topochemical[2+2] photodimerization and photopolymerization of olefinic compounds. *J. Am. Chem. Soc.* **120**, 3641-3649 (1998).

2. Bloom, C. R., Wu, N., **Dunn**, A., Kaarsholm, N. C. & Dunn, M. F. Comparison of the allosteric properties of the Co(II)- and Zn(II)-substituted insulin hexamers. *Biochemistry* **37**, 10937-10944 (1998).

1. Coates, G. W., **Dunn**, A. R., Henling, L. M., Dougherty, D. A. & Grubbs, R. H. Phenyl-perfluorophenyl stacking interactions: A new strategy for supermolecule construction. *Angew. Chem. Int. Ed. Engl.* **36**, 248-251 (1997).

Selected Presentations

* invited presentation

*113. "A molecular mechanism for symmetry breaking at cellular adhesion complexes" Biophysical Society Annual Meeting, San Diego, US, Feb. 15 – 19, 2020.

*112. "Symmetry breaking at cellular adhesion complexes" Mt. Sinai School of Medicine, Dept of Developmental and Regenerative Medicine, Jan. 16, 2020.

*111. "Regulation and dynamics of force transmission at cellular adhesion complexes" American Society for Cell Biology National Meeting, Dec. 7 – 11, 2019.

*110. "Single-molecule measurements of force transmission by integrin heterodimers in living cells" Materials Research Society National Meeting, Boston, MA Dec. 1 – Dec. 6, 2019.

*109. "A geometry based model describes lumen stability in epithelial cells" Biophysical Society Thematic Meeting: Biology and Physics Confront Cell-Cell Adhesion, Aussois, France, Oct. 14 – 17, 2019.

*108. Keynote speaker: "How to make a lumen" Triangle Cytoskeleton Meeting, UNC Chapel Hill, Sept. 29 – Oct. 1, 2019.

*107. "Molecular origins of symmetry breaking at cellular adhesion complexes" Physics of Living Matter, University of Cambridge, Cambridge, United Kingdom, Aug. 30 – Sept. 4., 2019.

*106. "Force-dependent allosteric regulation of a-catenin binding to F-actin by vinculin" Cell Contact and Adhesion Gordon Research Conference, Les Diablerets, Switzerland, Jun. 2-7, 2019.

*105. "Coupling of shape and mechanotransduction in model microtissues" ICBN19-International Conference on Bioengineering and Nanotechnology, Baltimore, MD, May 31, 2019.

*104. "Regulation and dynamics of force transmission at cellular adhesion complexes" Columbia University, Dept. of Chemical Engineering, Apr. 9, 2019.

*103. "Regulation and dynamics of force transmission at cell-cell and cell-matrix adhesion complexes" NYU, Dept. of Cellular Biology, Feb. 19, 2019.

*103. "Mechanotransduction at cell-cell and cell-matrix adhesions" Mechanobiology in Biomimetics, Facultad de Ciencias, UNAM, Mexico City, Mexico, Nov. 12-16, 2018.

*102. "Functional modularity of cellular adhesion complexes" Dept. of Department of Chemical & Biomolecular Engineering, Johns Hopkins University, Nov. 8, 2018.

*101. "Two physical mechanisms by which cells may regulate tissue architecture" RIKEN Osaka, Osaka, Japan, Sept. 18, 2019.

*100. "Two physical mechanisms by which cells may regulate tissue architecture" Kyoto University, Kyoto, Japan, Sept. 17. 2019.

*99. "Single-molecule measurements of force transmission by integrin heterodimers in living cells" Japanese Biophysical Society Meeting, Okoyama, Japan, Sept. 15, 2019.

*98. "Biophysical Basis of Force Transduction at the Cell-Matrix Interface" Gordon Research Conference: Signal Transduction by Engineered Extracellular Matrices, Proctor Academy, Andover, NH, July 22-27, 2019.

*97. "Dynamics of Force Transduction at Single Integrin Complexes in Living Cells" Gordon Research Conference: Signaling by Adhesion Receptors, University of New England, June 24-29, 2019.

*96. "Integrin-based force transduction at the molecular and cellular scales" Academia Sinica, Taipei, Taiwan, Jun. 21, 2019.

*95. “Single-molecule measurements of force transmission by single integrins in living cells” Academia Sinica, Taipei, Taiwan, Jun. 20, 2019

*94. “Mechanosensing at cell-cell and cell-matrix adhesions” Department of Mechanical Engineering, Brown University, Feb. 1, 2018.

*93. “Mechanosensing at cell-cell and cell-matrix adhesions” Department of Biological Chemistry and Molecular Pharmacology, Harvard Medical School, Jan. 25, 2018.

*92. “Mechanosensing at cell-cell and cell-matrix adhesions” Department of Biochemistry & Molecular Biology, Louisiana State University School of Medicine. Dec. 8, 2017.

*91. “Alterations in focal adhesion architecture and force transduction accompanying epithelial to mesenchymal transition.” American Society for Cell Biology/EMBO International Meeting, Philadelphia, PA. Dec. 2-6, 2017.

*90. “Mechanosensing at cell-cell and cell-matrix adhesions” Pennsylvania Muscle Institute, University of Pennsylvania, October 23, 2017.

*89. “Mechanosensing at cell-cell and cell-matrix adhesions” Biophysics Program, Arizona State University, October 11, 2017.

*88. “Single molecule force measurements in living cells reveal a minimally tensioned integrin state.” Dept. of Biochemistry, Duke University. Sept. 5, 2017.

*87. “Mechanosensing at cell-cell and cell-matrix adhesions” Physiology Course, Marine Biological Laboratory, Woods Hole, MA. Jul. 5, 2017.

*86. “Vinculin forms a directional catch bond to F-actin” Canadian Biophysical Society National Meeting, Montreal, Canada. May 24-26, 2017.

*85. “Vinculin forms a directional catch bond to F-actin” Cellular Dynamics & Models, Cold Spring Harbor Laboratory, Cold Spring Harbor, April 11-14, 2017.

*84. “Vinculin forms a directional catch bond to F-actin” The makings of a cell: regulating size, shape, and behavior. Cell Press Lablinks Symposium. UCSF, San Francisco, CA, April 7, 2017.

*83. “Mechanosensing at cell-cell and cell-matrix adhesions” Cardiovascular Institute, Stanford University School of Medicine, Stanford, CA, Mar. 14, 2017.

*82. “Mechanosensing at cell-cell and cell-matrix adhesions” National Institute of Heart, Lung, and Blood, NIH, Bethesda, MD. Feb. 8, 2017.

*81. “Single molecule force measurements in living cells reveal a minimally tensioned integrin state.” JST-Bay Area Structural Biology Workshop, Stanford University School of Medicine, Stanford, Jan. 23-25, 2017.

*80. “Using single-molecule biophysics to understand the physical basis of multicellularity” Physics Department, McGill University, Montreal, Canada, Jan. 12, 2017.

*79. “Cell motility and traction force generation in three-dimensional fibrin hydrogels” AIChE Annual Meeting, San Francisco, CA, Nov. 13-18, 2016.

*78. “Integrin-based force transduction at the molecular and cellular scales” Cancer cell migration in space and time, Instituto de Medicina Molecular, Lisbon, Portugal, Oct. 17, 2016.

*77. “Integrin-based force transduction at the molecular and cellular scales” Modeling and Quantifying Cell Function: 25 years of Cell Mechanobiology, Banff International Research Station for Mathematical Innovation and Discovery, Banff, Canada, October 10-14, 2016.

*76. “Physical basis of mechanosensing at cell-matrix adhesions” Mechanobiology of Disease, Mechanobiology Institute, National University of Singapore, Singapore, September 27-30, 2016.

*75. “Alpha-catenin and vinculin form a directional, force-sensitive linkage to actin” Single Molecule Gordon Research Conference, Hong Kong, People’s Republic of China, July 3-8, 2016

*74. “Genetically encoded sensors for measuring mechanical forces in living organisms” Imaging Mouse Development, Janelia Research Campus, Ashburn, VA, June 27-30, 2016.

*73. “Physics of cellular adhesion complexes” Harvard Engineering and Physical Biology Symposium, Harvard, MA, April 30, 2016

*72. “Physics of cellular adhesion complexes” Center for Bioengineering, UC Santa Barbara, April 26, 2016.

*71.“Force sensing and force transduction at integrin-based adhesion complexes” Dept. of Biomedical Engineering, UC Davis, April 19, 2016.

*70. “Mechanosensing at cell-cell and cell-matrix adhesions” Dept. of Chemical And Biological Engineering, Princeton University, Feb. 25, 2016.

*69. “Biophysical basis for cellular force transduction” Biophysics Program, Massachusetts Institute of Technology, Feb. 17, 2016.

*68. “Mechanosensing at cell-cell and cell-matrix adhesions” Dept. of Biochemistry, Molecular Biology and Biophysics, U. Minnesota, Jan. 27, 2016.

*67. “Cell motility and traction force generation in three-dimensional fibrin hydrogels” New England Complex Fluids Workshop, Harvard University, Dec. 4, 2015.

*66. “A molecular basis for mechanosensing at cell-cell contacts” Squishy Physics Seminar Series, Dept. of Physics and Applied Physics, Harvard University, Dec. 2, 2015.

*65. “Mechanosensing at cell-cell and cell-matrix adhesions” Dept. of Environmental Health, Harvard T.H. Chan School of Public Health, Dec. 1, 2015.

*64. “Mechanosensing at cell-cell and cell-matrix adhesions” BioFrontiers Institute, University of Colorado, Nov. 23, 2015.

*63. “Mechanosensing at cell-cell and cell-matrix adhesions” Dept. of Chemical Engineering, California Institute of Technology, Nov. 19, 2015.

*62. “Mechanosensing at cell-cell and cell-matrix adhesions” Dept. of Chemical & Biomolecular Engineering, Johns Hopkins University, Oct. 29, 2015.

*61. “Mechanosensing at cell-cell and cell-matrix adhesions” Dept. of Chemical Engineering, Stanford University, Oct. 26, 2015.

*60. “Mechanosensing at cell-cell and cell-matrix adhesions” Workshop on the Quantitative Biology of Cytoskeletal Mechanics, Chicago, IL, Oct. 22-24, 2015.

*59. “Mechanosensing at cell-cell and cell-matrix adhesions” Dept. of Chemical Engineering, Massachusetts Institute of Technology, Oct. 8, 2015.

*58. “Physics of Cellular Force Sensing at Cell-Cell Contacts” International Scientific Symposium on 42. Multivalent Interactions in Polyelectrolytes: New Physics, Biology and Materials October 2-4, 2015, University of Chicago, Oct. 2-4 2015.

*57. “Mechanosensing at cell-cell and cell-matrix adhesions” Dept. of Chemical & Biomolecular Engineering, UC Berkeley, Sept. 23, 2015.

*56. “Mechanosensing at cell-cell and cell-matrix adhesions” Dept. of Molecular Genetics, University of Toronto, Sept. 9, 2015.

Student Invited Colloquium, Physics Dept., Northern Illinois University, Sept. 4, 2015.

*55. “Mapping the force-producing machinery within focal adhesions” Matrix Metalloproteinases GRC, Sunday River, Newry, ME, August 2-7, 2015.

*54. “Mechanosensing at cell-cell contacts” Dept. of Physics, Technische Universität München, Munich, Germany, July 10, 2015.

*53. “The minimal cadherin-catenin complex forms a force-sensitive link to actin at cell-cell contacts” MPI Martinsried, Munich, Germany, July 9, 2015.

*52. “Mechanotransduction at cell-cell and cell-matrix adhesions” Dept. of Physics, University of Heidelberg, Heidelberg, Germany, July 8, 2015.

*51. “The minimal cadherin-catenin complex forms a force-sensitive link to actin at cell-cell contacts” Cell Contact and Adhesion Gordon Research Conference, Andover, NH, June 28 - July 2, 2015.
*50. “Nanoscale Architecture of Force Transmission at Integrin Adhesions” Fibronectin, Integrins, and Related Molecules Gordon Research Conference, Lucca, Italy, May 10 - 14, 2015.
*49. “Visualizing the architecture of cellular adhesion complexes using fluorescent molecular force sensors” Mechanobiology Institute, National University of Singapore, Singapore, May 8, 2015
*48. “The minimal cadherin-catenin complex forms a force-sensitive link to actin at cell-cell contacts” Mechanobiology Institute, National University of Singapore, Singapore, May 7, 2015.
*47. “Visualizing cellular force transduction using fluorescent molecular tension sensors” Dept. of Mechanical Engineering, University of California, San Diego, San Diego, CA April 6, 2015.
*46. “Tools to visualize molecular-scale forces in living cells” Force-Gated Ion Channels Meeting, Janelia Farm, Howard Hughes Medical Institute, Ashburn, VA, March 22-25, 2015.
*45. “The minimal cadherin-catenin complex forms a force-sensitive link to actin at cell-cell contacts” Dept. of Cell & Molecular Biology, Northwestern University, Chicago, IL, February 25, 2015.
*44. “Visualizing the architecture of cellular adhesion complexes using fluorescent molecular force sensors” Institute for Molecular Engineering, University of Chicago, Chicago, IL, February 24, 2015.
*43. “The minimal cadherin-catenin complex forms a force-sensitive link to actin at cell-cell contacts” Dept. of Biochemistry & Molecular Biology, University of Chicago, Chicago, IL, February 23, 2015.
*42. “Force transduction and conformational regulation of α-catenin.” Biophysical Society national meeting, Baltimore, MD, February 7-11, 2015.
*41. “Nanoscale architecture of tension generation within focal adhesions” American Society for Cell Biology national meeting, Philadelphia, PA, December 6-10, 2014.
*40. “Distribution of mechanical tension within focal adhesions in living cells” World Congress of Biomechanics, Boston, MA, July 6-11, 2014.
*39. “Force regulation of interactions between the E-cadherin-catenin complex and actin filaments” World Congress of Biomechanics, Boston, MA, July 6-11, 2014.
*38. “Mechanotransduction at cellular cadherin and integrin complexes” Dept. of Chemistry, University of California, Santa Barbara, CA, May 21, 2014.
*37. “Mechanotransduction at cadherin and integrin complexes” National Heart, Lung and Blood Institute, NIH, Bethesda, MD, April 8, 2014.
*36. “Cellular mechanotransduction at the molecule level” University of Maryland Biophysics Program, College Park, MD, April 7, 2014.
35. “Cellular mechanotransduction at the molecular level” NIH High Risk/High Reward Symposium, Bethesda, MD, Nov. 20, 2013.
*34. “Cellular biomechanics at the molecular scale” Dept. of Physics, U. California, Santa Cruz, Santa Cruz, CA, Nov. 7, 2013.
*33. “Cellular biomechanics at the molecular scale” Dept. of Chemical Engineering, University of Illinois, Urbana-Champaign, IL, Oct. 31, 2013.
*32. “Cellular traction at the single molecule level” Physiology Course, Marine Biological Laboratory. Woods Hole, MA June 28, 2013.
*31. “Mechanotransduction at cell-cell and cell-matrix adhesions” Genomics Institute of the Novartis Research Foundation. Torrey Pines, CA May 13, 2013.
*30. “Biomechanics at the molecular scale” University of California, San Francisco, Oral and Craniofacial Sciences Seminar Series. February 26, 2013.
*29. “Biomechanics at the molecular scale” University of Pennsylvania, Dept. of Chemical Engineering Colloquium Series. January 30, 2013.

*28. “Force” American Society for Cell Biology National Meeting, San Francisco, CA, December 15-19, 2012.

*27. “Metalloproteinase conformational dynamics accompanying the proteolytic degradation of trimeric collagen I” Gordon Research Conference: Plasminogen Activation & Extracellular Proteolysis Ventura, CA, February 12-17, 2012.

*26. “Roles of Mechanical Force in Extracellular Matrix Remodeling” Frontiers in Cardiovascular Science, Cardiovascular Institute, Stanford University School of Medicine, February 7, 2012.

*25. “E-cadherin experiences constitutive mechanical tension in living cells” Bioengineering Department Colloquium, Bioengineering Department, Stanford University. January 27th, 2012.

*24. “Measurement of cytoskeletal forces in living epithelial cells” Stanford Digestive Disease Center Retreat, Digestive Disease Center, Stanford University School of Medicine, September 24, 2011.

*23. “Building biology” Biophysics Program Retreat, Biophysics Program, Stanford University. September 23, 2011.

*22. “Molecular force probes for measuring cellular mechanotransduction” CVI Member Retreat, Cardiovascular Institute, Stanford University School of Medicine, September 9, 2011.

*21. “Exploring the role of mechanical forces in cell biology” Biomechanical Engineering Seminar Series, Mechanical Engineering, Stanford University, May 9, 2011

*20. “Using single molecule measurements to study cellular force sensors” Physics Department Colloquium, Dept. of Physics, UC Santa Cruz. February 25, 2011.

*19. “Mechanical forces in developmental biology” Bioengineering Department Colloquium, Bioengineering Department, Stanford University. January 11, 2011.

18. “Effect of mechanical load on extracellular matrix remodeling from single molecules to millimeters” 3rd USNCB Symposium on Frontiers in Biomechanics: Mechanics of Development. June 21, 2011, Farmington, Pennsylvania, USA.

17. “Mechanical force induces a 100-fold increase in the rate of collagen proteolysis by MMP-1” Biophysical Society 55th Annual Meeting. Mar. 5 – 9, 2011, Baltimore, USA.

*16. “Using single molecule measurements to study cellular force sensors” UC Santa Cruz Physics Dept. Seminar Series, Feb. 25, 2011.

15. Dunn, A. R., Chuan, P.-Y. & Spudich “Contribution of the myosin VI medial tail domain to processive stepping and intramolecular tension sensing.” Biophysical Society 54th Annual Meeting. Feb. 20 – 24, 2010, San Francisco, USA.

*14. “Contribution of the myosin VI medial tail domain to processive stepping and intramolecular tension sensing.” Japanese Molecular Biology Pre-meeting Symposium: Interface between Nano-biology and Molecular Biology. Dec. 8, 2009, Yokohama, Japan.

*13. “Myosin VI as a transporter and an anchor: A model for kinetics of the motor under load.” The 32nd Annual Meeting of the Molecular Biology Society of Japan. Dec. 9 – Dec. 12 2009, Yokohama, Japan.

*12. Dunn, A. R. & Spudich, J. A. “The mechanism of load detection in the molecular motor myosin VI.” American Physical Society March Meeting, Pittsburgh, PA, March 15-20 (2009).

*11. Dunn, A. R. & Spudich, J. A. “Single molecule measurements link myosin V biophysics and cellular function.” University of Oregon, Department of Physics, July 25 (2007).

*10. Dunn, A. R. & Spudich, J. A. “Structural dynamics of single molecular motors.” University of British Columbia, Department of Physics, April 30 (2007).

*9. Dunn, A. R. & Spudich, J. A. “Regulation of the cell’s dynamic city plan and the myosin family of molecular motors.” Traffic and Granular Flow, Orsay, France, June 20-22 (2007).

*8. Dunn, A. R. & Spudich, J. A. “Structural dynamics of myosin V: characterization of the one-head bound intermediate.” American Physical Society March Meeting. Denver, CO, March 5-9 (2007).

7. Dunn, A. R. & Spudich, J. A. “Characterization of the one-head-bound intermediate that occurs as

myosin V walks on actin." Biophysical Society Annual Meeting. Baltimore, MD, March 3-8 (2007).

6. Dunn, A. R., Churchman, L. S., Bryant, Z. & Spudich, J. A. "Tracking single gold nanoparticle-myosin V conjugates using darkfield imaging" Biophysical Society Discussions. Molecular Motors: Point Counterpoint. Asilomar, CA, October 19-22 (2006).

5. Dunn, A. R., Churchman, L. S., Bryant, Z. & Spudich, J. A. "Tracking single gold nanoparticle-myosin V conjugates using darkfield imaging" Biophysical Society Annual Meeting. Salt Lake City, UT, February 18-22 (2006).

4. Dunn, A. R., Hays, A.-M. A., Goodin, D. G., Stout, C. D., Chiu, R., Winkler, J. A. & Gray, H. B. "Luminescent probes for cytochrome P450" 13th International Conference on Cytochromes P450. Prague, Czech Republic, June 29-July 3 (2003).

3. Dunn, A. R., Belliston, W., Chiu, R., Hays, A.-M. A., Goodin, D. B., Stout, C. D., Winkler, J. R. & Gray, H. B. "Dark-to-light luminescent probes for metalloenzymes" Graduate Research Seminar: Bioinorganic Chemistry. Ventura, CA February 6-9 (2003).

2. Dunn, A. R., Crane, B. R., Dmochowski, I. J., Winkler, J. R. & Gray, H. B. "Sensitizer-linked substrates for cytochrome P450: Photoinduced electron transfer and structural insights" Graduate Research Seminar: Bioinorganic Chemistry. Ventura, CA January 24-27 (2002).

1. Dunn, A. R., Crane, B. R., Dmochowski, I. J., Winkler, J. R. & Gray, H. B. "Sensitizer-linked substrates for cytochrome P450: Photoinduced electron transfer and structural insights" 221st ACS National Meeting. San Diego, CA April 1-5 (2001).

Courses Taught

5. ChE 10 The Chemical Engineering Profession. A seminar class for undergraduates that brings outside professionals to Stanford to give advice on the career opportunities available to chemical engineering undergraduates.

4. ChE 420 Growth and Form. Graduate-level advanced topics course examining the role of physical forces in shaping living cells, tissues, and organs. (2013 – present)

3. ChE 185A Chemical Engineering Laboratory A. Junior/Senior laboratory course. Experimental aspects of chemical engineering science. Emphasizes laboratory work and development of communication skills. (2010)

2. ChE 320 Chemical Kinetics and Reaction Engineering. Graduate-level course on chemical reaction kinetics, with application to heterogeneous catalysis, enzyme engineering, and catalyst design. (2009 – present)

1. ChE/Ch 183, 283, Bio Sci 189 Biochemistry II. Advanced biochemistry course for juniors, seniors, and 1st-year graduate students. (2009 – present)

University Service

10. Undergraduate curriculum committee, Dept. of Chemical Engineering (2018-present)

9. Nanoscale Sciences and Engineering Shared Facility Program Committee (2015 – present)

8. Stanford Cardiovascular Institute Advisory Board (2013 – present)

7. ABET recertification committee, Department of Chemical Engineering (2013 – 2014)

6. Graduate Admissions Committee, Chemical Engineering Department (2013).

5. Graduate Admissions Committee, Stanford Biophysics Program (2012 – 2015).

4. Scientific Director, Cell Science Imaging Facility Cost Center for Building 4 (2011 – present)

3. Member, Department of Chemical Engineering undergraduate teaching committee (2009 – 2013)

2. Faculty advisor for the Stanford AIChE student chapter (2009 – 2013)

1. Co-chair of the Building 4 Laboratory Design Committee (2009-2010)

Service to the Scientific Community

18. Co-organizer ASCB subgroup "Mechanics of Large Cellular Machines" ASCB national meeting (2019)

17. Program committee, ASCB national meeting (2018)

16. Chair, Mechanobiology Subgroup, Biophysical Society (2017)

15. Intercellular Interactions (ICI) NIH study section (2017-present)

15. Editorial Board Member, Molecular Biology of the Cell (2017 – present)

14. Editorial Board Member, Biophysical Journal (2016 – present)

13. Chair for American Institute of Chemical Engineers National Meeting, Areas 15d/e.

12. Co-chair "Stem Cells in Tissue Engineering," American Institute of Chemical Engineers, Atlanta, GA, Nov. 16-21 2014.

11. Ad-hoc panelist, NIH Intercellular Interactions study section (October, 2014)

10. DARPA/Hertz Foundation Future Ideation Session, Arlington, VA Jan. 10-11, 2013.

9. NSF Proposal Review Panel, Directorate of Engineering (2013)

8. Secretary, Cellular Mechanobiology Subgroup, Biophysical Society (2013 – 2016)

7. Scientific Advisory Board, Myokardia, South San Francisco, CA.

6. Co-Organizer, Bay Area Mechanobiology Symposium, Stanford University, November 29, 2012.

5. Session Co-chair, "Cell Adhesion and Migration," American Institute of Chemical Engineers, Pittsburg, PA, October 28 – November 2, 2012.

4. Invitee, NIH Common Fund Forward Focus Workshop: Strategic Planning For The NIH Common Fund, May 3, 2012, San Francisco, CA, USA.

3. Ad hoc panelist, NIH Biological Chemistry and Macromolecular Biophysics Integrated Review Group, Dec. 6, 2011.

2. Panelist, NICHD Bringing the Vision Together Meeting, June 23-24, 2011, Leesburg, VA, USA.

1. Organized special topics session at the American Society for Cell Biology 2008 National Meeting: "New Applications for AFM and Optical Trapping in Cell Biology." San Francisco, USA

Ad hoc proposal review

Netherlands Organisation for Scientific Research
Israel Science Foundation (ISF)
Wellcome Trust

Journal article review

Proceedings of the National Academy of Sciences, U.S.A., Biomaterials, Physical Review Letters, Journal of the American Chemical Society, Optics Express, Interface Focus, Physics Review E, Journal of Molecular Biology, Biophysical Journal, PLoS Computational Biology, Nature Communications, Current Biology, Nature Cell Biology, eLife

Active Grants as PI

1. NIH R01GM112998 (PI: Dunn) 05/01/15 - 01/31/19
Biophysical mechanisms of mechanical tension sensing at cellular integrin complexes

2. NIH R01HL128779 (PI: Dunn) 07/01/15 - 06/30/19
Molecular mechanisms underlying flow sensing in lymphatic endothelial cells

3. NIH R01GM114462 (PI: Dunn) 09/22/15 - 04/30/19
Understanding force-dependent binding of alpha-catenin to actin

4. NIH R01GM117457 (PI: Dunn) 09/01/15 - 08/31/20
Molecular mechanisms underlying force sensing at intercellular junctions

5. HHMI Faculty Scholar Award (PI: Dunn) 10/01/16 – 09/30/21
Biophysical Mechanisms of Mechanotransduction at Cellular Adhesions