

# Adam Jeffrey Engler, PhD

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## ACADEMIC APPOINTMENTS AND AFFILIATIONS

### **University of California, San Diego; San Diego, CA**

<i>Assistant Professor</i> , Department of Bioengineering	2008 – 2014
<i>Associate Professor</i> , Department of Bioengineering	2014 – present
<i>Resident Scientist</i> , Sanford Consortium for Regenerative Medicine	2012 – present
<i>Member</i> , Material Science Graduate Program	2009 – present
<i>Member</i> , Biomedical Sciences Graduate Program	2009 – present
<i>Member</i> , UCSD Stem Cell Institute	2009 – present
<i>Member</i> , UCSD Glycobiology Research and Training Center	2009 – present
<i>Member</i> , UCSD Moores Cancer Center	2016 – present

## EDUCATION AND RESEARCH TRAINING

Postdoctoral Fellowship	<b>Princeton University</b> ; Princeton, NJ Dept. of Molecular Biology Research Area: Fibronectin's influence on embryonic stem cells and cell adhesion Advisor: Jean E. Schwarzbauer, Ph.D.	2006 - 2008
Ph.D.	<b>University of Pennsylvania</b> ; Philadelphia, PA Biophysical Engineering Lab Dissertation Title: <i>Mechanochemical Signaling Directs Cell State: A Mechanics of Materials Foundation for Cell Biology</i> Advisor: Dennis E. Discher, Ph.D.	2006
B.S.E.	<b>University of Pennsylvania</b> ; Philadelphia, PA Major: Bioengineering      Minor: Mathematics	2002

## SELECTED HONORS AND FELLOWSHIPS

- Frontiers of Engineering Symposium Attendee, National Academy of Engineering (2015)
- Y.C. Fung Young Investigator Award, American Society for Mechanical Engineering (2015)
- Renato Iozzo Mid-career Award, American Society for Matrix Biology (2014)
- Breast Cancer IDEA Award, US Dept. of Defense (2013)
- Young Investigator Award, Human Frontiers Science Program (2010)
- New Innovator Award, National Institutes of Health (2009)
- Rita Schaffer Young Investigator Award, Biomedical Engineering Society (2008)
- Rupert Timpl Award, International Society for Matrix Biology (2008)
- National Research Service Award, National Cancer Institute/Princeton (2006-2008)
- John A. Goff Prize, University of Pennsylvania (2006)
- Graduate Research Symposium Award, University of Pennsylvania (2006)
- Graduate Student Award, International Society of Biorheology (2005)
- Graduate Student Award, Biomedical Engineering Society (2004)
- Ashton Foundation Predoctoral Fellowship (2002-2006)
- National Science Foundation - REU Fellowship (2001)

**PROFESSIONAL SOCIETY MEMBERSHIPS**

- American Chemical Society (ACS) (2011-present)
- American Heart Association (AHA) (2012-present)
- American Society for Cell Biology (ASCB) (2002-present)
- American Society for Matrix Biology (ASMB) (2008-present)
- American Society for Mechanical Engineering (ASME) (2002-2007, 2010-present)
- Biomedical Engineering Society (BMES) (2002-present)
- Biophysical Society (2002-present)
- International Society for Stem Cell Research (ISSCR) (2008-present)
- Tissue Engineering and Regenerative Medicine International Society (TERMIS) (2009-present)

**PUBLICATIONS****REFEREED JOURNAL PUBLICATIONS****(Google Scholar: 15,000+ citations; H-index of 35)**

1. Happe, C.L., Tenerelli, K.P., Gromova, A.K., Kolb, F., and Engler, A.J. “Mechanically Patterned Neuromuscular Junctions-in-a-dish Have Improved Functional Maturation” (submitted)
2. Herum, K.M., Choppe, J., Kumar, A., Engler, A.J., and McCulloch, A.M. “Mechanical regulation of cardiac fibroblast pro-fibrotic phenotypes” (submitted)
3. Lo Sardo, V., William Ferguson, W., Chubukov, P., Kumar, A., Phillips, T., Duran, M., Villarasa, N., Engler, A.J., Fyodor Urnov, F., Topol, E.J., Torkamani, A., Baldwin, K.K. “Whole Haplotype Editing of the Principal Cardiovascular Disease Risk Locus in Human iPSCs” (submitted)
4. Hadden, W.J., Young, J.L., Holle, A.W., Taylor-Weiner, H., Wen, J.H., Lee, A., Spatz, J.P., Engler, A.J., and Choi, Y.S. “Tunable stiffness gradient hydrogels for stem cell mechanobiology” (submitted)
5. Sessions, A.O., Kaushik, G., Parker, S., Raedschelders, K., Duong, J.T., Bodmer, R., Van Eyk, J.E., and Engler, A.J. “Extracellular Matrix Downregulation in the Drosophila Heart Preserves Contractile Function and Improves Lifespan.” *Matrix Biol.* (in press; DOI: 10.1016/j.matbio.2016.10.008)
6. Thomas, K.A., Gibbons, M.C., Lane, J.G., Singh, A., Ward, S.R., and Engler, A.J. “Rotator cuff tear state modulates self-renewal and differentiation capacity of skeletal muscle progenitor cells” *J Ortho Res* (in press; DOI: 10.1002/jor.23453)
7. Fuhrmann, A., Banisadr, A., Beri, P., Tlsty, T.D., and Engler, A.J. “Metastatic State of Cancer Cells may be indicated by Attachment Strength.” *Biophys J*, 2017. 112(4): 736-745.
8. Gibbons, M.C., Singh, A., Anakwenze, O., Cheng, T., Pomerantz, M.D., Schenk, S., Engler, A.J., and Ward, S.R. “Histological Findings in Chronically Torn Human Rotator Cuff Muscle: Evidence of Degeneration, Regeneration and Remodeling” *J Bone Joint Surg Am.*, 2017. 99(3): 190-199.

9. Blice-Baum, A.C., Zambon, A.C., Kaushik, G., Viswanathan, M.C., Engler, A.J., Bodmer, R., and Cammarato, A. “Titered FOXO overexpression maintains cardiac proteostasis and ameliorates age-associated functional decline” *Aging Cell*, 2017. 16(1): 93-103.
10. Gibbons, M.C., Sato, E.J., Bachasson, D., Cheng, T., Azimi, H., Schenk, S., Engler, A.J., Singh, A., Ward, S.R. “Muscle Architectural Changes After Massive Human Rotator Cuff Tear” *J Ortho Res*, 2016; 34(12): 2089-2095.
11. Holle, A.W., McIntyre, A.J., Kehe, J., Wijesekara, P., Young, J.L., Vincent, L.G., and Engler, A.J. “High content image analysis of focal adhesion-dependent mechanosensitive stem cell differentiation” *Integr. Biol.* 2016; 8, 1049–1058.
12. Sessions, A.O. and Engler, A.J. “Mechanical Regulation of Cardiac Aging in Model Systems” *Circ Res*, 2016; 18(10): 1553-62.
13. Zhang, Z.-N., Freitas, B.C., Qian, H., Lux, J., Acab, A.J., Trujillo, C., Herai, R., Nguyen Huu, V.A., Wen, J.H., Joshi-Barr, S., Karpiak, J.V., Engler, A.J., Fu, X.-D., Muotri, A.R., and Almutairi, A. “Layered hydrogels accelerate iPSC-derived neuronal maturation and reveal migration defects in Rett syndrome” *Proc Nat Acad Sci*, 2016; 113(12):3185-90.
14. Ondeck, M., and Engler, A.J. “Mechanical Characterization of a Dynamic and Tunable Methacrylated Hyaluronic Acid Hydrogel” *J Biomech Eng*, 2016; 138(2):021003-021003-6.
15. Happe, C.L., and Engler, A.J. “Mechanical Forces Reshape Differentiation Cues that Guide Cardiomyogenesis” *Circ Res*, 2016. 118(2): 296-310.
16. Wen, J.H., Choi, O., Taylor-Weiner, H., Fuhrmann, A., Karpiak, J.V. Almutairi, A., and Engler, A.J. “Haptotaxis is cell type specific and limited by substrate adhesiveness.” *Cell Mol Bioeng*, 2015. 8(4): 530-542.
17. Meyer, G.A., Gibbons, M., Sato, E., Lane, J.G., Ward, S.R., and Engler, A.J. “Epimuscular Fat in the Human Rotator Cuff is a Novel Beige Depot” *Stem Cells Trans Med*, 2015. 4(7): 764-74.
18. Wu, H., Lee, J., Vincent, L.G., Wang, Q., Gu, M., Lan, F., Churko, J.M., Sallam, K.I., Matsa, E., Sharma, A., Gold, J.D., Engler, A.J., Xiang, Y.K., Bers, D.M., and Wu, J.C. “Epigenetic Regulation of Phosphodiesterases 2A and 3A Underlies Compromised  $\beta$ -Adrenergic Signaling in an iPSC Model of Dilated Cardiomyopathy” *Cell Stem Cells*, 2015. 7(1): 89-100.
19. Fuhrmann, A. and Engler, A.J. “The Cytoskeleton Regulates Cell Attachment Strength” *Biophys J*, 2015. 109(1): 57–65.
20. Kaushik, G., Spenlehauer, A., Sessions, A.O., Trujillo, A.S., Fuhrmann, A., Fu, Z., Venkatraman, V., Pohl, D., Tuler, J., Wang, M., Lakatta, E.G, Ocorr, K., Bodmer, R., Bernstein, S.I., Van Eyk, J.E., Cammarato, A., and Engler, A.J. “Vinculin-network

mediated Cytoskeletal Remodeling and Regulation of Contractile Function in Aging Myocardium” *Science Trans Med*, 2015. 292: 292ra99.

21. Hribar, K.C., Finlay, D., Ma, X., Qu, X., Ondeck, M. G., Chung, P.H., Zanella, F., Engler, A.J., Sheikh, F., Vuori, K., Chen, S. “Nonlinear 3D projection printing of concave hydrogel microstructures for long-term multicellular spheroid and embryoid body culture” *Lab-on-a-Chip*, 2015. 15(11): 2412-2418.
22. Taylor-Weiner, H., Ravi, N., and Engler, A.J. “Traction Forces mediated by Integrin Signaling are Necessary for Definitive Endoderm Specification” *J Cell Sci*, 2015. 128(10): 1961-1968.
23. Wei, S.C., Fattet, L., Tsai, J.H., Guo, Y., Pai, V.H., Majecki, H.E., Chen, A.C., Sah, R.L., Taylor, S.S., Engler, A.J., and Yang J. “Matrix stiffness drives Epithelial-Mesenchymal Transition and tumor metastasis through a Twist1-G3BP2 mechanotransduction pathway” *Nature Cell Biology*, 2015. 17(5): 678-688.
24. Jun, I., Lee, Y.B., Choi, Y.S., Engler, A.J., Park, H., Shin, H. “Transfer stamping of human mesenchymal stem cell patches using thermally expandable hydrogels with tunable cell-adhesive properties.” *Biomaterials*, 2015. 54: 44-54.
25. Viswanathan, P.,\* Ondeck, M.G.,\* Chirasatitsin, S., Nghamkham, K., Reilly, G.C., Engler, A.J., and Battaglia, G. “3D Surface Topology Guides Stem Cell Adhesion and Differentiation” *Biomaterials*, 2015. 52:140-147. \*co-first authors
26. Meyer, G.A., Farris, A., Sato, E., Gibbons, M., Lane, J.G., Ward, S.R. and Engler, A.J. “Muscle Progenitor Cell Regenerative Capacity in the Torn Rotator Cuff” *J Ortho Res*, 2015. 33(3): 421-429.
27. Fuhrmann, A., and Engler, A.J. “Acute Shear Stress Dictates Adherent Cell Remodeling and Verifies Shear Profile of Spinning Disc Assays” *Phys Biol*, 2015. 12(1): 016011.
28. Thomas, K.A., Engler, A.J., and Meyer, G.A. “Extracellular Matrix Regulation in the Muscle Satellite Cell Niche” *Connective Tissue Res*, 2015. 56(1): 1-8.
29. Wen, J.H.,\* Vincent, L.G.,\* Choi, Y.S., Fuhrmann, A., Hribar, K., Taylor-Weiner, H., Chen, S., and Engler, A.J. “Interplay of Matrix Stiffness and Protein Tethering in Mechanically Based Differentiation” *Nature Materials*, 2014. 13(10): p. 979-987. \*co-first authors
30. Young, J.L., Kretchmeyer, K., Ondeck, M. G., Zambon, A.C., and Engler, A.J. “Mechanosensitive Kinases Regulate Stiffness-Induced Cardiomyogenesis” *Sci Reports*, 2014. 4: 6425.
31. Hribar, K.C., Choi, Y.S., Ondeck, M., Engler, A.J., Chen, S. “Digital Plasmonic Patterning of Hydrogels” *Adv Funct Mat*, 2014. 24(31): 4922–4926.
32. Fuhrmann, A., Li, J., Chien, S., and Engler, A.J. “Cation Type Specific Cell Remodeling Regulates Attachment Strength” *PLOS ONE*, 2014. 9(7): e102424.

33. Murphy, W.L., McDevitt, T.C., and Engler, A.J. “Materials as stem cell regulators” *Nature Materials*, 2014. 13: 547–557.
34. Nishimura, M., Kumsta, C. Kaushik, G., Ding, Y., Bisharat-Kernizan, J., Cammarato, A., Ross, R.S., Engler, A.J., Bodmer, R., Hansen, M., and Ocorr, K. “Dual role of Integrin and Integrin Linked Kinase in cardiac aging and integrity” *Aging Cell*, 2014. 13(3): 431–440.
35. Viswanathan, M.C., Kaushik, G., Engler, A.J., Lehman, W., and Cammarato, A. “A Drosophila model of diastolic dysfunction and cardiomyopathy based on impaired troponin function” *Circ Research*, 2014. 114:e6-e17.
36. Holle, A.W., Tang, X., Vijayraghavan, D., Vincent, L.G., Fuhrmann, A., Choi, Y.S., del Alamo, J.C., and Engler, A.J. “In Situ Mechanotransduction via Vinculin Regulates Stem Cell Myogenesis” *Stem Cells*, 2013. 31(11): 2467-77.
37. Rao, N., Grover, G.N., Vincent, L.G., Evans, S.C., Choi, Y.S., Spencer, K.H., Hui, E.E., Engler, A.J., and Christman, K.L. “A co-culture device with a tunable stiffness to understand combinatorial cell-cell and cell-matrix interactions” *Integr. Biol.*, 2013. 5(11): 1344 – 1354.
38. Taylor-Weiner, H., Schwarzbauer, J.E., and Engler, A.J. “Defined Extracellular Matrix Components are Necessary for Definitive Endoderm Induction” *Stem Cells*, 2013. 31(10): 2084-94.
39. Young, D.A., Choi, Y.S., Engler, A.J., and Christman, K.L. “Mimicking the stiffness of adipose tissue stimulates adipogenesis of adult adipose-derived stem cells” *Biomaterials*, 2013. 34(34): 8581-8588.
40. Kiang, J.D., Wen, J.H., del Alamo, J.C., and Engler, A.J. “Dynamic and Reversible Surface Topography Influences Cell Morphology” *J Biomed Mat Res A*, 2013. 101A(8): 2313-2321.
41. Young, J.L., Tuler, J., Braden, R., Schüp-Magoffin, P., Schaefer, J., Kretchmer, K., Christman, K. L., and Engler, A.J. “Thiolated hyaluronic acid hydrogels have limited myocardial Compatibility” *Acta Biomaterialia*, 2013. 9(7): 7151–7157.
42. Vincent, L.G., Choi, Y.S., Alonso-Latorre, B., del Alamo, J.C., and Engler, A.J. “Mesenchymal Stem Cell Durotaxis Depends on Substrate Stiffness Gradient Strength” *Biotechnology J*, 2013. 8(4): 472-84.
43. Joshi-Barr, S., Karpiak, J.V., Ner, Y., Wen, J.H., Engler, A.J., and Almutairi, A. “Density Gradient Multilayered Polymerization (DGMP): a novel technique for creating multi-compartment, customizable scaffolds for tissue engineering.” *J Vis Exp*, 2013. 72: e50018.
44. Viswanathan, P.,\* Chirasatitsin, S.,\* Ngamkham, K., Engler, A.J.#, and Battaglia, G.# “Cell instructive microporous scaffolds through interface engineering” *J Am Chem Soc*, 2012. 134(49): 20103-9. \*co-first authors #co-corresponding authors

45. Choi, Y.S., Vincent, L.G., Lee, A.R., Kretchmer, K.C., Chirasatitsin, S., Dobke, M.K., and Engler, A.J. “The alignment, fusion and striation assembly of adipose-derived stem cells on mechanically patterned hydrogel matrices” *Biomaterials*, 2012. 33(29): 6943-6951.
46. Kshitiz, K., Park, J.S., Kim, P., Helen, W., Engler, A.J., Levchenko, A., Kim, D-H. “Control of stem cell fate and function by engineering physical microenvironments” *Integr. Biol.*, 2012. 4(9): 1008–1018.
47. Kaushik, G., Zambon, A., Fuhrmann, A., Bernstein, S.I., Bodmer, R., Engler, A.J., and Cammarato, A. “Measuring passive myocardial stiffness in *Drosophila melanogaster* to investigate diastolic function.” *J Cell Mol Med*, 2012. 16(8): 1656-1662.
48. Choi, Y.S., Vincent, L.G., Lee, A.R., Dobke, M.K., and Engler, A.J. “Mechanical Derivation of Functional Myotubes from Adipose-Derived Stem Cells.” *Biomaterials*, 2012. 33(8): 2482-2491.
49. Kaushik, G., Fuhrmann, A., Cammarato, A.,\* and Engler, A.J.\* “Indentation Analysis of Soft Bilayers: In Situ Measurements of *Drosophila* Myocardial Stiffness” *Biophys J*, 2011. 101(11): 2629-2637. \*co-corresponding authors
50. Holle, A.W., and Engler, A.J. “More Than a Feeling: Discovering, Understanding, and Influencing Mechanosensing Pathways” *Curr Opin Biotech*, 2011. 22(5): 648-54.
51. Battaglia, G., LoPresti, C., Forster, S., Massignani, M., Warren, N., Madsen, J, Armes, S., Vasilev, C., Hobbs, J., Chirasatitsin, S., and Engler, A.J. “Wet nano-scale imaging and testing of polymersomes” *Small*, 2011. 7(14): 2010-5.
52. LoPresti, C., Massignani, M., Fernyhough, C., Blanazs, A., Ryan, A.J., Madsen, J., Warren, N.J., Armes, S.P., Lewis, A.L. Chirasatitsin, S., Engler, A.J., and Battaglia, G. “Controlling Polymersomes Surface Topology at the Nanoscale by Membrane Confined Polymer/Polymer Phase Separation” *ACS Nano*, 2011. 5(3): 1775-84.
53. Tse, J.R. and Engler, A.J. “Stiffness Gradients Mimicking *In Vivo* Tissue Variation Regulate Mesenchymal Stem Cell Fate” *PLoS One*, 2011. 6(1): e15978.
54. Young, J.L., and Engler, A.J. “Hydrogels with Time-Dependent Mechanical Properties Enhance Cardiomyocyte Differentiation *In Vitro*” *Biomaterials*, 2011. 32(4): 1002-1009.
55. Flores-Merino, M.V.,\* Chirasatitsin, S.,\* LoPresti, C., Reilly, G.C., Battaglia, G., and Engler, A.J. “Nanoscale Mechanical Anisotropy in Hydrogel Surfaces” *Soft Matter*, 2010. 6(18): 4466-4470. \*co-first authors
56. Tse, J.R. and Engler, A.J. “Preparation of Hydrogel Substrates with Tunable Mechanical Properties” *Curr Protoc Cell Biol*, 2010. Chapter 10: Unit 10.16: 1-16.
57. Chirasatitsin, S. and Engler, A.J. “Detecting Cell-Adhesive Sites in Extracellular Matrix using Force Spectroscopy Mapping” *J Phys: Condensed Matter*, 2010. 22(19): 194102

58. Reilly, G.C. and Engler, A.J. “Intrinsic Extracellular Matrix Properties Regulate Stem Cell Differentiation” *J Biomechanics*, 2010. 43(1): 55-62.
59. Engler, A.J., Humbert, P.O. Wehrle-Haller, B., and Weaver, V.M. “Multiscale Modeling of Form and Function” *Science*, 2009. 208: 208-212.
60. Sen, S., Engler, A.J., Discher, D.E. “Matrix Strains Induced by Cells: Computing How Far Cells Can Feel” *Cell and Mol Bioeng*, 2009. 2(1): 39-48.
61. Oh, S., Brammer, K.S., Li, Y.S.J., Teng, D., Engler, A.J., Chien, S., and Jin, S. “Stem Cell Fate Dictated Solely by Altered Nanotube Dimension” *Proc Nat Acad Sci USA*, 2009. 106(7): 2130-2135.
62. Engler, A.J., Chan, M., Boettiger, D., and Schwarzbauer, J.E. “A Novel Mode of Cell Detachment from Fibrillar Matrix under Shear” *J Cell Sci*, 2009. 122(10): 1647-53.
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64. Engler, A.J., Carag-Krieger, C., Johnson, C.P., Raab, M., Tang, H.-Y., Speicher, D.W., Sanger, J.W., Sanger, J.M., and Discher, D.E. “Embryonic Cardiomyocytes Beat Best on a Matrix with Heart-like Elasticity: Scar-like Rigidity Inhibits Beating” *J Cell Sci*, 2008. 121(22): 3794-3802.
65. Rehfeldt, F., Engler, A.J., Eckhardt, A., Ahmed, F., and Discher, D.E. “Cell Responses to the Mechanochemical Microenvironment—Implications for Regenerative Medicine and Drug Delivery,” *Adv Drug Deliv Rev*, 2007. 59: 1329-1339.
66. Engler, A.J., Sen, S., Sweeney, H.L., and Discher, D.E. “Matrix Elasticity Directs Stem Cell Lineage Specification” *Cell*, 2006. 126(4): 677-689.
67. Brown, A.G., Leite, R.S., Engler, A.J., Discher, D.E., Strauss, J.F. “A hemoglobin fragment found in cervicovaginal fluid from women in labor potentiates the action of agents that promote contraction of smooth muscle cells.” *Peptides*, 2006. 27(7):1794-800
68. Berry, M.F., Engler, A.J., Woo, Y.J, Pirolli, T.J., Bish, L.T., Bell, P., Jayasankar, V., Morine, K.J., Gardner, T.J., Discher, D.E., and H.L. Sweeney “Mesenchymal Stem Cell Injection After Myocardial Infarction Improves Myocardial Compliance” *Am J Physiol: Heart Circ Physiol*, 2006. 290(6): H2196-H2203.
69. Dahl, K.N., Engler, A.J., Pajeroski, J.D., and Discher, D.E. “Power-law rheology of isolated nuclei and mapping deformation of subnuclear domains” *Biophysical J*, 2005. 89(4): 2855-2864.
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72. Engler, A.J., Richert, L., Wong, J.Y., Picart, C., and Discher, D.E. “Surface Probe Measurements of the Elasticity of Sectioned Tissue, Thin Gels and Polyelectrolyte Multilayer Films: Correlations between Substrate Stiffness and Cell Adhesion” *Surface Science*, 2004. 570:142-154.
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74. Dalhaimer, P., Engler, A.J., Parthasarathy, R., and Discher, D.E. “Targeted worm micelles” *Biomacromolecules*, 2004. 5(5): 1714-1719.
75. Griffin, M.A., Engler, A.J., Barber, T.A., Healy, K.E., Sweeney, H.L., and Discher, D.E. “Patterning, Prestress, and Peeling Dynamics of Myocytes” *Biophysical J*, 2004. 86(2): 1209-1222.
76. Engler, A.,\* Bacakova, L.,\* Newman, C., Hategan, A., Griffin, M., and Discher, D. “Substrate Compliance versus Ligand Density in Cell on Gel Responses.” *Biophysical J*, 2004. 86(1): 617-628. \*co-first authors

#### **BOOK CHAPTERS**

1. LaPointe V.L.S., de Boer, J., and Engler, A.J. “Cellular Signaling” in *Tissue Engineering*, van Blitterswijk, C. and J. de Boer, Editors. 2014, Elsevier Science: London. Vol. 2. Pg. 111-148.
2. Kaushik, G. and Engler, A.J. “From Stem Cells to Cardiomyocytes: The Role of Forces in Cardiac Maturation, Aging, and Disease” in *Progress in Molecular Biology and Translational Science*, Kumar, S. and A. J. Engler, Editors. 2014, Elsevier Science: London. Vol. 126, pg. 219–242.
3. Ondeck, M.G. and Engler, A.J. “Dynamic Materials Mimic Development and Disease Changes in Tissues” in *Bio-inspired Materials for Biomedical Engineering*, Brennan, A.B. and Kirschner, C.M., Editors. 2014, John Wiley & Sons: New York. pg. 25-44.
4. Wen, J.H., Taylor-Weiner, H., Fuhrmann, A. and Engler, A.J. “Cell Mechanics on Surfaces” in *Biomaterials Surface Science*, Taubert, A, Mano, J. and Rodriguez-Cabello, J.C., Editors. 2013, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany. pg. 511-537.



5. Choi, Y.S., Holle, A.W., and Engler, A.J. “Engineered ECM Microenvironments and their Regulation of Stem Cells” in *Extracellular Matrix in Development from Biology of Extracellular Matrix* (series), Mecham, R. and DeSimone, D., Editors. 2013, Springer: Heidelberg. pg. 133-160.
6. Varghese, S. and Engler, A.J. “Musculoskeletal Cell Mechanics” in *Orthopaedic Biomechanics*, Winkelstein, B.A., Ed. 2012, Taylor & Francis: New York. pg. 303-325.
7. Vincent, L., and Engler, A.J. “Effect of Substrate Modulus on Cell Function and Differentiation” in *Comprehensive Biomaterials*, Healy, K.E., Ducheyne, P., and J. Kirkpatrick, Editors. 2011, Elsevier Science: London. Vol. 5. pg. 51-64.
8. Helen, W. and Engler, A.J. “Mechanobiology in the Stem Cell Niche: Integrating Physical and Chemical Regulation of Differentiation,” in *Mechanobiology Handbook*, Nagatomi, J., Ed. 2010, CRC Press: Boca Raton, FL. pg. 439-455.
9. Young, J.L., Christman, K.L., and Engler, A.J. “Stem Cells for Cardiac Tissue Engineering,” in *Stem Cells and Tissue Engineering*, S. Li, N. L’Heureux, and J.H. Elisseeff, Editors. 2010, World Scientific Publishing: Singapore. pg. 95-114.
10. Rehfeldt, F., Engler, A.J., and Discher, D. E. “Stem Cells and Nanomedicine: Nanomechanics of the Microenvironment,” in *Nanotechnology*, 2010. 305–322.
11. Engler, A.J., Rehfeldt, F., Sen, S., and Discher, D.E., “Micro-Tissue Elasticity: Measurements by Atomic Force Microscopy and its Influence on Cell Differentiation,” in *Methods in Cell Biology: Cell Mechanics*, D.E. Discher and Y-L Wang, Editors. 2007, Elsevier: New York. pg. 521-545.
12. Frey, M.T., Engler, A., Discher, D.E., Lee, J., and Wang, Y-L, “Microscopic Methods for Measuring the Elasticity of Gel Substrates for Cell Culture: Microspheres, Microindenters, and Atomic Force Microscopy,” in *Methods in Cell Biology: Cell Mechanics*, D.E. Discher and Y-L Wang, Editors. 2007, Elsevier: New York. pg. 47-65.

### **COMMENTARIES**

1. Vincent, L.G. and Engler, A.J. “Stem Cell Differentiation: Post degradation Forces Kick-in” *Nat Materials* 2013. 12(5): 384-6.
2. Holle, A.W. and Engler, A.J. “Cell rheology: Stressed-out stem cells” *Nat Materials* 2010. 9(1): 4-6.
3. Merryman, W.D. and Engler, A.J. “Innovations in cell mechanobiology.” *J Biomech.* 2010 Jan 5; 43(1): 1-2.
4. Oh, S., Brammer, K.S., Li, Y.S.J., Teng, D., Engler, A.J., Chien, S., and Jin, S. “Reply to von der Mark et al.: Looking further into the effects of nanotube dimension on stem cell fate” *Proc Nat Acad Sci USA*, 2009. 106(24): E61.

### **U.S. PATENTS**

1. Kumar, A, Ondeck, M., Engler, A.J. “Methods of Disease Modeling Using Static and Time-dependent Hydrogels.” (US 62/088,405)

2. Engler, A.J., Sweeney, H.L., and Discher D.E. “Regulating stem cell differentiation by controlling matrix elasticity” (US2007190646)

### **INVITED TALKS**

“Improving on “Disease-in-a-dish:” How Engineered Niche Induce Novel Phenotypes from induced Pluripotent Stem Cells (iPSCs)”

BMES Cellular and Molecular Bioengineering Meeting (2017); Kona, HI  
 Dept. of Bioengineering, University of California, Berkeley (2016); Berkeley, CA  
 Biophysical Society Thematic Meeting: Mechanobiology of Disease (2016); Singapore  
 1st International Conference of Molecular Engineering of Polymers (2016); Shanghai, China  
 Carolina Biophysics Symposium (2016); Chapel Hill, NC  
 Dept. of Biomedical Engineering, Cornell University (2016); Ithaca, NY

“Niche Dynamics Promote Epithelial-Mesenchymal Transition via Mechanical Signaling”

American Society for Matrix Biology (2016); St. Petersburg, FL  
 Biomedical Engineering Society Meeting (2016); Minneapolis, MN  
 World Biomaterials Congress (2016); Montreal, Canada  
 American Association of Anatomist @ Experimental Biology Meeting (2016); San Diego, CA  
 American Chemical Society Biennial Meeting (2016); San Diego, CA  
 55<sup>th</sup> Annual American Society for Cell Biology Meeting (2015); San Diego, CA  
 Gordon Conference: Collagen (2015); New London, NH  
 Wake Forest Institute for Regenerative Medicine (2015); Winston-Salem, NC  
 Biomedical Engineering Society Meeting (2015); Tampa, FL  
 Fischell Dept. of Bioengineering, University of Maryland (2015); College Park, MD  
 Cell-Matrix Mechanobiology Workshop (2015); Urbana-Champaign, IL

“Mechanical Signaling and its Role in Differentiation, Aging, and Disease”

American Association of Anatomist @ Experimental Biology Meeting (2016); San Diego, CA  
 Biomaterials Seminar Series, University of Michigan (2015); Ann Arbor, MI  
 XIII Simpósio Brasileiro de Matriz Extracelular (2015); Buzios, Rio de Janeiro, Brazil  
 Dept. of Bioengineering, University of California, Riverside (2015); Riverside, CA  
 Dept. of Biomedical Engineering, University of Minnesota (2015); Minneapolis, MN  
 Stem Cell Institute, University of Southern California (2015); Los Angeles, CA  
 14<sup>th</sup> Annual ISSCR Meeting (2015); Stockholm, Sweden  
 Summer Biomechanics, Bioengineering, and Biotransport Conference (2015); Snowbird, UT  
 Wake Forest Institute for Regenerative Medicine (2015); Winston-Salem, NC  
 International Workshop on Multiscale Mechanobiology (2015); New York, NY

“Cytoskeletal remodeling modulates cardiomyocyte contractile function during aging”

Summer Biomechanics, Bioengineering & Biotransport Conference (2016); Washington, D.C.  
 7<sup>th</sup> AFMBIOMED Meeting (2016); Porto, Portugal  
 Insect Muscle Meeting, Johns Hopkins University (2015); Baltimore, MD  
 Develop and Aging Program, Sanford-Burnham Medical Research Institute (2015); La Jolla, CA  
 Dept of Pathology, UC San Diego (2014); La Jolla, CA

World Congress of Biomechanics (2014); Boston, MA  
 Dept. of Bioengineering, University of Washington (2014); Seattle, WA

“Interplay of Material Stiffness and Protein Tethering in Mechanically Based Differentiation”

Dept. of Physics, Wake Forest University (2015); Winston-Salem, NC  
 24<sup>th</sup> Cytometry Development Workshop: Technologies for Cell Analysis (2014); La Jolla, CA  
 Biomedical Engineering Society Meeting (2014); San Antonio, TX  
 9<sup>th</sup> Stem Cell Meeting on the Mesa (2014); La Jolla, CA  
 NHLBI Workshop on Lung Mechanobiology (2014); Bethesda, MD  
 World Congress of Biomechanics (2014); Boston, MA  
 Nature Conference on Genomic Technologies and Biomaterials (2014); San Diego, CA  
 International Workshop on Multiscale Mechanobiology (2014); Hong Kong, China  
 Dept. of Bioengineering, University of California, Los Angeles (2014); Los Angeles, CA  
 Dept. of Biomedical Engineering, Georgia Tech (2014); Atlanta, GA

“Traction Forces via Integrin Signaling are Necessary for Endoderm Specification”

American Society for Matrix Biology (2014); Cleveland, OH  
 World Congress for Regenerative Medicine (2013); Leipzig, Germany

“Cell instructive scaffolds through interface engineering”

3<sup>rd</sup> Global Congress on NanoEngineering for Medicine and Biology (2014); San Francisco, CA  
 World Congress for Regenerative Medicine (2013); Leipzig, Germany  
 Stony Brook University Stem Cell Symposium (2013); Stony Brook, NY  
 Cambridge Stem Cell Institute Symposium (2013); Cambridge, UK  
 Dept of Mechanical Engineering, POSTECH University (2013); Pohang, Republic of Korea  
 43<sup>rd</sup> Princess Takamatsu Cancer Symposium (2012); Tokyo, Japan  
 Cell Biophysics Summer School, University of Ottawa (2012); Ottawa, Canada  
 Gordon Conference: Signal Transduction By Engineered ECMs (2012); Biddeford, ME  
 9<sup>th</sup> World Biomaterials Congress (2012); Chengdu, China  
 International Conference on Stem Cell Engineering (ICSCE) (2012); Seattle, WA  
 Spring Meeting, Material Research Society (MRS) (2012); San Francisco, CA

“Vinculin Mechanosensing and its Role in Differentiation, Disease, and Aging”

Dept. of Biophysics, University of Gottingen (2013); Gottingen, Germany  
 8<sup>th</sup> Stem Cell Meeting on the Mesa (2013); La Jolla, CA  
 Dept. of Bioengineering, University of California, Irvine (2013); Irvine, CA  
 Graduate Programs in Bioengineering and Pharmaceutical Sciences & Pharmacogenomics;  
 University of California, San Francisco (2013); San Francisco, CA  
 Dept of Biomedical Engineering; Tufts University (2013); Medford, MA  
 Dept of Biochem & Mol Genetics; University of Alabama-Birmingham (2013); Birmingham, AL  
 Muscle Development & Regeneration Program; Sanford-Burnham Institute (2013); La Jolla, CA  
 Dept. of Bioengineering, University of Pennsylvania (2013); Philadelphia, PA  
 Regen. Med. & Rehab. Mtg., American Physical Therapy Assoc. (2012); Beaver Hollow, NY  
 Amer. Soc. for Investigative Pathology Experimental Biology Meeting (2012); San Diego, CA  
 Dept. of Cell and Developmental Biology, Vanderbilt University (2012); Nashville, TN  
 American Physical Society March Meeting (2012); Boston, MA  
 Dept. of Cardiology, University of California, San Diego (2012); La Jolla, CA  
 Rheumatology, Allergy & Immunology Seminars Series, UCSD (2011); San Diego, CA  
 Bionanotechnology IGERT, UIUC (2011); Urbana-Champaign, IL

“Probing Mechanisms of Mechano-sensitive Differentiation in Mesenchymal Stem Cells”

Division of Physics, University of California, San Diego (2012); La Jolla, CA  
 Institute for Bioeng’g; Ecole Polytechnique Federale de Lausanne (2011); Lausanne, Switzerland  
 American Physiological Society @ Experimental Biology Meeting (2011); Washington, DC  
 Tokyo Medical and Dental University (2011); Tokyo, Japan  
 Translational Excellence in Regenerative Medicine Meeting (2010); Amsterdam, Netherlands  
 Dept. of Mech. & Aerospace Eng’g, University of California, San Diego (2010); La Jolla, CA  
 ASME Summer Bioengineering Conference (2010); Naples, FL

“Intrinsic Matrix Properties Govern Embryonic Stem Cell Function”

INSERM/Nantes Stem Cell Meeting (2011); Nantes, France  
 American Society for Matrix Biology Biennial Meeting (2010); Charleston, SC  
 Gordon Conference: Signal Transduction By Engineered ECMs (2010); Biddeford, ME  
 American Association of Anatomist @ Experimental Biology Meeting (2010); Anaheim, CA  
 Dept. of Bioengineering, University of California, Berkeley (2010); Berkeley, CA  
 Dept. of Bioengineering, University of California, Irvine (2010); Irvine, CA  
 2<sup>nd</sup> TERMIS World Congress (2009); Seoul, South Korea  
 Tissue & Cell Engineering Society Annual Meeting (2009); Glasgow, Scotland UK  
 British Society for Matrix Biology Meeting (2009); London, England UK

“Towards ‘Smart’ Materials to Mimic Stem and Cardiomyocyte Microenvironments”

2<sup>nd</sup> TERMIS World Congress (2009); Seoul, Republic of Korea  
 Dept. of Mech. & Aerospace Eng’g, University of California, San Diego (2009); La Jolla, CA  
 Biomedical Sciences Program, University of California, San Diego (2009); La Jolla, CA  
 Stem Cell Institute, Salk Institute (2009); La Jolla, CA  
 Dept. of Cardiology, University of California, San Diego (2009); La Jolla, CA

“Stem Cells are Touchy-Feely: A Role for Matrix in Development and Disease”

Tokyo Medical and Dental University (2011); Tokyo, Japan  
 Dept. of Biomedical Engineering; University of Alabama-Birmingham (2008); Birmingham, AL  
 Annual Biomedical Engineering Society (2008); St. Louis, MO  
 19<sup>th</sup> Federation of European Connective Tissue Societies Meeting (2008); Marseille, France  
 47<sup>th</sup> Annual American Society for Cell Biology Meeting (2007); Washington, D.C.  
 37<sup>th</sup> International Sun Valley Workshop on Skeletal Tissue Biology (2007); Sun Valley, ID  
 Dept. of Biomedical Engineering; University of Wisconsin-Madison (2007); Madison, WI  
 Institute for Bioeng’g; Ecole Polytechnique Federale de Lausanne (2007); Lausanne, Switzerland  
 Dept. of Biomedical Engineering; Boston University (2007); Boston, MA  
 IEEE-Engineering Medicine and Biology Society Annual Meeting (2006); New York, NY  
 Pennsylvania Muscle Institute Symposium (2006); Philadelphia, PA  
 12<sup>th</sup> International Congress of Biorheology (2005); Chongqing, P.R. China  
 Gordon Conference: Signal Transduction By Engineered ECMs (2004); Lewiston, ME  
 Pennsylvania Muscle Institute Symposium (2004); Philadelphia, PA

## RESEARCH FUNDING

### ACTIVE SUPPORT

#### **National Institutes of Health**

1R01AG045428

Engler (PI); Cammarato (co-PI)

7/2013-6/2018

\$1,744,883 TC

Title: *Mechanogenetics: An Integrated Approach to Aging in Muscle Dysfunction*

**National Science Foundation** 4/2015-3/2018  
 1463689 Engler (PI) \$400,000 TC  
 Title: *Strain-Activated Signaling within Cell Adhesions Dictates Cell Fate*

**National Science Foundation** 4/2016-3/2019  
 1559781 Engler (PI) \$326,497 TC  
 Title: *REU Site: Engineered Materials for Tissue Engineering and Drug Delivery*

**National Institutes of Health** 8/2016-7/2021  
 R01CA206880 Engler (PI); Yang (co-PI) \$1,805,706 TC  
 Title: *Biomaterial Mimicry of Dynamic Matrix Stiffening During Tumor Progression*

#### **PENDING SUPPORT**

**National Institutes of Health** 7/2017-6/2020  
 R21CA217735 Engler (PI) \$620,000 TC  
 Title: *Developing Adhesive Technology as a Physical Marker of Highly Metastatic Cells*

**Department of Defense/CDMRP** 7/2017-6/2020  
 BC161721 Engler (PI) \$581,250 TC  
 Title: *Exploring and Exploiting Stromal Adhesion as a Physical Marker of Highly Metastatic Cells*

**National Institutes of Health** 9/2017-8/2019  
 R21HL139209 Engler (PI) \$403,105 TC  
 Title: *Microvasculature-in-a-dish to probe the genetic risks of CAD*

**American Heart Association** 7/2017-6/2020  
 17CSA33610140 Engler (PI); Baldwin (co-PI) \$750,000 TC  
 Title: *Combining bioengineering with iPSC genome editing to probe the consequence of human genetic risk for CAD*

#### **COMPLETED SUPPORT**

**National Institutes of Health** 9/2011-8/2016  
 P30AR061303 Lieber (PI); Engler (co-Inv) \$3,352,905 TC  
 Title: *San Diego Skeletal Muscle Research Center*

**Department of Defense/CDMRP** 6/2013-5/2016  
 W81XWH-13-1-0133 Yang (PI); Engler (partnering PI) \$116,250 TC  
 Title: *Regulation of Breast Cancer Stem Cell by Tissue Rigidity*

**National Institutes of Health** 7/2010-6/2015  
 R01HL103566 Omens (PI); Engler (co-Inv) \$1,931,250 TC  
 Title: *Cardiomyocyte mechanotransduction through the integrin complex*

**Muscular Dystrophy Association** 8/2012-7/2015  
 241665 Engler (PI) \$390,000 TC  
 Title: *Mechanically programmed adipose-derived stem cells to treat muscular dystrophy*

<b>National Institutes of Health</b>		9/2009-8/2014
DP02OD006460	Engler (PI)	\$2,317,500 TC
Title: <i>“Smart” Materials to Engineer a More Complete Stem Cell Niche</i>		
<b>National Institutes of Health</b>		8/2012-7/2013
U54CA143803-03	Austin (PI); Engler (co-Inv)	\$77,500 TC
Title: <i>“Adhesive heterogeneity as an indicator of metastatic state”</i>		
<b>National Institutes of Health</b>		7/2011-6/2013
R21HL106529	Engler (PI)	\$396,675 TC
Title: <i>Stem Cells and Dynamic Materials Improve Cardiac Function Post-Myocardial Infarction</i>		
<b>Human Frontier Science Program</b>		5/2010-4/2013
RGY0064/2010	Engler (PI)	\$750,000 TC
Title: <i>Stem Cell Differentiation in 3D Nanostructured Environments</i>		
<b>National Institutes of Health</b>		5/2010-4/2012
R21EB011727	Engler (PI)	\$357,807 TC
Title: <i>Improving Endoderm Specification with Hybrid Materials and Growth Factors</i>		
<b>American Heart Association</b>		7/2008-6/2010
Beginning Grant-in-Aide: 0865150F	Engler (PI)	\$140,000 TC
Title: <i>From Physical to Molecular Mechanisms Governing Cardiomyocyte Function</i>		
<b>University of California, San Diego Academic Senate</b>		1/2009-12/2009
RI-324G-ENGLER	Engler (PI)	\$8,595 TC
Title: <i>Undergraduate Research in Stem Cell Bioengineering</i>		

## UNIVERSITY AND PROFESSIONAL SERVICE

### UNIVERSITY COMMITTEE SERVICE

- **University of California, San Diego, La Jolla, CA**  
Department of Bioengineering Undergraduate Studies Committee (2009-present); Medical Scientist Training Program Committee (MSTP; 2010-present; *admission chair*, 2014-present); Academic Internship Program Faculty Advisory Board (AIP; 2011-present); Sanford Consortium for Regenerative Medicine (SCRM) Space Committee (2012-present); Engineering Medical School Liaison Council (2013-present)

### TEACHING SERVICE

- **University of California, San Diego, La Jolla, CA**  
BENG 087: Freshman Seminar in Bioengineering (2012-2017); BENG 102: Molecular Components of Living Systems (2016); BENG 110: Continuum Biomechanics (2009); BENG 112B: Biomechanics II (2009 - 2017); BENG 140B: Physiology (2010); BENG 192: Senior Seminar in Bioengineering (2009); BENG 230B: Molecular and Cell Biology (2012 - 2017); BENG 241B: Tissue Engineering (2011, 2013, 2015, 2017); CMM 250: Stem Cell Biology (2009 – 2012; 2014-2016)
- **Princeton University, Princeton, NJ**  
Molecular Biology: Seminar in Stem Cell Biology (2007)

- **University of Pennsylvania**, Philadelphia, PA  
BE 200: Introduction to Biomechanics and Biomaterials (2004 - 2005), MEAM 247: Mechanics of Materials Laboratory (2003); MEAM 211: Dynamics (2002 - 2004)

### **JOURNAL SERVICE**

- Editorial Board Memberships: Public Library of Science One (*PLoS One*) (2012 – present), Physics and Chemistry of Stem Cells (2013 – present), Cells Tissues Organs (2013 – present)
- Ad hoc reviewer: Biophysical Journal (2007 – present), Journal of Biomechanics (2007 – present), Journal of Biological Chemistry (2009), Journal of Cell Science (2008 – present), Journal of Cell Biology (2009 – present), Molecular Biology of the Cell (2009 – present), Nature Materials (2009 – present), Proc Nat Acad Sci USA (2010 – present)

### **GRANT REVIEWER/STUDY SECTION SERVICE**

- Ad hoc reviewer: U.S. – Israel Binational Science Foundation (2008); Netherlands Organization for Scientific Research (2008 – 2009); New Jersey Commission on Cancer Research (2009 – 2010); Engineering and Physical Sciences Research Council (UK) (2009 – 2010); National Institutes of Health, Cardiovascular Sciences Study Section (2010), Cellular Aspects of Diabetes and Obesity Study Section (CADO; 2011), Early Independence Award Study Section (2012), Cardiac Contractility, Hypertrophy, and Failure Study Section (CCHF; 2016); National Science Foundation (2012 – present)
- Study section member: American Heart Association, Basic Cell-Regenerative Cell Biology 2 (RCB2) Study Section Member (2010 - 2016)

### **PROFESSIONAL SOCIETY SERVICE**

- Member, American Society of Cell Biology Project 50 (2007 – present)
- Speaker, California Institute of Regenerative Medicine Stem Cell Awareness Day, High Tech High; San Diego, CA (2009)
- Guest Editor, Special Issue on “Cell Mechanobiology,” Journal of Biomechanics (2010)
- Session Chair and Organizer, “New Materials to Regulate Stem Cells,” TERMIS 2<sup>nd</sup> World Congress (2009); “Controlling Microenvironment and Cell Fate,” TERMIS NA Meeting (2010)
- Program Committee Member, 5<sup>th</sup> Biennial American Society for Matrix Biology Meeting (2010)
- Session Chair and Organizer, “Bioengineering and Mechanobiology,” American Society for Cell Biology (2011)
- Guest Editor, Special Issue on “Mechanobiology,” Progress in Molecular Biology and Translational Science (2014)
- Council Member, American Society for Matrix Biology (2015-2018)
- Guest Editor, Special Issue on “Provisional Matrix,” Matrix Biology (2017)