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M. Shane Hutson

http://my.vanderbilt.edu/shanehutson/
Department of Physics & Astronomy, Vanderbilt University
VU Station B #401807, Nashville, TN 37240
(615) 343-9980 (office) or (615) 319-0027 (cell)
shane.hutson@vanderbilt.edu or m.shane.hutson@gmail.com

EDUCATION & TRAINING

Duke University — Postdoctoral Fellow, Biological Physics — 2000-2003
Mentors: Prof. Glenn Edwards (Physics) and Prof. Dan Kiehart (Biology)

University of Virginia — Ph.D., Biophysics — 2000
Dissertation: Time-resolved Fourier transform infrared spectroscopy of light-driven ion pumps.
Mentor: Prof. Mark Braiman (Chemistry)

Wake Forest University — M.S., Physics — 1993
Thesis: Two-dimensional motion of DNA bands during 120° pulsed-field gel electrophoresis.
Mentor: Prof. George Holzwarth (Physics)

Wake Forest University — B.A., Physics, Minor in Mathematics — 1992

ACADEMIC APPOINTMENTS & LEADERSHIP

Vanderbilt University

Chair, Department of Physics & Astronomy, 2017-
Co-Chair, University Faculty Development Committee, 2020-
Chair, University Laser Safety Committee, 2020-
Chair, Faculty Senate Committee on Strategic Planning and Academic Freedom, 2019-2020
Professor of Communication of Science and Technology, 2019-
Elected Senator, University Faculty Senate, 2017-2020
Professor of Physics, and of Biological Sciences, 2016-
Director, Program in Career Development, College of Arts & Science, 2015-2017
Deputy Director, Vanderbilt Institute for Integrative Biosystem Research & Education, 2013-
Associate Professor of Physics, and of Biological Sciences, 2010-2016
Elected Member, Faculty Council, College of Arts & Science 2009-2011 (Secretary, 2010-2011)
Assistant Professor of Biological Sciences, 2006-2009
Fellow, Vanderbilt Institute for Integrative Biosystem Research & Education, 2003-2013
Assistant Professor of Physics, 2003-2010

U.S. Environmental Protection Agency

ORISE Faculty Fellow, National Center for Computational Toxicology, 2012-2013

University of Waterloo, Ontario, Canada

Visiting Professor, 2007

HONORS & AWARDS

Society of Toxicology Bridging Award, 2013
Jeffrey Nordhaus Award for Excellence in Undergraduate Teaching, College of Arts & Science, Vanderbilt University, 2007
National Science Foundation Faculty Early Career Development (CAREER) Award, 2006
Coblentz Society Outstanding Student Award in Vibrational Spectroscopy, 2000
National Institutes of Health Biophysics Training Grant Fellow, 1996-1999
Dean's Fellowship, University of Virginia, 1995-1999
magna cum laude, Guy T. Carswell Scholar, William Poteat Scholar, National Merit Scholar, Wake Forest University, 1988-1992

RESEARCH

Works under Review

A.C. Stevens, J.T. O'Connor, A.D. Pumford, A. Page-McCaw, M.S. Hutson (2022) "A mathematical model of calcium signals around laser-induced epithelial wounds"

Refereed Journal Articles – Primary Research

1. J.T. O'Connor, E.K. Shannon, M.S. Hutson, A. Page-McCaw (2022) "Drosophila pupal case dissection for laser ablation and live imaging of the notum" *STAR Protocols* 3: 101396 https://doi.org/10.1016/j.xpro.2022.101396.

2. J.T. O'Connor, F.B. Akbar, M.S. Hutson, A. Page-McCaw (2021) "Zones of Cellular Damage Around Pulsed-Laser Wounds" *PLoS One* 16(9): e0253032 https://doi.org/10.1371/journal.pone.0253032.

3. J.T. O'Connor, A.C. Stevens, E.K. Shannon, F.B. Akbar, K.S. LaFever, N. Narayanan. M.S. Hutson and A. Page-McCaw (2021) "Proteolytic activation of Growth-blocking peptides triggers calcium responses through the GPCR Mthl10 during epithelial wound detection" *Developmental Cell* 56: 2160-2175, https://doi.org/10.1016/j.devcel.2021.06.020.
   Featured in *VU Research News* (https://news.vanderbilt.edu/2021/07/27/research-snapshot-novel-discovery-describes-the-mechanisms-of-wound-detection-in-the-body/)

4. W.T. McCleery, J. Veldhuis, M.E. Bennett, H.E. Lynch, X. Ma, G.W. Brodland and M.S. Hutson (2019) "Elongated cells drive morphogenesis in a surface-wrapped finite element model of germband retraction" *Biophysical Journal* 117: 157-169, https://doi.org/10.1016/j.bpj.2019.05.023.
   Featured in *VU Research News* (https://news.vanderbilt.edu/2019/06/19/computer-model-illuminates-critical-moment-in-drosophila-development/)

5. A. Auner, K.M. Tasneem, D.A. Markov, L.J. McCawley and M.S. Hutson (2019) "Chemical-PDMS Binding Kinetics and Implications for Bioavailability in Microfluidic Devices" *Lab on a Chip*, 19: 864-874, https://dx.doi.org/10.1039/C8LC00796A.

6. E.K Shannon, A. Stevens, W. Edrington, Y. Zhao, A.K Jayasinghe, A. Page-McCaw, M.S. Hutson (2017) "Multiple Mechanisms Drive Calcium Signal Dynamics around Laser-Induced Epithelial Wounds" *Biophysical Journal* 113 (7): 1623-1635, https://dx.doi.org/10.1016/j.bpj.2017.07.022.
   Featured in *VUMC Reporter* (https://news.vumc.org/2017/10/03/cell-signals-that-trigger-wound-healing-are-surprisingly-complex/)

7. R.G. Abramson, N. Lakomkin, A. Hainline, H. Kang, M.S. Hutson, C.L. Arteaga (2017) "The Attenuation Distribution Across the Long Axis of Breast Cancer Liver Metastases at CT: A Quantitative Biomarker

for Predicting Overall Survival" *American Journal of Roentgenology* 210: W1-W7, https://dx.doi.org/10.2214/AJR.17.18249.

8. M.S. Hutson, M.C.K. Leung, N.C. Baker, R.M. Spencer and T.B. Knudsen (2017) "Computational model of secondary palate fusion and disruption" *Chemical Research in Toxicology* 30(4): 965-979, https://dx.doi.org/10.1021/acs.chemrestox.6b00350.
9. M.C.K. Leung, M.S. Hutson, A.W. Seifert, R.M. Spencer and T.B. Knudsen (2016) "Computational modeling and simulation of genital tubercle development" *Reproductive Toxicology* 64:151-61, http://dx.doi.org/10.1016/j.reprotox.2016.05.005.
10. N. Lakomkin, H. Kang, B. Landman, M.S. Hutson, R.G. Abramson (2016) "The attenuation distribution across the long axis (ADLA): Preliminary findings for assessing response to cancer treatment" *Academic Radiology* 23(6): 718-723, http://dx.doi.org/10.1016/j.acra.2016.02.007.
11. J. Kozub, J.-H. Shen, K.M. Joos, R. Prasad and M.S. Hutson (2016) "Optic nerve sheath fenestration using a Raman-shifted alexandrite laser" *Lasers in Surgery and Medicine* 48: 270-280, http://dx.doi.org/10.1002/lsm.22456.
12. S.M. Crews, W.T. McCleery and M.S. Hutson (2015) "Pathway to a Phenocopy: Heat Stress Effects in Early Embryogenesis" *Developmental Dynamics* 245: 402-413 https://doi.org/10.1002/dvdy.24360.
13. J. Kozub, J.-H. Shen, K.M. Joos, R. Prasad and M.S. Hutson (2015) "Efficacy and predictability of soft tissue ablation using a prototype Raman-shifted alexandrite laser" *Journal of Biomedical Optics* 20(10): 105004 (Oct 12, 2015; 10 pp), https://doi.org/10.1117/1.JBO.20.10.105004.
14. G. Kavanaugh, R. Zhao, Y. Guo, K.N. Mohni, G. Glick, M.E. Lacy, M.S. Hutson, M. Ascano and D. Cortez (2015) "Enhancer of Rudimentary Homolog affects the replication stress response through regulation of RNA processing" *Molecular and Cellular Biology* 35(17): 2979-2990, https://doi.org/10.1128/MCB.01276-14.
15. G.W. Brodland, J.H. Veldhuis, S. Kim, M. Perrone, D. Mashburn and M.S. Hutson (2014) "CellFIT: a cellular force-inference toolkit using curvilinear cell boundaries" *PLoS ONE* 9: e99116 (15pp), https://doi.org/10.1371/journal.pone.0099116.
16. H.E. Lynch, J. Veldhuis, G.W. Brodland and M.S. Hutson (2014) "Modeling cell elongation during germ band retraction: cell autonomy versus applied anisotropic stress" *New Journal of Physics* 16: 055003 (18pp), https://doi.org/10.1088/1367-2630/16/5/055003.
17. Y. Yan, L. Jiang, K.J. Aufderheide, G.A. Wright, A. Terekhov, L. Costa, K. Qin, W.T. McCleery, J.J. Fellenstein, A. Ustione, J.B. Robertson, C.H. Johnson, D.W. Piston, M.S. Hutson, J.P. Wikswo, W. Hofmeister and C. Janetopoulos (2014) "A microfluidic-enabled mechanical microcompressor for the immobilization of live single- and multi-cellular specimens" *Microscopy and Microanalysis* 20(1): 141-151, https://doi.org/10.1017/S1431927613014037.
18. H.E. Lynch, S.M. Crews, B. Rosenthal, E. Kim, R. Gish, K. Echiverri and M.S. Hutson (2013) "Cellular mechanics of germ band retraction in Drosophila" *Developmental Biology* 384: 205-213, https://doi.org/10.1016/j.ydbio.2013.10.005.
19. A.K. Jayasinghe, S.M. Crews, D.N. Mashburn and M.S. Hutson (2013) "Apical oscillations in amnioserosa cells: basolateral coupling and mechanical autonomy" *Biophysical Journal* 105: 255-265, https://doi.org/10.1016/j.bpj.2013.05.027.

20. D.N. Mashburn, H.E. Lynch, X. Ma, M.S. Hutson (2012) "Enabling user-guided segmentation and tracking of surface-labeled cells in time-lapse image sets of living tissues" *Cytometry A* 81A(5): 409-418, https://doi.org/10.1002/cyto.a.22034.

21. M.A. Mackanos, D.M. Simanovskii, K.E. Schriver, M.S. Hutson, C.H. Contag, J.A. Kozub, E.D. Jansen (2012) "Pulse Duration Dependent Mid-Infrared Laser Ablation for Biological Applications" *IEEE Journal of Selected Topics in Quantum Electronics* 18(4): 1514-1522, https://doi.org/10.1109/JSTQE.2012.2188501.

22. D. Azevedo, M. Antunes, S. Prag, X. Ma, U. Hacker, G.W. Brodland, M.S. Hutson, J. Solon, A. Jacinto (2011) "DRhoGEF2 Regulates Cellular Tension and Cell Pulsations in the Amnioserosa during Drosophila Dorsal Closure" *PLoS ONE* 6(9): e23964 (11pp), https://doi.org/10.1371/journal.pone.0023964.

23. A. Jayasinghe, J. Rohner, M.S. Hutson (2011) "Holographic UV laser microsurgery" *Biomedical Optics Express* 2(9): 2590-2599, https://doi.org/10.1364/BOE.2.002590. (Online journal cover is a movie from this paper, https://www.osapublishing.org/boe/issue.cfm?volume=2&issue=9).

24. J. Kozub, B. Ivanov, A. Jayasinghe, R. Prasad, J. Shen, M. Klosner, D. Heller, M. Mendenhall, D.W. Piston, K. Joos, M.S. Hutson (2011) "Raman-shifted alexandrite laser for soft tissue ablation in the 6- to 7-μm wavelength range" *Biomedical Optics Express* 2(5): 1275-1281, https://doi.org/10.1364/BOE.2.001275.

25. G.W. Brodland, V. Conte, P.G. Cranston, J. Veldhuis, S. Narasimhan, M.S. Hutson, A. Jacinto, F. Ulrich, B. Baum, M. Miodownik (2010) "Video force microscopy reveals the mechanics of ventral furrow invagination in Drosophila" *Proceedings of the National Academy of Sciences USA* 107(51): 22111-22116, https://doi.org/10.1073/pnas.1006591107.

26. M.S. Hutson, J. Veldhuis, X. Ma, H.E. Lynch, P.G. Cranston, G.W. Brodland (2009) "Combining laser microsurgery and finite element modeling to assess cell-level epithelial mechanics" *Biophysical Journal* 97: 3075-3085 (+4 pp online supplement), https://doi.org/10.1016/j.bpj.2009.09.034.

27. M.S. Hutson, B. Ivanov, A. Jayasinghe, G. Adunas, Y. Xiao, M. Guo, J. Kozub (2009) "Interplay of wavelength, fluence and spot-size in free-electron laser ablation of cornea" *Optics Express* 17: 9840-9850, https://doi.org/10.1364/OE.17.009840.

28. X. Ma, H.E. Lynch, P.C. Scully, M.S. Hutson (2009) "Probing embryonic tissue mechanics with laser hole drilling" *Physical Biology* 6: 036004 (12pp + 2pp online supplement), https://doi.org/10.1088/1478-3975/6/3/036004.

29. M.S. Hutson, G.W. Brodland, J. Yang, and D. Viens (2008) "Cell Sorting in Three Dimensions: Topology, Fluctuations, and Fluidlike Instabilities" *Physical Review Letters* 101: 148105 (4pp + 3pp online supplement), https://doi.org/10.1103/PhysRevLett.101.148105.
    Featured in *Vanderbilt Explorations*

30. Y. Xiao, M. Guo, P. Zhang, G. Shanmugam, P. L. Polavarapu and M. S. Hutson (2008) "Wavelength-Dependent Conformational Changes in Collagen after Mid-Infrared Laser Ablation of Cornea" *Biophysical Journal* 94(4): 1359-1366, https://doi.org/10.1529/biophysj.107.114389.

31. M. S. Hutson and X. Ma (2007) "Plasma and Cavitation Dynamics during Pulsed Laser Microsurgery *in vivo*", *Physical Review Letters* 99(15): 158104 (4pp), https://doi.org/10.1103/PhysRevLett.99.158104.
    Featured news item in *Laser Focus World* (Nov 2007) and *Biophotonics* (Dec 2007).

32. G.S. Edwards, R.D. Pearlstein, M.L. Copeland, M.S. Hutson, K. Latone, A. Spiro and G. Pasmanik (2007) "6450 nm wavelength tissue ablation using a nanosecond laser based on difference frequency

mixing and stimulated Raman scattering" *Optics Letters* 32(11): 1426-1428, https://doi.org/10.1364/OL.32.001426.

33. X.G. Peralta, Y. Toyama, Y. Tokutake, M.S. Hutson, S. Venakides, D.P. Kiehart, and G.S. Edwards (2007) "Upregulation of Forces and Morphogenic Asymmetries in Dorsal Closure during *Drosophila* Development", *Biophysical Journal* 92: 2583-2596 (+ 3pp online supplement), https://doi.org/10.1529/biophysj.106.094110.
34. Y. Xiao, M. Guo, K. Parker and M.S. Hutson (2006) "Wavelength-Dependent Collagen Fragmentation during Mid-IR Laser Ablation", *Biophysical Journal* 91: 1424-1432, https://doi.org/10.1529/biophysj.106.084616.
35. Y. Xiao, M.S. Hutson, M. Belenky, J. Herzfeld, M.S. Braiman (2004) "Role of Arginine-82 in Fast Proton Release during the Bacteriorhodopsin Photocycle: A Time-Resolved FT-IR Study of Purple Membranes Containing ^{15}N-Labeled Arginine", *Biochemistry* 43: 12809-12818, https://doi.org/10.1021/bi049238g.
36. M.S. Hutson, Y. Tokutake, M.-S. Chang, J.W. Bloor, S. Venakides, D.P. Kiehart, G.S. Edwards (2003) "Forces for Morphogenesis Investigated with Laser Microsurgery and Quantitative Modeling" *Science* 300: 145-149 (+ 19pp online supplement), https://doi.org/10.1126/science.1079552.
37. G.S. Edwards and M.S. Hutson (2003) "Advantage of the Mark-III FEL for biophysical research and biomedical applications" *Journal of Synchrotron Radiation* 10: 354-357, https://doi.org/10.1107/S0909049503007970.
38. M.S. Hutson, S.A. Hauger and G. Edwards (2002) "Thermal diffusion and chemical kinetics in laminar biomaterial due to heating by a free-electron laser" *Physical Review E* 65: 061906 (6pp), https://doi.org/10.1103/PhysRevE.65.061906.
39. M.S. Hutson, R.A. Palmer, M.-S. Chang, A. Gillikin, V. Litvinenko and G. Edwards (2002) "Commissioning of a UV/time-resolved-FTIR beamline at the Duke FEL laboratory" *Nuclear Instruments and Methods in Physics Research A* 483: 560-564, https://doi.org/10.1016/S0168-9002%2802%2900382-0.
40. G.D. Smith, M.S. Hutson, Y. Lu, M.T. Tierney, M.W. Grinstaff and R.A. Palmer (2001) "Step-Scan FT-IR Time-Resolved Spectroscopy in the Solid State" *Applied Spectroscopy* 55: 637-642, https://doi.org/10.1366/0003702011952262.
41. M.S. Hutson, S.V. Shilov, R. Krebs and M.S. Braiman (2001) "Halide Dependence of the Halorhodopsin Photocycle as Measured by Time-Resolved Infrared Spectra" *Biophysical Journal* 80: 1452-1465, https://doi.org/10.1016/S0006-3495%2801%2976117-6.
42. M.S. Hutson, U. Alexiev, S.V. Shilov, K.J. Wise and M.S. Braiman (2000) "Evidence for a Perturbation of Arginine-82 in the Bacteriorhodopsin Photocycle from Time-Resolved Infrared Spectra" *Biochemistry* 39: 13189-13200, https://doi.org/10.1021/bi000426q.
43. M.S. Hutson and M.S. Braiman (1999) "Application of doubled-angle phase correction method to time-resolved step-scan FT-IR spectra" *Vibrational Spectroscopy* 19: 381-385, https://doi.org/10.1016/S0924-2031%2898%2900090-3.
44. M.S. Hutson and M.S. Braiman (1998) "Direct Phase Correction of Differential FT-IR Spectra" *Applied Spectroscopy* 52: 974-984, https://www.osapublishing.org/as/abstract.cfm?uri=as-52-7-974.

45. M.S. Hutson, G. Holzwarth, T. Duke and J. Viovy (1995) "Two-Dimensional Motion of DNA Bands During 120° Pulsed-Field Gel Electrophoresis. I. Effect of Molecular Weight." *Biopolymers* 35: 297-306, https://doi.org/10.1002/bip.360350305.

46. L.M. Neitzey, M.S. Hutson and G. Holzwarth (1993) "Two-dimensional motion of DNA bands during 120° pulsed-field gel electrophoresis." *Electrophoresis* 14: 296-303, https://doi.org/10.1002/elps.1150140152.

Refereed Journal Articles – Reviews

47. M.S. Hutson, P.G. Alexander, V. Allwardt, D.M. Aronoff, K.L. Bruner-Tran, D.E. Cliffel, J.M. Davidson, A. Gough, D.A. Markov, L.J. McCawley, J.R. McKenzie, J.A. McLean, K.G. Osteen, V. Pensabene, P.C. Samson, N.K. Senutovitch, S.D. Sherrod, M.S. Shotwell, D.L. Taylor, L.M. Tetz, R.S. Tuan, L.A. Vernetti and J.P. Wikswo (2016) "Organs-on-Chips as Bridges for Predictive Toxicology" *Applied In Vitro Toxicology* 2(2): 97-102, https://doi.org/10.1089/aivt.2016.0003.

48. M.E. Lacy and M.S. Hutson (2016) "Amnioserosa development and function in Drosophila embryogenesis: critical mechanical roles for an extraembryonic tissue" *Developmental Dynamics* 245(5): 558-568, https://doi.org/10.1002/dvdy.24395.

49. M.S. Hutson and X. Ma (2008) "Mechanical aspects of developmental biology: perspectives *On Growth and Form* in the (post)-genomic age" *Physical Biology* 5(1): 015001 (8pp), https://doi.org/10.1088/1478-3975/5/1/015001.

50. G.S. Edwards, R.H. Austin, F.E. Carroll, M.L. Copeland, M.E. Couprie, W.E. Gabella, R.F. Haglund, B.A. Hooper, M.S. Hutson, E.D. Jansen, K.M. Joos, D.P. Kiehart, I. Lindau, J. Miao, H.S. Pratisto, J.H. Shen, Y. Tokutake, A.F.G. van der Meer, A. Xie (2003) "Free-electron-laser-based biophysical and biomedical instrumentation", *Review of Scientific Instruments* 74: 3207-3245, https://doi.org/10.1063/1.1584078.

Book Chapters

51. J.H. Veldhuis, D. Mashburn, M.S. Hutson, G.W. Brodland "Practical Aspects of the Cellular Force Inference Toolkit (CellFIT)", in *Methods in Cell Biology Volume 125: Biophysical Methods in Cell Biology*, edited by E. Paluch, Chapter 18, pp. 331-351 (Elsevier, 2015), https://doi.org/10.1016/bs.mcb.2014.10.010.

52. D.P. Kiehart, Y. Tokutake, M.-S. Chang, M.S. Hutson, J. Wiemann, X.G. Peralta, Y. Toyama, A.R. Wells, A. Rodriguez, and G.S. Edwards "Ultraviolet Laser Microbeam for Dissection of *Drosophila* Embryos", in *Cell Biology: A Laboratory Handbook*, 3rd Edition, edited by J.E. Celis, Chapter 9, pp. 87-103, (Elsevier, 2006), https://doi.org/10.1016/B978-012164730-8/50137-4.

Published Conference Proceedings (Refereed)

53. M.S. Hutson and G.S. Edwards (2004) "Advances in the Physical Understanding of Laser Surgery at 6.45 Microns", *Proceedings of the 26th International Free Electron Laser Conference and 11th FEL Users Workshop:* FRAIS01. Published in *JACoW* (6pp), http://accelconf.web.cern.ch/AccelConf/f04/papers/FRAIS01/FRAIS01.PDF.

Published Conference Proceedings (Non-refereed)

54. M.S. Hutson, G.W. Brodland, X. Ma, H.E. Lynch, A.K. Jayasinghe, J. Veldhuis, “Measuring and Modeling Morphogenetic Stress in Developing Embryos” in *Mechanics of Biological Systems and Materials (Conference Proceedings of the Society for Experimental Mechanics)* Vol. 4, pp. 107-115 (Lombard, IL, 2013), https://doi.org/10.1007/978-3-319-00777-9_15.
55. M.S. Hutson, Y. Xiao and M. Guo, "Protein structural failure in mid-IR laser ablation of cornea" *High Power Laser Ablation VI, SPIE* 6261: 62612N – 10 pages (Taos, NM, May 2006), https://doi.org/10.1117/12.669004.
56. G.S. Edwards, M.S. Hutson and S. Hauger, "Heat diffusion and chemical kinetics in Mark-III FEL tissue ablation" *Commercial & Biomedical Applications of Ultrafast and Free Electron Lasers, SPIE* 4633: 184-193 (San Jose, CA, 2002), https://doi.org/10.1117/12.461378.
57. G. Edwards, M.S. Hutson, S. Hauger, J. Kozub, J. Shen, C. Shieh, K. Topadze and K. Joos, "Comparison of OPA and Mark-III FEL for tissue ablation at 6.45 microns" *Commercial & Biomedical Applications of Ultrafast and Free Electron Lasers, SPIE* 4633: 194-201 (San Jose, CA, 2002), https://doi.org/10.1117/12.461379.
58. M.S. Hutson, R.A. Palmer, A. Gillikin, M.-S. Chang, V.N. Litvinenko and G.S. Edwards, "UV/time-resolved FTIR beamline at the Duke FEL Laboratory" *Commercial & Biomedical Applications of Ultrafast and Free Electron Lasers, SPIE* 4633: 225-232 (San Jose, CA, 2002), https://doi.org/10.1117/12.461383.
59. M. Emamian, G. Swift and M.S. Hutson “Optical beam line design for the Duke Free Electron Laser Laboratory” *Proceedings of the 2001 Particle Accelerator Conference* 4: 2524-2526 (Chicago, 2001), https://accelconf.web.cern.ch/accelconf/p01/PAPERS/WPPH036.PDF.
60. G. Edwards, C. Fowler, S. Hutson, V. Litvinenko, R.A. Palmer and B. Roberts "Light source capabilities and applications research at the Duke FEL Laboratory" *Biomedical Applications of Free Electron Lasers, SPIE* 3925: 106-115 (San Jose, CA, 2000), https://doi.org/10.1117/12.384258

Editorials / News & Views

61. M.S. Hutson (2018) “Cellular Diversity Heals” *Nature Physics* 14: 639-641, https://doi.org/10.1038/s41567-018-0192-y.
62. M.S. Hutson (2008) “Physical Aspects of Developmental Biology: 21st Century Perspectives *On Growth and Form*” *Physical Biology* 5(1): preface (1p), https://doi.org/10.1088/1478-3975/5/1/E01.

Patents

63. K. Joos, J.-H. Shen, M.S. Hutson and J. Kozub, “Apparatus and Method for Real-Time Imaging and Monitoring of an Electrosurgical Procedure,” U.S. Patent No. 8,655,431 (Feb 2014) based on U.S. Provisional Patent Application 13/149,502 (May 2011), https://www.google.com/patents/US8655431.

64. M.S. Hutson and G.S. Edwards, "Method and Apparatus for Infrared Tissue Ablation", U.S. Patent No. 8,074,661 (Dec 2011) based on U.S. Provisional Patent Application #60/384,877 (May 2002), https://www.google.com/patents/US8074661.

Research Grants Received

1. "Cell fusion and the role of syncytia in the response to epithelial damage"
   National Institutes of Health NIGMS 2R01GM130130
   Principal Investigators: Andrea Page-McCaw and M. Shane Hutson
   Total Costs: $1,328,792; Period of Award: 9/1/2022 – 5/31/2026

2. "Measuring Toxicokinetics for Organ-on-Chip Devices"
   U.S. Environmental Protection Agency 84003101
   Principal Investigator: M. Shane Hutson
   Co-PIs: Lisa McCawley, Dmitry Markov
   Total Costs: $790,352; Period of Award: 8/1/2020 – 7/30/2023

3. "Cellular Integration of Information in the Detection and Response to Epithelial Damage"
   National Institutes of Health NIGMS 1R01GM130130
   Principal Investigators: Andrea Page-McCaw and M. Shane Hutson
   Total Costs: $1,298,297; Period of Award: 8/15/2018 – 4/30/2023
   Equipment Supplement: $215,001

4. "Biomedical Microscopy – Immersion, Innovation and Discovery (BioMIID)"
   Vanderbilt University Trans-Institutional Program VRA Grant
   Principal Investigator: Anita Mahadevan-Jansen
   Co-PIs: Matt Tyska, M. Shane Hutson
   Co-Is: Duco Jansen, Richard Simerly, Carl Johnson, Dylan Burnett, Lauren Buchanan, Matt Lang
   Total Costs: $4,000,000; Period of Award: 7/1/2017 - 6/30/2022

5. "Collaborative Research: AGEP Transformation Alliance: Bridging the PhD to Postdoc to Faculty Transitions for Women of Color in STEM"
   National Science Foundation, Division of Human Resource Development HRD-1647196
   Principle Investigator: Keivan Stassun, Vanderbilt University
   Co-PIs: Richard Pitt, M. Shane Hutson, Clare McCabe, William Robinson
   Total Costs: $1,049,859; Period of Award: 10/1/2016 – 9/30/2021

6. "FlpOn: an optogenetic circuit for user-designed mosaics and its application to wound healing"
   National Institutes of Health 1R21AR068933-01
   Principal Investigator: Andrea Page-McCaw, Vanderbilt University
   Co-Investigator: M. Shane Hutson
   Total Costs: $368,589; Period of Award: 5/1/2015 – 4/30/2017

7. "Vanderbilt-Pittsburgh Resource for Organotypic Models for Predictive Toxicology (VPROMPT)"
   U.S. Environmental Protection Agency STAR Center R835736
   Project Director: M. Shane Hutson
   Co-PIs: Lisa McCawley, Kevin Osteen, Rocky Tuan, Lansing Taylor, John Wikswo

Total Costs: $6,000,000 ($3,761,827 for Vanderbilt; $2,238,173 passed through to U. Pittsburgh)
Period of Award: 12/1/2014-11/30/2018

8. "Optogenetic and Pharmacological Investigations of Epithelial Wound Detection"
Vanderbilt University Discovery Grant
Principal Investigators: M. Shane Hutson and Andrea Page-McCaw
Total Costs: $100,000; Period of Award: 5/11/2012 – 6/30/2015

9. "Cellular Biomechanics of Heat-Shock Induced Defects in *Drosophila* Embryogenesis"
National Institutes of Health 1R01GM099107-01
Principal Investigators: M. Shane Hutson and G. Wayne Brodland
Total Costs: $1,146,304 ($817,353 for Vanderbilt; $328,951 passed through to U. Waterloo)
Period of Award: 7/1/2011 – 4/30/2016

10. "A Clinically Practical Laser System for Neurosurgery"
National Institutes of Health Phase II SBIR (Small Business Innovation Research)
Principal Investigator: Donald Heller, Light Age, Inc.
Co-Lead Investigators for Research Institution Partner: M. Shane Hutson and Karen Joos
Total Costs: $750,000 ($200,000 subcontract for Vanderbilt); Period of Award: 7/15/2010 – 7/14/2013

11. "Dual-Functionality Laser System For High-Contrast Diagnostic Imaging And Precision Surgery"
Department of Defense Phase II STTR Program (Small business Technology TRansfer)
Principal Investigator: Marc Klosner, Light Age, Inc.
Lead Investigator for Research Institution Partner: M. Shane Hutson
Total Costs: $850,000 ($225,000 subcontract for Vanderbilt); Period of Award: 9/8/2009 – 9/7/2012

12. "Spinning Disk Confocal Microscope System with Photobleaching, Photoactivation, and Photoablation"
National Institutes of Health Major Research Instrumentation
Principle Investigators: Chris Janetopoulos and Donna Webb, Vanderbilt University
Major Users: Kevin Ess, M. Shane Hutson, Irina Kaverina, Ann Kenworthy, Ryoma Ohi, Matthew Tyska
Total Costs: $500,000; Period of Award: 4/1/2009 – 3/31/2010

13. "Integrating the genetics, mechanics and phenomenology of embryonic wound healing"
Human Frontier Science Program
Principal Applicant: M. Shane Hutson; Co-applicants: Antonio Jacinto, Institute of Molecular Medicine, Lisbon, Portugal; and G. Wayne Brodland, University of Waterloo, Waterloo, Ontario, Canada
Total Costs: $1,050,000 ($350,000 to Vanderbilt); Period of Award: 7/1/2007 – 6/30/2010

14. "CAREER - Forces Underlying Germ Band Retraction in Drosophila Embryogenesis"
National Science Foundation
Principal Investigator: M. Shane Hutson
Total Costs: $832,833; Period of Award: 2/1/2006 – 1/31/2012

15. "Vanderbilt Free-Electron Laser Center for Research in Surgery, Medicine, Photobiology and Materials Science: Supplemental Applications: Anomalous Wavelength Dependence."
Department of Defense Medical Free Electron Laser Program
Program Director and Principal Investigator: David Piston, Vanderbilt University
Co-Principal Investigator: M. Shane Hutson
Total Costs: $168,326; Period of Award: 6/1/2004 – 1/31/2006
Total Costs: $142,244; Period of Award: 7/1/2006 – 1/31/2007

Invited Talks – International Conferences

1. *Jamming in Biological Systems: Dense packing in Protein Cores, Crowding in the Bacterial Cytoplasm, and Jamming of Cells in Tissues and Tumors*, Kavli Institute for Theoretical Sciences and Institute of Physics, Chinese Academy of Sciences, Beijing, China, August 2018, "Planar cell polarity and cell packing in morphologically active epithelia"
2. *QuanTissue Meeting on the Physics of Biological Systems: Visualization and Manipulation of Cellular Communities*, Helmholtz Zentrum münchen (German Research Center for Environmental Health), Munich, Germany, October 10, 2014, "Cellular mechanics in early embryogenesis: a mechanical assist from an extra-embryonic tissue"
3. *7th World Congress of Biomechanics* (a quadrennial event), Symposium on Mechanics of Tissue and Organ Development, Boston, MA, July 8, 2014. "Measuring morphogenetic stresses and dynamic mechanical properties in live embryos"
4. *Tissue Growth and Morphogenesis: from Genetics to Mechanics and Back*, Banff International Research Station for Mathematical Innovation and Discovery (BIRS), Banff, Alberta, Canada, July 26, 2012, "Probing oscillatory cell shape changes using holographic laser microsurgery"
5. *Human Frontier Science Program Awardees Meeting*, Kovalam, Kerala, India, November 3, 2010 "Cell-shape changes, forces and genes: Integrating the genetics, mechanics and phenomenology of embryonic wound healing"
6. Université de Nice-Sophia Antipolis, Nice, France, *Conference on Modeling and Biomechanics of Morphogenesis and Tissue Repair*, May 25, 2010 "Deconstructing epithelial morphogenesis using laser-microsurgery"
7. *26th International Free Electron Laser Conference and 11th FEL User's Workshop,* Trieste, Italy, August 2004. "Advances in the Physical Understanding of Laser Surgery at 6.45 microns"

Invited Talks – Major National Conferences & Symposia

8. *March Meeting of the American Physical Society*, Invited talk for a Division of Biological Physics Focus Session on Morphogenesis, Virtual, March 18, 2021 "Patterned morphogenesis of epithelial wound detection and healing"
9. *Society of Mathematical Biology Annual Meeting (eSMB2020)*, Virtual, August 19, 2020, "Something's wrong in the (cellular) neighborhood: Mechanisms of wound detection in epithelia"
10. *Society of Toxicology Annual Meeting, EPA STAR Center Kickoff Session,* San Diego, CA, March 25, 2015, "VPROMPT: Vanderbilt-Pittsburgh Resource for Organotypic Models for Predictive Toxicology"
11. *March Meeting of the American Physical Society*, Invited Session on Mechanical Interactions and Pattern Formation in Multicellular Systems, San Antonio, TX, March 6, 2015, "Cell mechanics and non-genetic developmental defects"
12. *Photonics West, Optical Methods in Developmental Biology III*, San Francisco, CA, February 7, 2015, "Reverse engineering morphogenesis in embryonic epithelia: time-lapse confocal microscopy, laser microsurgery, and force inference from cell shape"
13. *Annual Drosophila Research Conference, Workshop on Developmental Mechanics*, San Diego, CA, March 28, 2014, "Cellular mechanics of germband retraction"
14. *Society for Experimental Mechanics Annual Conference & Exposition on Experimental and Applied Mechanics*, Lombard, IL, June 5, 2013, "Measuring and Modeling Residual Morphogenetic Stress in Developing Embryos"
15. *Frontiers Symposium on the Mechanics of Development*, Farmington, PA, June 21, 2011 "Measuring the sub-cellular mechanics that drive tissue-level morphogenesis"

16. *March Meeting of the American Physical Society*, Invited talk for a Division of Biological Physics Focus Session on "Self-organization in Tissues", Portland, OR, March 17, 2010 "Epithelial self-organization in fruit fly embryogenesis"
17. *Joint Annual Conference of the National Society of Black Physicists and the National Society of Hispanic Physicists*, Nashville, TN, February 12, 2009 "Probing the mechanics of morphogenesis with laser hole-drilling"

Invited Departmental Colloquia & Program-Wide Seminars

18. Vanderbilt University, Nashville, TN, Center on Mechanobiology Retreat, August 15, 2022, "Something's wrong in the (cellular) neighborhood: Mechanisms of epithelial wound detection"
19. Vanderbilt University, Nashville, TN, Quantitative Systems Biology Center Seminar, October 6, 2021, "Something's wrong in the (cellular) neighborhood: Mechanisms of epithelial wound detection"
20. University of British Columbia, Vancouver, Canada, Math-Bio Seminar (Virtual), July 15, 2020, "Something's wrong in the (cellular) neighborhood: Mechanisms of epithelial wound detection"
21. University of Notre Dame, South Bend, IN, Bioengineering Seminar, March 29, 2018, "Visualizing Fast Ca^{2+} Dynamics around Microsurgical Wounds"
22. Vanderbilt University, Nashville, TN, VU Institute of Imaging Science Seminar, November 3, 2017 "Visualizing Fast Ca^{2+} Dynamics around Microsurgical Wounds"
23. Emory University, Atlanta, GA, Physics Seminar, December 6, 2016 "Measuring and modeling the mechanics of morphogenesis"
24. Ohio State University, Columbus, OH, Biophysics Seminar, November 18, 2016 "Measuring and modeling the mechanics of morphogenesis"
25. Sewanee – The University of the South, Sewanee, TN, Physics Seminar, October 19, 2016 "Of physicists and fruit flies, cellular mechanics and morphogenesis"
26. Vanderbilt University, Nashville, TN, Molecular Biophysics Training Program / Center for Structural Biology Seminar, December 2, 2014 "From non-specific environmental stresses to adverse developmental outcomes: the role of cellular mechanics"
27. Vanderbilt University, Nashville, TN, Biophotonics Seminar, September 30, 2014 "Imaging, Image Analysis and Optical Manipulation of Cellular Mechanics in Early Embryogenesis"
28. Kennesaw State University, Kennesaw, GA, Molecular Biology Seminar, February 1, 2013, "Tissue fusion events during embryogenesis: microsurgery, mechanics and modeling"
29. Yeshiva University, New York, NY, Physics Colloquium, May 1, 2012, "Putting models of morphogenesis to the test using laser-microsurgery"
30. Instituto Gulbenkian de Ciência, Lisbon, Portugal, January 13, 2012, "Dissecting cellular biomechanics in Drosophila embryogenesis"
31. Vanderbilt University, Nashville, TN, Molecular Biophysics Training Program / Center for Structural Biology Seminar, May 3, 2011 "Measuring the cell-level mechanics that drive tissue-level morphogenesis"
32. Instituto Gulbenkian de Ciência, Lisbon, Portugal, December 1, 2009 "Mechanics of Morphogenesis"
33. Vanderbilt University, Nashville, TN, Biomedical Engineering Seminar, November 17, 2009 "How does a fly make itself? Dissecting morphogenesis with laser microsurgery"
34. University of Michigan, Ann Arbor, MI, Biological Physics/Complex Systems Seminar, October 5, 2009 "How does a fly make itself? Dissecting morphogenesis with laser microsurgery"
35. Vanderbilt University, Nashville, TN, Physics & Astronomy Colloquium, September 17, 2009 "How does a fly make itself? Dissecting morphogenesis with laser microsurgery"

36. St Vincent College, Latrobe, PA, Physics Colloquium, March 19, 2009 "Dissecting the mechanics of developmental biology with laser microsurgery"
37. Vanderbilt University, Nashville, TN, Cell and Developmental Biology Seminar, February 23, 2009 "Probing epithelial mechanics with laser microsurgery"
38. Wake Forest University, Winston-Salem, NC, Physics Colloquium (I) and Annual Alumni Colloquium (II), November 6-7, 2008 "How does a fly make itself? I. Dissecting morphogenesis with laser-microsurgery. II. Modeling cell-level mechanics."
39. Ohio University, Athens, OH, Physics & Astronomy Colloquium, September 26, 2008 "How does a fly make itself? Dissecting morphogenesis with laser-microsurgery"
40. Institute of Molecular Medicine, Lisbon, Portugal, Developmental Biology Seminar, July 4, 2008 "How does a fly make itself? The mechanics of morphogenesis"
41. Ohio State University, Columbus, OH, Biophysics Seminar, March 5 2008 "How does a fly make itself? Dissecting morphogenesis with laser-microsurgery"
42. Boston College, Boston, MA, Physical Chemistry Seminar, January 10, 2008. "Wavelength-dependent structural failure of collagen during mid-IR laser surgery"
43. Syracuse University, Syracuse, NY, Chemistry Colloquium, October 23, 2007. "Structural failure of the protein matrix during mid-IR laser surgery"
44. University of South Florida, Tampa, FL. Physics Colloquium, March 2, 2007. "Laser Ablation and Tissue Dynamics from Picoseconds to Minutes and Molecules to Cells"
45. Vanderbilt University, Nashville, TN, Biological Sciences Seminar, March 2006. "Of Flies and Physics (and maybe a little scientific philosophy)"
46. Fisk University, Nashville, TN, Joint Seminar: Dept of Physics and Div of Natural Sciences and Mathematics, November 2004. "Physical Biology (or Biological Physics) of Morphogenesis"
47. Albert Einstein College of Medicine, New York, NY, Anatomy & Structural Biology Seminar, April 2003. "Forces for Morphogenesis: Laser-microsurgery and Quantitative Modeling Applied to Dorsal Closure"
48. Indiana University, Bloomington, IN, Physics Colloquium, February 2003. "Forces for Morphogenesis: Laser-microsurgery and Quantitative Modeling Applied to Dorsal Closure"
49. Texas A&M University, College Station, TX, Biomedical Engineering Seminar, February 2003. "Forces for Morphogenesis: Laser-microsurgery and Quantitative Modeling Applied to Dorsal Closure"
50. Vanderbilt University, Nashville, TN, Physics & Astronomy Colloquium, January 2003. "Forces for Morphogenesis: Laser-microsurgery and Quantitative Modeling Applied to Dorsal Closure"
51. Colgate University, Hamilton, NY, Physics & Astronomy Colloquium, February 2002. "Unraveling the Role of Arginine-82 in the Bacteriorhodopsin Photocycle"
52. Wake Forest University, Winston-Salem, NC, Physics Colloquium, April 2001. "Unraveling the Role of Arginine-82 in the Bacteriorhodopsin Photocycle"
53. University of Virginia, Charlottesville, VA, Biophysics Seminar, March 1998. "Direct Phase Correction of Differential FT-IR Spectra"

Invited Talks – Other Conferences & Workshops

54. *Grantee Progress Meeting – Advancing Toxicokinetics for Efficient and Robust Chemical Evaluations,* U.S. Environmental Protection Agency, Virtual, August 11, 2022, "Measuring Toxicokinetics for Organ-on-Chip Devices"

55. *CompuCell3D Workshop,* Virtual, Indiana University, Bloomington, IN, August 8, 2022 "Modeling Secondary Palate Fusion and Disruption"
56. *4th Annual STAR Organotypic Culture Models (OCM) for Predictive Toxicology Research Centers Progress Review,* U.S. Environmental Protection Agency, Research Triangle Park, NC, October 16, 2019, "Progress and next steps in making organ-on-chip technologies amenable to toxicity testing"
57. *3rd Annual STAR Organotypic Culture Models (OCM) for Predictive Toxicology Research Centers Progress Review,* U.S. Environmental Protection Agency, Research Triangle Park, NC, May 23, 2018, "Using OCMs to link high-throughput in vitro data to toxicological hazard identification"
58. *Workshop on Cell Signaling and Cytoskeleton in Directed Cell Migration*, Vanderbilt University, Nashville, TN, March 6, 2012, "Putting models of collective migration to the test using laser-microsurgery"
59. *Annual Meeting of SESAPS – Southeastern Section of the American Physical Society*, Roanoke, VA, October 21, 2011 "Dissecting cellular biomechanics with a laser"
60. *Biocomplexity X Conference: Quantitative Tissue Biology and Virtual Tissues*, Indiana University, Bloomington, IN, October 28-30, 2009 "Modeling microsurgical interventions in morphogenesis"
61. *CompuCell3D Workshop*, Indiana University, Bloomington, IN, August 17, 2009 "How does a fly make itself? Dissecting morphogenesis with laser microsurgery"
62. *Workshop on New Research Opportunities in the UV and Soft X-ray Region with Linac-Driven Free Electron Laser Sources,* University of Wisconsin, Madison, WI, October 2006. "Potential Applications of UV-FELs for Probing (and Manipulating?) Protein Dynamics"
63. *Workshop on Free Electron Laser Applications for Biology and Medicine*, Jefferson Lab, Newport News, VA, June 2005. "Photothermal Chemistry of Collagen During Mid-IR Laser Ablation"
64. *Workshop on Novel Research Opportunities Using the Duke Storage Ring FEL (SR FEL)*, Duke University, Durham, NC, February 2005. "Time-Resolved Broadband IR Spectroscopy with a UV-FEL-Pump/Synchrotron-IR Probe Beam Line"

Other Invited Seminars

65. U.S. EPA, National Center for Computational Toxicology, Research Triangle Park, NC, Virtual Embryo Seminar, October 31, 2012, "Probing oscillatory cell shape changes using holographic laser microsurgery"
66. Duke University, Biological Physics Research Group, Durham, NC, October 25, 2012, "Probing oscillatory cell shape changes using holographic laser microsurgery"

In addition, my students and trainees have given more than 90 contributed presentations at national and international conferences.

TEACHING

Courses Taught

Preparing for Immersive Experiences: The Pursuit of Scientific Discovery, S2018-2019
Freshman seminar
Introductory Physics for the Life Sciences I, F2004-2006, F2013-2014
Calculus-based, Newtonian Mechanics, Strong life science emphasis
Introductory Physics for the Life Sciences II, S2014-2017, S2020-2021
Calculus-based, Electricity & Magnetism, Optics, Strong life science emphasis
Introductory Physics, F2010
Calculus-based, Electricity & Magnetism, Optics, Primarily engineers

General Physics, S2007
Calculus-based, Electricity & Magnetism, Optics, Prospective physics majors
Seminar in Presenting Physics Research, F2017-2018, F2021
Required seminar for physics majors
Physical Measurements of Biological Systems, F2003, S2006, S2008, F2009 & F2011
Elective course for graduate students in Physics, Chemistry, Biomedical Engineering and Chemical & Physical Biology
Statistical Mechanics, S2004-2005, S2009-2012
Required core course for graduate students in Physics
Elective for graduate students in Chemical Engineering
Selected Topics: Biophysics of Pattern Formation, F2008
Elective course for graduate students in Physics, Biological Sciences and Chemical & Physical Biology

Guest Lectures Given in Other Disciplines' Courses

Cell Motility (BSCI 341), F2007-2009
Elective course for graduate students, primarily those in Biological Sciences (BSCI) and Cell & Developmental Biology; lecture on collective motility in morphogenesis
Biochemical and Molecular Toxicology (BCHM 8336), F2017-2022
Required Biochemistry (BCHM) course for students on T32 training grant in toxicology; lecture on computational toxicology
Introduction to Modern Biological Microscopy (CBIO 8313), S2010-2012, S2016-2018
Elective course for graduate students in Biological Sciences, Cell & Developmental Biology (CBIO) and Chemical & Physical Biology; lecture on laser ablation techniques
Cancer Systems Biology (CANB 8347), S2017
Elective course for graduate students in Cancer Biology (CANB) and Chemical & Physical Biology; lecture on the fundamentals of statistical mechanics

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Curriculum Development

Revamped Physics 117 – Introductory, calculus-based physics for pre-med and life science majors

- Led effort to introduce active learning strategies via Personal Response Units and peer-instruction. In Fall 2006, students achieved a mean normalized gain on the Force Concept Inventory of 0.44 (twice the typical level of student learning accomplished with traditional lectures, 0.22 ± 0.10).
- Implemented Just-In-Time-Teaching strategies to encourage students to read material before class and to relate material to their experiences outside the classroom.
- Implemented online homework tutorials using MasteringPhysics.
- Organized P117 HelpDesk staffed (~30 hrs / week) both by TAs and the professors teaching each section.
- Designed VPython-based "demonstrations" for section on thermodynamics/statistical mechanics.

Developed Physics 113A/B (now 1501/1502) – Introductory Physics for the Life Sciences

- New course aligning content and goals with new guidance on MCAT-relevant topics and the physics-related competencies delineated in the AAMC-HHMI report *Scientific Foundations for Future Physicians*
- Part of a nationwide effort to redesign such IPLS courses to meet future needs for quantitative and interdisciplinary life scientists and physicians
- Continued implementation of active learning techniques as in Physics 117 above
- Student learning via mean normalized gain on Force Concept Inventory: 0.54 (Fall 2013), 0.49 (Fall 2014)
- Student learning via mean normalized gain on Conceptual Survey of Electricity & Magnetism: 0.49 (Spr 2015)
- Worked with a Graduate BOLD (Blended & Online Learning Design) Fellow to develop pre-recorded lectures and online concept mapping activities to aid students in learning electrostatics
- Presented details of course development at 2014 *American Physical Society March Meeting*

Teaching about Teaching

- Facilitator, "Lessons from the COVID-19 online teaching and learning experiences: Assessing Student Work", AAPT/APS Physics Department Chairs Conference (Virtual), June 19, 2020
- Panelist, "Teaching with Technology", Center for Teaching (CfT) Workshop, November 6, 2019
- Speaker, "Classroom Assessments", CIRTL (Center for the Integration of Research, Teaching and Learning) Workshop on Evidence-Based Teaching for Future STEM Faculty, May 2016, August 2017
- Speaker, "Active Learning in the STEM Classroom", CIRTL Workshop on Evidence-Based Teaching for Future STEM Faculty, August 24, 2015; January 6, 2017
- Panelist, "Teaching with Technology", Center for Teaching (CfT) Workshop, November 8, 2017
- Panelist, "Dealing with Student Distress", CfT Workshop, November 17, 2016
- Panelist, "Assessments", CfT Junior Faculty Teaching Fellows Workshop, October 26, 2015
- Interviewee for MOOC entitled "An Introduction to Evidence-Based Undergraduate STEM Teaching," produced by Vanderbilt Center for Teaching and CIRTL, Fall 2014; Used in Coursera MOOC and for course preview posted to YouTube: https://www.youtube.com/watch?v=lKZ6HBY3tHo
- Panelist, "Reflections from VU Faculty on Effective Teaching", Vanderbilt University New Faculty Orientation, August 15, 2013
- Panelist, Center for Teaching Workshop "Engaging Students with Data and Information, Lessons from Edward Tufte" March 27, 2006
- Panelist, Center for Teaching Workshops on "Personal Response Systems" October 4, 2004 and February 21, 2005

Research Mentorship

Postdoctoral Fellows –
W. Tyler McCleery, Physics, 2018-2020; Technical Staff Scientist, MIT Lincoln Laboratories
Xiaoyan Ma, Physics, 2004-2011; Data Analyst, AdvanceMed
Borislav Ivanov, Physics, 2007-2009; Research Assistant Professor, Vanderbilt
Yaowu Xiao, Physics, 2004-2006; Senior Research Scientist, EMD Millipore

Graduate Students – directing thesis/dissertation research
Mia Grace Cantrell, Physics
Jupiter Simpson, Physics (Fisk-Vanderbilt Bridge Program)
Richard Ficek, Physics
Nathaniel Hermann, Physics
Aaron Stevens, Physics
James O'Connor (jointly), Cell & Developmental Biology
James White (jointly), Cell & Developmental Biology
Kazi Tasneem, Chemical & Biomolecular Engineering, PhD 2021; Staff Scientist, Genentech Inc.
Alex Auner, Physics, PhD 2018; Assistant Professor of the Practice, Boston College
Erica Shannon (jointly), Biological Sciences, PhD 2018; Postdoc, Marshall University
Monica Lacy (NSF Graduate Research Fellow), Physics, PhD 2017; Free-lance Science Communicator
W. Tyler McCleery (NSF Graduate Research Fellow), Physics, PhD 2016; Technical Staff Scientist, MIT Lincoln Laboratories
Sarah Crews (US Dept. of Ed. GAANN Fellow), Physics, PhD 2015; Technical Staff Scientist, MIT Lincoln Laboratories
David Mashburn, Physics, PhD 2015; Data Scientist, PluralSight Inc.

Aroshan Jayasinghe, Physics, PhD 2012; Product Development Scientist, Denovix Inc.
Holley Lynch (US Dept. of Ed. GAANN Fellow), Physics, PhD 2012; Associate Professor, Stetson University
Jason Rohner, Physics, MS 2009
Tomas Yan, Biology (Fisk-Vanderbilt Bridge Program), MS 2008; Educational Scientist, Metro Nashville Public Schools
Gilma Adunas, Physics, MS 2006

Graduate Students – supervised research rotation

Sarah Maddox, Quantitative Chemical Biology, 2017
Christian Meyer, Quantitative Chemical Biology, 2014
Abigail Searfoss, Quantitative Chemical Biology, 2013
Adam Dillman, Chemical & Physical Biology, 2011
Stacey Lawrence, Biological Sciences, 2011
Brad Robinson, Chemical & Physical Biology, 2009
Vimal Deepchand, Physics, 2006
Laurel Hoffman, Chemical & Physical Biology, 2005
Manoj Sridhar, Physics, 2003

Undergraduate Students – Cora Ferguson (St. Lawrence Univ.), REU, Summer 2022
Cooper Pich (Baylor Univ.), REU, Summer 2022
Michael Phan, Fall 2021-
Henoc Zinga, Fall 2021-Spring 2022
Kasie Azie, Fall 2021
Lila Nassar (Ga.Tech.), REU, Summer 2021
Ivy Han (jointly), Spring 2021-
Nilai Vemula, Physics, Fall 2019-Spring 2021
Andrew Pumford, Physics, Fall 2019-Spring 2021
Deshaun Dail, Physics, Fall 2020-Summer 2022
Caroline Howell (Troy Univ.), REU, Summer 2020
X.J. Xu, Physics, Fall 2018 - Spring 2019
Hannah Kim (U. Virginia), REU, Summer 2018
Sam Hotchkiss, Computer Science, Summer-Fall 2017
Leila Arefnezhad, Physics, Spring 2017
Jocelyn Jackson, Physics, Spring 2017-Spring 2018
Tracy Edwards, Physics (Hampton Univ.), NIH MARC/REU, Summer 2016/17
Yunhua Zhao, Computer Science, Fall 2016
Wes Edrington, Physics (U. Nebraska), REU, Summer 2016
Ama Agyapong, Physics (Elizabeth City St. Univ.) NIH MARC, Summer 2015
Grace Yook, Biophysics (Wake Forest Univ.), REU Summer 2015
Steven Pei, Physics, Spring 2015
Jason Creeden, Physics (Eastern Kentucky Univ.), REU Summer 2014
Nick Peoples, Physics (Southern Nazarene Univ.), REU Summer 2014
Cameron Togrye, Physics, Summer 2014
Nikita Lakomkin (jointly), Biological Sciences, 2014-15
Attiyya Houston, SyBBURE Summer 2013
Sam Barnett, Physics (Univ. Southern Indiana), REU Summer 2012
Eric Copenhaver, Physics (Univ. of Akron), REU Summer 2011
Karl Echiverri, Biological Sciences, Fall 2010 - Fall 2011
Paula Angarita, Physics (Florida International Univ.), REU Summer 2010
Trevor Meek, Physics (Southern Nazarene Univ.), REU Summer 2010
Mershard Frierson (Fisk Univ.), Spring/Summer 2010
John Kirkham, Physics (Rhodes College), REU Summer 2009

Siri Kadire, Medicine, Health & Society, SyBBURE Summer/Fall 2009
Brett Rosenthal, Physics (Duke Univ.), REU Summer 2008
Robert Gish, Physics, REU Summer 2007, Directed Study Fall 2007
Elliott Kim, Biological Sciences, REU Summer 2007
Peter Scully, Physics, Directed Study Spring 2006
MacRae Linton, Computer Science (Duke), Summer 2006
Alanna Patsiokas (jointly), Biomedical Engineering, Senior Design Project 2004
Kevin Parker, Physics, (Duke Univ.), Summer 2003

High School Interns – Jason Hoang, (School for Science & Math at Vanderbilt), 2019
Naureen Azziz (School for Science & Math at Vanderbilt), 2016
Xena McDonald (School for Science & Math at Vanderbilt), 2014
Hannah Asbell (School for Science & Math at Vanderbilt), 2010
Justine Hart, Summer 2007
Lauren Hughes, Summer 2006

PhD Committee Member (excludes students under my direct supervision who are listed above) –

Matthew Murrow, Physics
Victoria Stephens, MolPath/Immun
Utsav Kumar, Ch.Bio.Engr
Savannah Starko, Physics, PhD 2020
Hong Ni, Physics, PhD 2018
Jonathan Ehrman, Physics, PhD 2016
John Spear, Physics, PhD 2016
Jie Zhao, Physics, PhD 2016
Lauren Palladino, Physics, PhD 2015
Lewis Kraft, Ch.Phys.Bio., PhD 2014
Lili Gai, Chem.Eng., PhD 2014
Alex Krejci, Physics, PhD 2013
Marc Ramsey, Mech.Eng, PhD 2013
Ilija Uzelac, Physics, PhD 2012
Walter Georgescu, Bio.Eng., PhD 2012
Vimal Deepchand, Physics, MS 2010
S. Reese Harry, Chemistry, PhD 2010
Jonathon Jarvis, Physics, PhD 2009
Stephen Johnson, Physics, PhD 2008
Andreas Werdich, Physics, PhD 2006
Nicole Rodgers, Ch.Phys.Biol.
Tyler Doane, Earth&Env.Sci.
Austin Oleskie, Ch.Phys.Biol, PhD 2020
Erica Shannon, Cell/DevBio, PhD 2018
Brittany Kamai, Physics, PhD 2016
Peter Denton, Physics, PhD 2016
Qingqing Mao, Physics, PhD 2015
Daniel Sissom, Physics, PhD 2015
Hui-Yiing Chang, Physics, PhD 2014
Bernadette Cogswell, Physics PhD 2014
Ken Lewis, Physics, PhD 2013
Jessica Mazerik Cell/DevBio PhD 2013
Robel Yirdaw, Physics, PhD 2012
Ben Lawrie, Mat. Sci., PhD 2011
Ben McDonald, Physics, PhD 2010
Heungman Park, Physics, PhD, 2010
Junkai Xu, Physics, PhD 2008
Mark Holcomb, Physics, PhD 2007
Michelle Baltz-Knorr, Physics, MS 2004

Undergraduate Honors Thesis Committee Member –

Patrick Diggins, Physics, 2010
Brittany Rohrman, Physics, 2009
Charles Wright, Physics, 2008
William Blake Hooper, Physics, 2007
David Mashburn, Physics, 2006
Megan Leah O'Grady, Physics, 2004

SERVICE

Department of Physics & Astronomy

Chair, Department of Physics & Astronomy, 2017-Present
Member, Biological Physics Search Committee, 2008-2011
Member, New Building Committee, 2010-2011
Member and Chair, Colloquium Committee, 2004-11, 2014-15 (Chair, 2006-07, 2009-11, 2014-17)
Member, Graduate Program Committee, 2003-2011, 2013-2015
Member, Undergraduate Program Committee, 2011-2012
Member and Chair, Long-Range Planning Committee, 2005-2012 (Chair 2011-2012)
Member, P&T Research Evaluation Committee, 2011, 2014, 2016, 2017
Member, P&T Teaching Evaluation Committee, 2013
Chair, Ad Hoc Review Committee for Senior Lecturer Applicants, 2012
Organizer, Mid-IR Ablation Journal Club, 2004-2005
Physics Major Advisor, 2008-Present
REU Seminar Coordinator, Summer 2007-2012, 2014-2016

College of Arts & Science

Member, ESB Architect's Working Group, 2021-2022
Member, Sciences and Engineering Space Faculty Advisory Committee, 2018-2019
Panelist, A&S Faculty Workshop on NSF CAREER Proposals, May 17, 2016
Member and Secretary, A&S Faculty Council, 2009-2011 (Secretary, 2010-2011)
Director, Program in Career Development (http://as.vanderbilt.edu/overview/faculty/PCD/), 2015-2017
Member, Advisory Board for Program in Career Development, 2010-2012
Member, Junior Advisory Review Committee, 2010-2011
Panelist, A&S Workshop "Writing for Publication: Pleasures & Problems in the Academic Writing Process", part of "Prof 101: Launching Successful Faculty Careers" February 21, 2009
Member, AXLE Implementation Committee, 2014-2015
Member, A&S Committee on Academic Standards and Procedures, 2009-2010, 2011-2012
Member, A&S Ad Hoc Joint CASP/CEP Committee, 2009-2010

University

Member, Internal Awards Review Committee (Office of VPR), 2022-
Reviewer, VICTR Grant Review Studio, 2021
Chair, University Laser Safety Committee, 2020-
Co-Chair, University Faculty Development Committee, 2020-
Co-author, UFDC Report on the 2020 COACHE Survey of Vanderbilt Faculty Job Satisfaction, 2020-21
Member, University Environmental Health & Safety Governance Committee, 2020-
Mentor, First Gen Success Program, 2019
Member, Environmental Health & Safety Assessment and Planning Working Group, 2019
Member, Lewis-Burke Federal Funding Working Group, 2019
Chair, Faculty Senate Standing Committee on Strategic Planning and Academic Freedom, 2019-2020
Elected Representative, Faculty Senate, 2017-2020
Member, University Faculty Development Committee, 2018-2020
Member, Technology Review Committee, 2018-2021
Member, Search Committee for Vice-Chancellor for Equity, Diversity and Inclusion, 2018
Reviewer, Edge for Scholars, Office for Clinical & Translational Scientist Development, 2016-2017
Member, Center for Technology Transfer and Commercialization Advisory Committee, 2013-
Member, Graduate Honor Fellowship Committee, 2011-2012, 2014-2015
Ad hoc reviewer, Pre-proposals for NSF Major Research Instrumentation (MRI) Program, 2014
Member, Search Committee for FEL Associate Director for Medical Applications, 2005-2006
Member, *Ad hoc* Studio Panel for the WM Keck Foundation's Science and Engineering Program, 2012

Professional

Member and Chair, George B. Pegram Award Committee (recognizing outstanding contributions to teaching physics), Southeast Section of the American Physical Society, 2013-2014 (Chair, 2014)

Session Organizer, March Meeting of the American Physical Society, Division of Biological Physics
2017: "Physics of the Cytoskeleton I and II"
2009: "Biological Physics II"
2008: "General Biological Patterns"
2006: "Physical Aspects of Morphogenesis: Computational Approaches"
2006: "Biological Photophysics"
Additionally chaired at least one session each year: 2006-2011, 2014

Guest Editor, *Physical Biology* 5(1), Special Focus Issue on "Physical Aspects of Developmental Biology" March 2008.

Invited Participant, National Science Foundation Workshop on "Vision and Change in Biology Undergraduate Education – A View for the 21st Century", July 19, 2007

Reviewer of Grant Proposals –
National Science Foundation, Member, Physics of Living Systems Review Panel (2018)
National Science Foundation Division of Integrative Organismal Biology, *ad hoc* (4)
National Institutes of Health, Member ZRG1 CB P55 Review Panel (2013, 2014) plus *ad hoc* (1)
Human Frontier Science Program, *ad hoc* (2 research projects, 1 career development award)
l'Agence Nationale de la Recherche (French National Research Agency), *ad hoc* (2)
Ontario Research Fund - Research Excellence, *ad hoc* (1)
European Research Council, *ad hoc* (1)

Reviewer of Articles for Journals –

Applied In Vitro Toxicology,
Biomechanics and Modeling in Mechanobiology,
Biomedical Microdevices,
Biophysical Journal,
Bulletin of Mathematical Biology,
Cytometry A,
Developmental Cell,
Developmental Dynamics,
International Journal for Numerical Methods in Biomedical Engineering,
Journal of Biomechanical Engineering,
Journal of Biomedical Optics,
Journal of Theoretical Biology,
Journal of Visualized Experiments (JoVE),
Nature Communications,
Nature Physics,
New Journal of Physics,
Optics Communications,
Optics Express,
Optics Letters,
Physical Biology,
Physical Review Letters,
Physical Review E,
Physical Review X,
PLoS Computational Biology,
PLoS One,
Proceedings of the National Academy of Sciences U.S.A.,
Protein Journal,
Soft Matter,
Toxicology,
Wound Repair and Regeneration