

Scott S. Verbridge, Ph.D.

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EDUCATION

Ph.D. in Physics, Cornell University, May, 2008

Dissertation title “*Nanomechanical resonators: Sensing Limits, Loss Mechanisms, and Directions for New Materials and Methods*”, advised by Harold G. Craighead and Jeevak M. Parpia

M.S. in Physics, Cornell University, January, 2007

B.S. in Physics, University of Rochester, May 2002, *summa cum laude*

B.S. in Applied Mathematics, University of Rochester, May 2002, *summa cum laude*

POSITIONS

Assistant Professor, Virginia Tech Faculty of Health Sciences, June, 2016-present

Tumor Progression and Recurrence Program Member, Wake Forest School of Medicine Comprehensive Cancer Center, February, 2013-present

Assistant Professor, Virginia Tech – Wake Forest School of Biomedical Engineering and Sciences, and the Department of Biomedical Engineering and Mechanics, December, 2011-present

Research in the Verbridge Laboratory for Integrative Tumor Ecology (LITE) utilizes a multidisciplinary approach, combining micro/nanoscale science, tissue engineering and mathematical models in order to study tumor progression and therapy response as an ecological process within a tissue microenvironment.

Postdoctoral Research Associate, Cornell University, 2008-2011

Co-advised by Claudia Fischbach and Abraham Stroock, focused on 3D tumor angiogenesis models.

Graduate Research Assistant, Cornell University, 2003-2008

Co-advised by Harold G. Craighead and Jeevak M. Parpia, studying nanomechanical sensors.

USI Participant, Lawrence Livermore National Laboratory, Aug 2001

Research at LLNL focused on optical studies, using a diamond anvil apparatus, of phase transitions in a high explosive material.

REU Student, University of Rochester, May 2001-August 2001

Advised by Professor Eric Blackman, developing mathematical models of planet formation in sheared accretion discs.

Undergraduate Research Assistant, University of Rochester, 1999-2001

Laboratory for Laser Energetics with Dr. James Knauer, working on data acquisition for the Omega laser calorimetry system.

PUBLICATIONS

Dr. Verbridge has contributed to 37 peer-reviewed journal publications as of February, 2017. He has also contributed to books as both chapter author and editor. Dr. Verbridge has a Google Scholar h-index of 23,

with over 5,200 citations. His work been published in numerous high impact factor journals, as summarized in the partial table, and complete list below (asterisks indicate my advisees):

Journal Name	Impact Factor	Number of Papers
Science	33.6	1
Nano Letters	13.6	6
Nature Protocols	9.7	1
Biomaterials	8.6	3
Physical Review Letters	7.5	2
Cancer Letters	5.6	1
Scientific Reports (Nature Publishing Group)	5.6	3
Cell Adhesion and Migration	4.5	1
Tissue Engineering	4.4	2
Integrative Biology	3.8	1
Journal of Biomedical Materials Research A	3.4	3
Applied Physics Letters	3.3	2
Annals of Biomedical Engineering	3.2	1

- Goswami, I.*; Coutermash-Ott, S.; Morrison, R.G.; Allen, I.C.; Davalos, R.V.; **Verbridge, S.S.**; Bickford, L.R., Irreversible electroporation inhibits pro-cancer inflammatory signaling in triple negative breast cancer cells, *Bioelectrochemistry* **2017**, 113, 42-50.
- Kanabur, P.; Guo, S.; Simonds, G.R.; Kelly, D.F.; Gourdie, R.G.; **Verbridge, S.S.**; Sheng, Z., Patient-derived glioblastoma stem cells respond differentially to targeted therapies, *Oncotarget* **2016**, 7, (52).
- Sun, C.; Hassanisaber, H.; Yu, R.; Ma, S.; **Verbridge, S.S.**; Lu, C., Paramagnetic structures within a microfluidic channel for enhanced immunomagnetic isolation and surface patterning of cells, *Scientific Reports* **2016**, 6.
- Vishwakarma, S.D.; Pandey, A.K.; Parpia, J.M.; **Verbridge, S.S.**; Craighead, H.G.; Pratap, R., Size modulated transition in the fluid-structure interaction losses in nano mechanical beam resonators, *Journal of Applied Physics* **2016**, 119, (19), 194303.
- Thayer, P.S.; **Verbridge, S.S.**; Dahlgren, L.A.; Kakar, S.; Guelcher, S.A. ; Goldstein, A.S., Fiber/collagen composites for ligament tissue engineering: influence of elastic moduli of sparse aligned fibers on mesenchymal stem cells, *Journal of Biomedical Materials Research Part A* **2016**, 104, (8), 1894-1901.
- Ivey, J.W.*; Bonakdar, M.; Kanitkar, A.*; Davalos, R.V.; **Verbridge, S.S.**, Improving cancer therapies by targeting the physical and chemical hallmarks of the tumor microenvironment, *Cancer Letters* **2016**, 1, (380), 330-339.
- Ivey, J.W.*; Latouche, E.L.; Sano, M.B.; Rossmeisl, J.H.; Davalos, R.V.; **Verbridge, S.S.**, Targeted cellular ablation based on the morphology of malignant cells, *Scientific Reports* **2015**, 5.
- Cox, M.C.*; Reese, L.M.; Bickford, L.R.; **Verbridge, S.S.**, Toward the broad adoption of 3D tumor models in the cancer drug pipeline, *ACS Biomaterials Science and Engineering* **2015**, 1, (10), 877-894.
- DelNero, P.; Lane, M.; **Verbridge, S.S.**; Kwee, B.; Kermani, P.; Hempstead, B.; Stroock, A.D.; Fischbach, C., 3D culture broadly regulates tumor cell hypoxia response and angiogenesis via pro-inflammatory pathways, *Biomaterials* **2015**, 55, 110-118.
- Hosseini, Y.; Agah, M.; **Verbridge, S.S.**, Endothelial Cell Sensing, Restructuring, and Invasion in Collagen Hydrogel Structures, *Integrative Biology* **2015**, 7, (11), 1432-1441.
- Hosseini, Y.; **Verbridge, S.S.**; Agah, M., Bio-inspired Microstructures in Collagen Type I Hydrogel, *Journal of Biomedical Materials Research: Part A* **2015**, 103, (6), 2193-2197.

12. Buchanan, C.F.; **Verbridge, S.S.**; Vlachos, P.P.; Rylander, M.N., Flow shear stress regulates endothelial barrier function and expression of angiogenic factors in a 3D microfluidic tumor vascular model, *Cell Adhesion and Migration* **2014**, 8, (5), 517-524.
13. Liu, B.; Yu, H.; **Verbridge, S.S.**; Sun, L.; Wang, G., Dictionary-learning-based reconstruction method for electron tomography, *Scanning*, **2014**, 36, (4), 377-383.
14. Morgan, J.P.; Delnero, P.F.; Zheng, Y.; **Verbridge, S.S.**; Chen, J.; Craven, M.; Choi, N.W.; Diaz-Santana, A.; Kermani, P.; Hempstead, B.; Lopez, J.A.; Fischbach-Teschl, C.; Stroock, A.D., Formation of microvascular networks in vitro, *Nature Protocols*, **2013**, 8, (9), 1820-1836.
15. **Verbridge, S.S.**; Chakrabarti, A.; Del Nero, P.; Kwee, B.; Varner, J.D.; Stroock, A.D.; Fischbach, C., Physicochemical regulation of endothelial sprouting in a 3-D microfluidic angiogenesis model, *Journal of Biomedical Materials Research: Part A*, **2013**, 101, (10), 2948-2956.
16. Physical Sciences – Oncology Network, A physical sciences network characterization of nonmalignant and metastatic cells, *Scientific Reports*, **2013**, 3, 1449.
17. Chakrabarti, A.; **Verbridge, S.S.**; Stroock, A.D.; Fischbach, C.; Varner, J.D., Multiscale Models of Breast Cancer Progression, *Annals of Biomedical Engineering*, **2012**, 40, (11), 2488-2500.
18. Choi, N.**; **Verbridge, S.S.****; Williams, R.M.; Chen, J.; Kim, J.Y.; Schmehl, R.; Farnum, C.E.; Zipfel, W.R.; Fischbach, C.; Stroock, A.D., Phosphorescent nanoparticles for quantitative measurements of oxygen profiles *in-vitro* and *in-vivo*, *Biomaterials* **2012**, 33, (9), 2710-2722 (**Co-first authors).
19. Wilson-Rae, I.; Barton, R.A.; **Verbridge, S.S.**; Southworth, D.R.; Ilic, R.; Craighead, H.G.; Parpia, J.M., High-Q Nanomechanics via Destructive Interference of Elastic Waves, *Physical Review Letters* **2011**, 106, (4), 047205.
20. Cross, V.L.; Zheng, Y.; Choi, N.; **Verbridge, S.S.**; Sutermeister, B.A.; Bonassar, L.J.; Fischbach, C.; Stroock, A.D., Dense type I collagen matrices that support cellular remodeling and microfabrication for studies of tumor angiogenesis and vasculogenesis *in vitro*, *Biomaterials* **2010**, 31, (33), 8596-8607.
21. **Verbridge, S.S.**; Choi, N.; Zheng, Y.; Brooks, D.J.; Stroock, A.D.; Fischbach, C., Oxygen-Controlled 3-D Cultures to Analyze Tumor Angiogenesis. *Tissue Engineering Part A* **2010**, 16, (7), 2133-2141.
22. **Verbridge, S.S.**; Chandler, E.M.; Fischbach, C., Tissue-Engineered 3-D Tumor Models to Study Tumor Angiogenesis. *Tissue Engineering Part A* **2010**, 16, (7), 2147-2152.
23. Barton, R.A.; Ilic, B.; **Verbridge, S.S.**; Cipriany, B.R.; Parpia, J.M.; Craighead, H.G., Fabrication of a Nanomechanical Mass Sensor Containing a Nanofluidic Channel. *Nano Letters* **2010**, 10, (6), 2058-2063.
24. Dimov, S.; Bennett, R.G.; Corcoles, A.; Levitin, L.V.; Ilic, B.; **Verbridge, S.S.**; Saunders, J.; Casey, A.; Parpia, J.M., Anodically bonded submicron microfluidic chambers. *Review of Scientific Instruments* **2010**, 81, (1), 013907.
25. Dimov, S.G.; Bennett, R.G.; Ilic, B.; **Verbridge, S.S.**; Levitin, L.V.; Fefferman, A.D.; Casey, A.; Saunders, J.; Parpia, J.M., Decoupling of Confined Normal He-3. *Journal of Low Temperature Physics* **2010**, 158, (1-2), 155-158.
26. Southworth, D.R.; Barton, R.A.; **Verbridge, S.S.**; Ilic, B.; Fefferman, A.D.; Craighead, H.G.; Parpia, J.M., Stress and Silicon Nitride: A Crack in the Universal Dissipation of Glasses. *Physical Review Letters* **2009**, 102, (22), 225503.
27. Bunch, J. S.; **Verbridge, S. S.**; Alden, J. S. ; van der Zande, A. M.; Parpia, J. M.; Craighead, H. G.; McEuen, P. L., Impermeable Atomic Membranes from Graphene Sheets. *Nano Letters* **2008**, 8, (8), 2458-2462.

28. **Verbridge, S. S.**; Ilic, R.; Craighead, H. G.; Parpia, J. M., Size and frequency dependent gas damping of nanomechanical resonators. *Applied Physics Letters* **2008**, 93, 013101.
29. **Verbridge, S. S.**; Craighead, H. G.; Parpia, J. M., A megahertz nanomechanical resonator with room temperature quality factor over a million. *Applied Physics Letters* **2008**, 92, 013112.
30. **Verbridge, S. S.**; Shapiro, D. F.; Craighead, H. G.; Parpia, J. M., Macroscopic tuning of nanomechanics: Substrate bending for reversible control of frequency and quality factor of nanostring resonators. *Nano Letters* **2007**, 7, (6), 1728-1735.
31. Moran-Mirabal, J. M.; Slinker, J. D.; DeFranco, J. A.; **Verbridge, S. S.**; Ilic, R.; Flores-Torres, S.; Abruna, H.; Malliaris, G. G.; Craighead, H. G., Electrospun Light-Emitting Nanofibers. *Nano Letters* **2007**, 7, (2), 458-463.
32. Bunch, J. S.; Van der Zande, A. M.; **Verbridge, S. S.**; Frank, I. W.; Tanenbaum, D. M.; Parpia, J. M.; Craighead, H. G.; McEuen, P. L., Electromechanical Resonators from Graphene Sheets. *Science* **2007**, 315, 490-493.
33. **Verbridge, S. S.**; Bellan, L. M.; Parpia, J. M.; Craighead, H. G., Optically Driven Resonance of Nanoscale Flexural Oscillators in Liquid. *Nano Letters* **2006**, 6, (9), 2109-2114.
34. **Verbridge, S. S.**; Parpia, J. M.; Reichenbach, R. B.; Bellan, L. M.; Craighead, H. G., High quality factor resonance at room temperature with nanostrings under high tensile-stress. *Journal of Applied Physics* **2006**, 99, 124304.
35. **Verbridge, S. S.**; Edel, J. B.; Stavis, S. M.; Moran-Mirabal, J. M.; Allen, S. D.; Coates, G. W.; Craighead, H. G., Suspended glass nanochannels coupled with microstructures for single molecule detection. *Journal of Applied Physics* **2005**, 97, 124317.
36. Kameoka, J.**; **Verbridge, S. S.****; Liu, H.; Caplewski, D. A.; Craighead, H. G., Fabrication of suspended silica glass nanofibers from polymeric materials using a scanned electrospinning source. *Nano Letters* **2004**, 4, (11), 2105. (**Co-first authors).
37. Czaplewski, D. A.; **Verbridge, S. S.**; Kameoka, J.; Craighead, H. G., Nanomechanical Oscillators Fabricated Using Polymeric Nanofiber Templates. *Nano Letters* **2004**, 4, (3), 437.

BOOK CHAPTER CONTRIBUTIONS

1. Balhouse, B.*; Ivey, J.*, **Verbridge, S.S.**, Engineered Microenvironments for Cancer Study, in *Three-Dimensional Microfabrication Using Two-Photon Polymerization*, Elsevier Publishing, **2016**.

BOOKS EDITED

1. *Microfluidic Methods for Molecular Biology*, co-edited by Drs. Chang Lu and Scott S. Verbridge, Springer Publishing, **2016**.

CONFERENCE PROCEEDINGS

1. Thayer, P.; Plessl, D.; Tong, E.; **Verbridge, S.S.**; Dahlgren, L.; Guelcher, S.; Goldstein, A., Influence of Sparse Electrospun Fibers on the Differentiation of Mesenchymal Stem Cells in Collagen Gels, *Tissue Engineering Part A* **2014**, 20, (S18).
2. DelNero, P.; **Verbridge, S.S.**; Lane, M.; Rabbany, P.; Kwee, B.; Zheng, Y.; Stroock, A.D.; Fischbach, C., 3D Context Regulates Hypoxic Response and Angiogenesis in Engineered Models of the Tumor Microenvironment, *Tissue Engineering Part A* **2014**, 20, (S94).

3. Choi, N.; **Verbridge, S.S.**; Williams, R.M.; Park, K.; Zipfel, W.R.; Fischbach, C.; Stroock, A.D., Oxygen-Sensing Microfluidic Scaffolds. *International ASME Conference on Nanochannels, Microchannels and Minichannels* **2009**, ICNMM2009-82292.
4. Stroock, A.D.; Choi, N.; Wheeler, T.D.; Cross, V.; **Verbridge, S.S.**; Fischbach, C.; Bonassar, L.J., Microvascular Structure and Function in Vitro. *International ASME Conference on Nanochannels, Microchannels and Minichannels* **2009**.
5. **Verbridge, S. S.**; Shapiro, D. F.; Bunch, J. S.; Van der Zande, A. M.; McEuen, P. L.; Parpia, J. M.; Craighead, H. G., An All-Optical Actuation and Detection Scheme for Studying Dissipation and Materials Properties of NEMS Resonators. *Invited talk at IEEE LEOS Meeting*, Lake Buena Vista, FL, 2007.

SELECTED PRESENTATIONS

Presentations by myself:

1. **Verbridge, S.S.**; Toward targeting the physical hallmarks of tumors with pulsed electric field ablation therapy, *Invited talk presented at the Macromolecules Innovation Institute (MII) annual meeting*, October, 2016, Blacksburg, VA.
2. **Verbridge, S.S.**; Toward targeting the physical hallmarks of tumors with pulsed electric field ablation therapy, *Invited talk presented at the annual BMES meeting*, October, 2016, Minneapolis, MN.
3. **Verbridge, S.S.**; Tumor Engineering, *Presented as part of the Additive Manufacturing Tutorial Session of the 2016 Manufacturing Science and Engineering Conference (MSEC)*, June, 2016, Blacksburg, VA.
4. **Verbridge, S.S.**; Targeted Electric Field Therapy for Malignant Glioma, *Wake Forest Brain Tumor Center of Excellence meeting presentation*, June, 2015, Winston-Salem, NC.
5. **Verbridge, S.S.**, Targeted Electric Field Therapy Development in 3D Models of the Heterogeneous Glioma Microenvironment, *Invited presentation at the Functional Analysis and Screening Technologies Congress*, November, 2014, Boston, MA.
6. **Verbridge, S.S.**, 3-D Microfluidic Angiogenesis Models to Analyze the Physicochemical Regulators of Brain Tumor Therapy Response, *Invited presentation at the Physiologically-Relevant Cellular Models for Drug Discovery meeting*, February, 2014, La Jolla, CA.
7. **Verbridge, S.S.**; Microengineering for cancer studies, *Wake Forest Brain Tumor Center of Excellence meeting presentation*, June, 2013, Winston-Salem, NC.
8. **Verbridge, S.S.**; Microengineered in-vitro blood vessels to study paracrine and autocrine triggers of the tumor angiogenic switch, *Talk presented at Biomedical Engineering Society Annual Meeting*, 2012, Atlanta, GA.
9. **Verbridge, S.S.**; Microengineered tissue models of the pro-angiogenic tumor microenvironment, *Wake Forest University Graduate School Seminars*, July, 2012, Winston-Salem, NC.
10. **Verbridge, S.S.**; Chakrabarti, A.; Catena, R.; Mittal, V.; Varner, J.D.; Stroock, A.D.; Fischbach, C., Microengineered blood vessel mimics to analyze the tumor angiogenic switch, *Poster presented at Keystone Angiogenesis Meeting*, 2012, Snowbird, UT.
11. **Verbridge, S.S.**; Tissue engineered cancer models: Microengineered 3-D cultures to study the pro-angiogenic tumor microenvironment, *Virginia Tech-Wake Forest SBES Distinguished lecturer series*, 2011, Blacksburg, VA.
12. **Verbridge, S.S.**; Tissue engineered cancer models: Microengineered 3-D cultures to study the pro-angiogenic tumor microenvironment, *SUNY Buffalo Department of Biomedical Engineering Seminar*, 2011, Buffalo, NY.

13. **Verbridge, S.S.**; Choi, N.; Zheng, Y.; Williams, R.M.; Stroock, A.D.; Fischbach, C., Engineering 3-D Microscale Niches for Studies of Oxygen-dependent Tumor Angiogenic Behavior, *Poster presented at Biomedical Engineering Society Annual Meeting*, 2010, Austin, TX.
14. **Verbridge, S.S.**; Choi, N.; Zheng, Y.; Stroock, A.D.; Fischbach, C., A microfluidic tumor model to study the effects of oxygen level and 3-D culture on tumor angiogenesis, *Talk Given at Society for Biomaterials Annual Meeting*, 2010, Seattle, WA.
15. **Verbridge, S.S.**; Choi, N.; Zheng, Y.; Stroock, A.D.; Fischbach, C., The Effects of 3D Culture and Hypoxia on Tumor Angiogenesis, *Poster presented at Biomedical Engineering Society Annual Meeting*, 2009, Pittsburg, PA.
16. **Verbridge, S.S.**, Effects of Oxygen in a 3D Tumor Model, *Invited talk presented at the Cornell Biomedical Engineering Society annual retreat*, 2009, Ithaca, NY.
17. **Verbridge, S.S.**; Choi, N.; Stroock, A.D.; Fischbach, C., The Effects of 3D Culture and Hypoxia on Tumor Angiogenesis, *Poster presented at the Dublin City University Nanotechnology-Enabled Sensors & Diagnostics Workshop*, 2009, Dublin, Ireland.
18. **Verbridge, S.S.**; Choi, N.; Brooks, D.; Bonassar, L.J.; Stroock, A.D.; Fischbach, C. Microfluidic tissue scaffolds for studies of tumor angiogenesis. *Talk at NBTC Seminar Series*, Ithaca, NY, 2008.
19. **Verbridge, S. S.**; Ilic, R.; Craighead, H. G.; Parpia, J. M., High-Q nanostring resonators: Understanding gas damping issues. *Talk at Darpa N/MEMS S&T Fundamentals Program Review*, Miami, FL, 2008.
20. **Verbridge, S. S.**; Shapiro, D. F.; Craighead, H. G.; Parpia, J. M., Addition and Removal of Stress to Drastically Tune Frequency and Quality Factor of Nanomechanical Resonators. *Talk at American Vacuum Society Symposium*, Seattle, WA, 2007.
21. **Verbridge, S. S.**; Craighead, H. G.; Parpia, J. M., Gas damped nanostring resonators: Understanding size and frequency effects. *Talk at Darpa N/MEMS S&T Fundamentals Program Review*, San Fransisco, CA, 2007.
22. **Verbridge, S. S.**; Bellan, L. M.; Reichenbach, R. B.; Parpia, J. M.; Craighead, H. G., Effects of Tensile Stress and Viscous Damping on the Resonance of Nanomechanical Beams and Cantilevers. *Talk at American Vacuum Society Symposium*, San Fransisco, CA, 2006.
23. **Verbridge, S. S.**; Moran-Mirabal, J. M.; Tanenbaum, D. M.; Craighead, H. G., Detection of Specifically Bound Biological Mass with Resonant Nanobeams and Nanochannels. *Talk at American Vacuum Society Symposium*, Boston, MA, 2005.
24. **Verbridge, S. S.**; Czaplewski, D. A.; Kameoka, J.; Craighead, H. G., Fabrication of Nanomechanical Oscillators using Electrospun Polymeric Fibers. *Talk at American Physical Society March Meeting*, Montreal, QC, 2004.

Additional talks and posters presented by my students (presenter underlined):

1. Cox, M.; Zhu, Y.; Hsieh, Y.P.; Lu, C.; **Verbridge, S.S.**, Analyzing Discrete Cancer Cell Subpopulations for Epigenetic Alterations Driven by Oxygen Gradients within the Tumor Microenvironment, Talk presented at BMES Annual Meeting, October, 2016, Minneapolis, MN.
2. Balhouse, B.N.; **Verbridge, S.S.**, Synergistic Regulation of Breast Cancer Viability by 3D Culture, Hypoxia, and Bacterial Quorum-Sensing Signals, Talk presented at BMES Annual Meeting, October, 2016, Minneapolis, MN.
3. Ivey, J.W.; Latouche, E.; Lesser, G.J.; Debinski, W.; Davalos, R.V.; **Verbridge, S.S.**, Enhancing preferential glioma cell death by leveraging a combination pulsed electric field and molecular targeting approach, Poster presented at BMES Annual Meeting, October, 2016, Minneapolis, MN.

4. Cox, M.; Li, L.; **Verbridge, S.S.**, Implications of Low Level Chronic LPS on Vascular Dynamics and Tumor Progression, Talk presented at Biomedical Engineering Society Annual Meeting, October, 2015, Tampa, FL
5. Ivey, J.; Latouche, E.; Sano, M.; Rossmeisl, J.; Davalos, R.; **Verbridge, S.S.**, Targeted cellular ablation based on the morphology of malignant glioblastoma cells, Poster presented at Biomedical Engineering Society Annual Meeting, October, 2015, Tampa, FL
6. Balhouse, B.; **Verbridge, S.S.**, Bacterial OdDHL impacts breast tumor response to hypoxia and 3D culture, Talk at Biomedical Engineering Society (BMES) Annual Meeting, October 2015, Tampa, FL
7. Richards, M.; Ivey, J.; Latouche, E.; Davalos, R.V.; **Verbridge, S.S.**, Targeting Morphological Changes in Glioblastoma with EphrinA1/EphA2 and the Effect on electroporation therapies, Poster at Biomedical Engineering Society (BMES) Annual Meeting, October 2015, Tampa, FL
8. Cox, M.; Abdulahad, A.; Long, T.; **Verbridge, S.S.**, A Microfluidic Device to Analyze Vascular Dynamics in a Heterogeneous Brain Tumor Microenvironment, Poster presented at Biomedical Engineering Society Annual Meeting, October, 2014, San Antonio, TX
9. Ivey, J.; Latouche, E.; Sano, M.; Davalos, R.; **Verbridge, S.S.**, 3D Glioma Platform for Therapy-Resistant Cell Targeting Using High Frequency Electric Fields, Talk presented at Biomedical Engineering Society Annual Meeting, October, 2014, San Antonio, TX
10. Hosseini, Y.; **Verbridge, S.S.**; Agah, M., A single mask, single etch process for fabricating 3-D geometries in collagen I hydrogel, Poster at Biomedical Engineering Society (BMES) Annual Meeting, October 2014, San Antonio, TX
11. Hosseini, Y.; **Verbridge, S.S.**; Agah, M., Endothelial Cell Invasion Dependency on Extracellular Matrix Microstructure and Geometry, Poster at Biomedical Engineering Society (BMES) Annual Meeting, October 2014, San Antonio, TX
12. Hosseini, Y.; **Verbridge, S.S.**; Agah, M., Geometrical Cues Mediate The Invasion Of Endothelial Cells In Collagen I Hydrogel, 18th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS), October 2014, San Antonio, TX
13. Ivy, J.; Sano, M.; Fischbach, C.; Davalos, R.; **Verbridge, S.S.**, Three-Dimensional Glioma Platform for Therapy-Resistant Cell Targeting, *Poster presented at Biomedical Engineering Society Annual Meeting*, September 2013, Seattle, WA
14. Cox, M.; **Verbridge, S.S.**, Modeling Angiogenesis in the Brain Microenvironment, *Poster presented at Biomedical Engineering Society Annual Meeting*, September 2013, Seattle, WA

PATENTS

Sano, M.B.; Arena, C.B; **Verbridge, S.S.**; Davalos, R.V., Selective Modulation of Intracellular Effects of Cells Using Pulsed Electric Fields, Published November, 2015, **WO2015175570**

FUNDING

Dr. Verbridge has received research support from a wide range of funders, including the NIH, NSF, as well as state and university sources. He is currently PI on three NIH grants and one NSF grant, and his funding totals as of February, 2017 are as follows:

- **Total funding: \$3,804,407**
- **Total external funding as PI: \$3,058,074**
- **Personal share of external funding: \$1,614,391**

Ongoing Research Support

1652112 Verbridge (PI) 2/17–1/22
NSF/CBET
Total award amount: \$504,160
“CAREER: Multi-Gradient Microtissue Arrays to Analyze Patient-Derived Cancer Cell Modulation by Combinatorial Electrical and Chemical Stimulation”
This CAREER award from the NSF is to develop a multi-gradient microtissue platform for combinatorial therapy testing, and basic biology studies on small cell number samples such as those from patient biopsies.
Role: Principal Investigator

R01CA213423 Verbridge (MPI) 1/17–12/21
NIH/NCI
Total award amount: \$1,761,285
“High-frequency Irreversible Electroporation (H-FIRE) combinatorial GBM treatment”
This project, in collaboration with Rafael Davalos in Biomedical Engineering, and collaborators at the Virginia-Maryland College of Veterinary Medicine and the Wake Forest University Comprehensive Cancer Center, is focused on blood-brain-barrier disruption and *in vivo* efficacy using combinatorial H-FIRE therapies.
Role: Principal Investigator

R21CA192042 Verbridge (MPI) 2/15–1/18
NIH/NCI
Total award amount: \$386,149
“Targeted electric field therapy for malignant infiltrative glioma”
This project, in collaboration with Rafael Davalos in Biomedical Engineering, and clinical collaborators at the Wake Forest University Comprehensive Cancer Center, is focused on developing high frequency electric field parameters for the physical targeting of infiltrative and stem cell types in malignant glioma.
Role: Principal Investigator

R21EB019123 Verbridge (PI) 9/14–7/17
NIH/NIBIB
Total award amount: \$406,480
“3D micro-addressable tissue models to understand spatiotemporal heterogeneity in transcriptional regulation”
This project, in collaboration with Chang Lu in Chemical Engineering, is focused on developing tissue engineered brain tumor models in combination with microfluidic cellular analysis, to enable high spatiotemporal resolution studies of transcriptional stress response dynamics.
Role: Principal Investigator

Completed Research Support

VBHRC Grant Davalos (PI) 1/16–12/16
Virginia Biosciences Health Research Corporation
Total award amount: \$380,000
“INSPIRE to Fight Brain Cancer”
This is a project to translate electric field based cancer therapies closer to clinical use for brain cancer.
Role: Co-Principal Investigator

Wake Forest Pilot Grant Davalos (PI) 1/16–12/16
Wake Forest Comprehensive Cancer Center
Total award amount: \$75,000
“Brain cancer SPORE pilot”
This is a project to help build collaboration between Virginia Tech and Wake Forest on combinatorial brain cancer therapies combining molecular and electric field based treatments.
Role: Co-Principal Investigator

JFC Grant Verbridge (PI) 7/14–6/16
Virginia Tech Institute for Critical Technology and Applied Science

Total award amount: \$120,000

“Why is cancer so smart? Breaking through at the intersection of tumor engineering and microbiology”

This is a junior faculty project in collaboration with faculty mentor Liwu Li in Biological Sciences, focused on understanding how circulating bacterial factors impact tumor cell response to tissue microenvironment stress.

Role: Principal Investigator

SBES/CCC pilot grant

Verbridge (PI)

10/14–10/15

Virginia Tech/Wake Forest Comprehensive Cancer Center

Total award amount: \$50,000

“Towards Individualized Optimization of Radiosurgery Dose Profile Using Arrays of Patient-Specific Miniaturized 3D Brain Metastasis Models”

This is a collaborative project between SBES and the Comprehensive Cancer Center, to develop patient-specific tumor models for radiation dose optimization.

Role: Principal Investigator

Seed grant

Verbridge (PI)

11/14-7/15

Virginia Tech Institute for the Systems Biology of Engineered Tissues

Total award amount: \$21,133

“Therapeutic Electric Fields to Extract Malignant Cells from Heterogeneous Tissues”

The goal of this project is to develop the ability to extract malignant cells from tissues using electric fields, ultimately to be used as an adjuvant therapy following surgical debulking of glioma.

Role: Principal Investigator

Seed grant

Verbridge (PI)

7/12-6/13

Virginia Tech Institute for the Systems Biology of Engineered Tissues

Total award amount: \$21,000

“Tomographically-Aided Integrative Modeling of Tumor Cell Evolutionary Dynamics”

The goal of this project was to develop 3D models with integrated tomographic optical imaging for studies of the dynamics of tumor evolution under spatiotemporally varying chemical microenvironments.

Role: Principal Investigator

Seed grant

Verbridge (PI)

9/13-6/14

Virginia Tech Institute for Critical Technologies and Applied Science

Total award amount: \$5,000

“Tumor-Microbiome Interactions”

The goal of this project was to study the influence of bacterial signals in modifying the population dynamics of tumor cells adapting to stressful tissue microenvironments.

Role: Principal Investigator

TEACHING

BMES 5984, Cancer Diagnostics and Therapeutics, Fall 2016

Act as *lead instructor* and course developer in this graduate level course on cancer. The course takes an integrative approach to understanding cancer processes, detection, and treatment, emphasizing a quantitative and engineering based perspective.

TBMH 5024, Fundamentals of Cancer, Spring 2015

(Lead instructors: Schmelz and Davalos) Presented two lectures on Tumor Engineering in a cancer course offered by the Virginia Tech Translational Biology, Medicine, and Health program.

BMES 5984, Engineering Approaches to Cancer, Fall 2013

(Lead instructors: Bickford and Robertson) Presented one lecture on the tumor microenvironment.

BMES 5054, Quantitative Cell Physiology, Fall 2012 - present

(Lead instructor: Gabler) Designed and teach a six lecture unit in cell physiology, focusing on mathematical models in cell metabolism, gene regulation, mitosis and cell adhesion.

BMES 2104, Introduction to Biomedical Engineering, Spring 2012 - present

Act as *lead instructor*, and present senior undergraduate level lectures on biomaterials, biomedical optics, and biomedical engineering approaches to cancer research.

Performance Rock Climbing (Cornell University), Fall 2009

Intermediate rock climbing course, focusing on more advanced techniques and training principles, offered by Cornell Outdoor Education.

Basic Rock Climbing (Cornell University), Spring 2008-Spring 2009

Introductory rock climbing course offered by Cornell Outdoor Education.

Physics 101/102 (Cornell University), Fall 2002-Spring 2003

Graduate Teaching Assistant in Physics 101 and 102.

Math 281/Mechanical Engineering 201 (University of Rochester), Fall 2000

Undergraduate Teaching Assistant in Math 281/Mechanical Engineering 201, Partial Differential Equations.

RECOGNITION

- Received the NSF CAREER award from the BME program in CBET, in 2017
- Received 2016 Department of Biomedical Engineering and Mechanics Leader in Scholarship Award
- 2015 Virginia Tech Engineering Dean's Award for Outstanding New Assistant Professor
- Received 2015 Department of Biomedical Engineering and Mechanics Leader in Scholarship Award
- Selected as the Virginia Tech Research Scholar of the Week for the week of April 6, 2015
- Invited to participate as an expert panelist in a think tank panel discussion on physiologically-relevant assays, at the 2014 Functional Analysis and Screening Technologies Congress
- Awarded 2014 ICTAS Junior Faculty Collaboration (JFC) award, to study tumor-microbe interactions
- 2013 tumor engineering publications highlighted in the Virginia Tech Daily News, and on the White House Office of Science and Technology website
- Selected for participation in the NIH Early Career Reviewer program
- Postdoc research highlighted in the Cornell Chronicle, and a special issue of Tissue Engineering Part A
- Graduate research highlighted in numerous media outlets, including MSNBC and US News and World Report
- Awarded GAANN graduate research fellowship at Cornell University
- John F. Flagg Prize recipient for highest graduating GPA in University of Rochester physics
- Phi Beta Kappa inductee (in Junior year)
- Sigma Pi Sigma physics honor society inductee

PROFESSIONAL AND SERVICE

Mentoring

Virginia Tech – Wake Forest (as faculty advisor): *PhD*: Jill Ivey, Megan Cox, Brittany Balhouse, Ishan Goswami (co-advising with Dr. von Spakovsky); *Undergraduate*: Current – Andrea Kuliasha, Robert Accolla, Sara Peterson; Previous – Megan Richardson (REU student), Ryan Watral, Eileen Cheng, Casey Patnode (REU student), Logan Patterson, Sebastian Shaner, Tyler Davidson, Kara Ford, Meryl Suresh, Courtney Robertson, Jay Chaniyara.; *PhD Committee member for*: Current - Mahesh Devarasetty, Sai Ma, Ben Heithoff, Mohammad Bonakdar; Graduated - John McQuilling, Patrick Thayer, Joon Cho, Chen Sun, Gaurav Jain
Cornell (as postdoc mentor): *PhD*: Peter Del Nero, Young-Hye Song; *Masters*: Won Hong, Teddy de Groot; *Undergraduate*: Brian Kwee, Guen Bradbury.

Additional Advising and Outreach

- Guided a project focused on cancer mechanics for the NSF-funded Research Experience for Undergraduates (REU) program in multiscale biomechanics at Virginia Tech. The program is lead by Principal Investigator Dr. Pamela VandeVord, and funded for three years starting summer 2014.
- Acting as faculty advisor to the Virginia Tech graduate student chapter of the Biomedical Engineering Society, starting summer 2014. This chapter won the BMES *award for best student chapter* in 2016.
- Acted as judge for the Regional High School Science Fair held at Radford University in 2015 and 2016.

- Designed and ran an activity for the VT IMAGINATION summer camp in 2015 for middle school students, on gels in biomedical research.

Journal Refereeing

- Refereed research papers for numerous journals including *Nature Protocols*, *Plos One*, *Biomaterials*, *Scientific Reports*, *Tissue Engineering*, *Integrative Biology*, *Experimental Cell Research*, *Annals of Oncology*, *Nano Letters*, *Cancer Letters* and the *Journal of Microelectromechanical Systems*.
- Recognized with an *Outstanding Reviewer* award by *Integrative Biology*, for my reviewing service during 2016.

Editorial Board Service

I am currently an Editorial Board member for the journal *Scientific Reports*, published by the Nature Publishing Group.

Grant Review

- Regularly participate in ad-hoc review panels at the NIH and NSF.
- Serve on grant review panels for ICTAS.

Society Membership

Current member of the Biomedical Engineering Society. Past member of the Society for Biomaterials, American Physical Society, American Vacuum Society, and the American Chemical Society.

Additional Service

- Serving on faculty search committee (fall 2016/spring 2017).
- Serving on planning committee (2016) for the new Health Sciences and Technology building at VTCRI.
- 2016, presented as an expert panelist on an NIH grant workshop led by Dr. Irving Allen at Virginia Tech.
- 2016, presented as an expert panelist at the Assistant Professor Mentoring Workshop, offered by the Virginia Tech Provost's office.
- Co-chair several sessions on undergraduate research and cancer technologies at the annual Biomedical Engineering Society meetings.
- Act as abstract reviewer for the annual Biomedical Engineering Society meetings