

Caleb Stine, PhD

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EDUCATION

Doctorate of Philosophy in Biomedical Engineering

School of Biomedical Engineering and Sciences, Virginia Tech-Wake Forest University, Blacksburg, VA

May 2022

Future Professoriate Certificate

Virginia Tech, Blacksburg, VA

May 2022

Bachelor of Science in Mechanical Engineering

Russ College of Engineering, Ohio University, Athens, OH

August 2014

RESEARCH EXPERIENCE

Virginia Tech, Blacksburg, VA

May 2022-Present

Postdoctoral Research Associate

P.I. Dr. Jennifer Munson

- Perform research on interstitial fluid flow and glioma invasion by leveraging *in vitro*, *in vivo*, and *in silico* techniques
- Lead meetings for a multidisciplinary team of researchers involving research projects and professional development
- Train and mentor graduate and undergraduate students

Virginia Tech, Blacksburg, VA

August 2017-May 2022

PhD Candidate

P.I. Dr. Jennifer Munson

Research: Interstitial fluid flow characterization in glioblastoma and device design

- Created novel *in vivo* surgical technique allowing for fluid flow manipulation beneath a cranial window to study interstitial fluid flow magnitude in the brain and study cellular phenomena such as tumor progression
- Designed *in vitro* flow device to modulate flow magnitude through hydrogels compatible with a cell culture insert system
- Developed finite element model of cellular microenvironment to study effect of fluid flow magnitude on autologous chemotaxis with respect to glioma invasion

Clinical Rotation, Roanoke, VA and Winston Salem, NC

Summer 2018

Virginia Tech – Wake Forest School of Medicine

- Worked alongside clinicians to define user needs for future medical device designs
- Observed surgeries, clinical visits with patients, and various cancer treatment methods

TEACHING/MENTORSHIP EXPERIENCE

Departmental Peer Mentor, Virginia Tech Biomedical Engineering Department

2020-2022

Undergraduate Student Mentor, Blacksburg, VA

Undergraduate Research for Credit

2018-2022

Summer REI Program

Summer 2018

Virginia Tech, Blacksburg, VA

Fall 2020

Teaching Assistant

Instructor: Dr. Sara Arena

BMES 2104: Introduction to Biomedical Engineering

PUBLICATIONS

Cornelison RC, Yuan JX, Tate KM, Petrosky A, Beeghly GF, Bloomfield M, Schwager SC, Berr AL, **Stine CA**, Cimini D, Bafakih FF, Mandell JW, Purow BW, Horton BJ, Munson JM. *A patient-designed tissue-engineered model of the infiltrative glioblastoma microenvironment*. Published July 2022.

Stine CA, Munson JM. *Autologous gradient formation under differential interstitial fluid flow environments*. Published January 2022.

McGuire JA, Monclova JL, Slazar Coariti AC, **Stine CA**, Tousisaint Jr. KC, Munson JM, Dillard DA, De Vita R. *Tear Propagation in vaginal tissue under inflation*. Published June 2021.

Stine CA, Munson JM. *Convection enhanced delivery: role of increased interstitial fluid flow in drug delivery*. Published March 2019.

PRESENTATIONS

Stine CA, Munson JM, Kimbrough IF. *Intravital Imaging to Simultaneously Manipulate and Measure Interstitial Fluid Flow and its Effects in Glioblastoma Mouse Model*. GRC 2021. **Cancelled** due to COVID.

Stine CA et al. *Improving Survival in Pediatric Osteosarcoma from Standard of Care to Relapse*. 2019, Integrated Mathematical Oncology Workshop 9: Tumor Board Evolution.

Stine CA, Kingsmore KA, Munson JM. *Interstitial Fluid Flow Magnitude and Invasion in Glioma*. University of Limerick Guest Speaker, October 2019.

Stine CA, Kingsmore KA, Munson JM. *Interstitial Fluid Flow in the Tumor Microenvironment*. 2018, Brain Tumor Short Course at Cold Spring Harbor.

POSTERS

Stine CA, Munson JM. *Autologous CXCL12 Gradient Formation around Single Cells in the Glioma Microenvironment*. CRUK-AACR Conference on Engineering and Physical Sciences in Oncology 2019, London, England

Stine CA, Kingsmore KA, Munson JM. *High Throughput System for Analyzing Effect of Differential Interstitial Fluid Flow Rates*. BMES 2018, Atlanta, GA

LEADERSHIP AND INVOLVEMENT

Volunteer, Blue Ridge Highlands Regional Science Fair Judge, *Radford, VA*

March, 2018 - 2022

Volunteer, VT Science Festival, *Virginia Tech*

October 2018-2021

Participant, AIMBE Anti-Racist Summit

January 2021

Volunteer, Tutor, *Blacksburg Refugee Partnership*

January 2018-2020

Selected attendee, Brain Tumor Short Course, *Cold Springs Harbor, NY*

August 7-13, 2018

Volunteer, Science Olympiad, *Virginia Tech*

December 2, 2017

Volunteer, USA Science and Engineering Festival, *Washington, DC*

April 17, 2015

Member, Pi Tau Sigma Mechanical Engineering Honor Society, *Ohio University*

November 2012-May 2014

TECHNICAL SKILLS

Cell Culture: 3D gel in vitro model of tumor microenvironment, human and murine cancer cell lines, microfluidic device design/handling/analysis, cell tracking and counting

Imaging: confocal microscopy including z-stack, tile scan, FRAP, and multiphoton, brightfield, fluorescence microscopy including live imaging and time lapse, intravital imaging on mice, experience with Nikon, Zeiss, and Olympus microscopes/software

Animal: rodent handling and husbandry, IP injection, tail vein injection, subcutaneous injection, retro-orbital injection, cranial window surgery (mouse), cranial window and cannula surgery (mouse), skull thinning surgery (mouse), cardiac perfusion, intracranial injection (mouse), convection enhanced delivery (mouse), brain dissection (mouse)

Software: Matlab, ImageJ, CellProfiler, AutoCAD, Solid Edge, Inventor, COMSOL, GraphPad Prism, Zen, Meshmixer, Cura, JMP, Minitab, C++ Programming, Interactive C, Simulink, EES, Arduino

AWARDS AND FELLOWSHIPS

Virginia Tech **Pratt Fellowship** (2017-2018)

WORK EXPERIENCE

Mechanical Engineer, Bechtel, *Reston, VA*

November 2015-July 2017

- Designed HVAC systems for industrial buildings within the nuclear industry
- Originated and revised heating and cooling calculations, ventilation and instrumentation diagrams, airflow diagrams, fan static calculations, insulation thickness calculations, and duct sizing calculations

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- Led technical discussion for topics relating to the HVAC field

Project Engineer, Roki America Co., Ltd., *Findlay, OH*

November 2014-June 2015

- Serviced automotive industry through design and production of air and oil filtration systems for Honda, Toyota, and Nissan
- Implemented a new design modification which reduced waste by 2,500 parts per week and served as project lead for new model filtration systems
- Assisted in creating and leading improvement event which saved company approximately \$100,000/year

PROJECT EXPERIENCE

Senior Design Capstone, *Ohio University*

- Participated in a year-long course focusing on application of engineering knowledge
- Designed and manufactured custom-built machine for local farmer using FEA, 3D modeling, and hand calculations
- Won Silver Award from the James F. Lincoln ARC Welding Foundation for structural welding

Special Projects Course, *Ohio University*

- Refurbished automatic basketball shooter for wheelchair accessibility
- Designed and built mechanical component for a senior design team