KYLE STEVEN MARTIN, PH.D.

CONTACT INFORMATION

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EDUCATION

Ph.D.	*University of Virginia*, Department of Biomedical Engineering, Charlottesville, VA	2015
	Dissertation: "Agent-based modeling of skeletal muscle adaptation"	
	Advisers: Shayn Peirce-Cottler and Silvia Salinas Blemker	
B.S.	*Drexel University*, Department of Biomedical Engineering, Philadelphia, PA	2009
	Senior design project: "Development of a venturi foam eductor for firefighting applications"	

AWARDS

Whitaker International Scholarship, *Karolinska Institutet*	2017
Wenner-Gren Fellowship, awarded but declined, *Karolinska Institutet*	2017
Cardiovascular Research Postdoctoral Training Grant, NIH 4T32HL007284-39, *University of Virginia*	2016
Image-Based Biomedical Modeling (IBBM) fellowship, *Scientific Computing and Imaging Institute*	2014
One of fifteen fellowship recipients to invited to a summer course on image-based modeling techniques	
American Society of Biomechanics President's award, *World Congress of Biomechanics*	2014
SEAS Graduate Teaching Fellowship, *University of Virginia*	2013
One of five recipients to receive a paid fellowship to co-instruct an undergraduate course	
Tomorrow's Professor Today, *University of Virginia*	2013
A graduate student teaching program where participants focus on improving teaching abilities	
Cardiovascular Research Graduate Student Training Grant, NIH 5T32HL007284, *University of Virginia*	2010
Double-Hoo Scholarship, *University of Virginia*	2010
Graduate student mentorship grant awarded to fund a research project with one undergraduate	

RESEARCH

Positions

Karolinska Institutet, Sweden

Post-Doctoral Researcher   2017 - present

My research focuses on inter-organ communication. Organs communicate to one another in response to changes in metabolic demands. For instance, exercised muscles release signals that aid in reducing body fat and insulin resistance while improving cardiovascular function. Through the use of microfluidic devices, I am exploring paired organ relationships, such as skeletal muscle to liver or adipose to neuron signaling.

University of Virginia, USA

Post-Doctoral Researcher   2016 - 2017

Severe muscle injuries, such as volumetric muscle loss, involves the disruption of many biological systems that work congruently to function (muscle, nervous system, vasculature, etc.). While the effects of injury on muscle

fibers are actively researched, the blood vessels and nerves are less studied. My project focuses on understanding the native vasculature and nervous system in muscle before and after volumetric injury.

Graduate Research Assistant   2009 – 2015

I developed a novel tissue level agent-based model of skeletal muscle and used the model to simulate muscle adaptation. The first application was to investigate disuse-induced muscle atrophy. Through the inclusion of muscle injury and inflammation, current model simulations focus on how muscles remodel and recovery after injury (contusion/crush/laceration). Modulation of the temporal patterning of inflammatory cells (neutrophils, pro or anti-inflammatory macrophages) 1) elucidates the importance of inflammatory cell timing during muscle regeneration and 2) provides insight into optimum timing/duration of therapeutics during muscle recovery.

Journal Publications

JA Call, J Donet, **KS Martin**, AK Sharma, …Z Yan. "Muscle-derived extracellular superoxide dismutase inhibits endothelial activation and protects against multiple organ dysfunction syndrome in mice" *Free Radical Biology & Medicine*, October 2017

CC Henry, **KS Martin**, BB Ward, GG Handsfield SM Peirce, SS Blemker. "Spatial and age-related changes in the microstructure of dystrophic and healthy diaphragms" *PloS one*, September 2017

KS Martin, CD Kegelman, KM Virgilio, JA Passipieri, GJ Christ, SS Blemker, SM Peirce. "In silico and in vivo experiments reveal M-CSF injections accelerate regeneration following muscle laceration" *Annals of Biomedical engineering,* March 2017

KS Martin, KM Virgilio, SM Peirce, SS Blemker. "Computational modeling of muscle regeneration and adaptation to advance muscle tissue regeneration strategies" *Cells, Tissues, Organs,* November 2016

KS Martin, SS Blemker, SM Peirce. "Agent-based computational model investigates muscle-specific responses to disuse-induced atrophy" *Journal of Applied Physiology,* May 2015

> **-** *Featured in the editorial:* An, Gary. *Journal of Applied Physiology,* May 2015
> **-** *Editor's pick:* June 2015

KM Virgilio, **KS Martin**, SM Peirce, SS Blemker. "Multiscale models of skeletal muscle reveal the complex effects of muscular dystrophy on tissue mechanics and damage susceptibility" *Interface Focus*. February 2015

JA Call, KH Chain, **KS Martin**, VA Lira, M Okutsu, M Zhang, Z Yan. "Enhanced skeletal muscle expression of EcSOD mitigates streptozotocin-induced diabetic cardiomyopathy by reducing oxidative stress and aberrant cell signaling" *Circulation: Heart Failure*. Dec 2014

M Okutsu, JA Call, VA Lira, M Zhang, JA Donet, BA French, **KS Martin**, SM Peirce, CM Rembold, BH Annex, Z Yan. "Extracellular Superoxide Dismutase Ameliorates Skeletal Muscle Abnormalities, Cachexia and Exercise Intolerance in Mice with Congestive Heart Failure" *Circulation: Heart Failure*. May 2014

AO Awojoodu, ME Ogle, LS Sefcik, DT Bowers, **KS Martin**, KL Brayman, KR Lynch, SM Peirce, E Botchwey. "Sphingosine 1-phosphate receptor 3 regulates recruitment of anti-inflammatory monocytes to microvessels during implant arteriogenesis" *Proceedings of the National Academy of Sciences*. August 2014

AM Guendel*, **KS Martin***, J Cutts, PL Foley, AM Bailey, F Mac Gabhann, TR Cardinal, SM Peirce. "Murine Spinotrapezius Model to Assess the Impact of Arteriolar Ligation on Microvascular Function and Remodeling" *Journal of Visualized Experiments*. March 2013 (* authors contributed equally)

M Zhang, M Huang, C Le, PB Zanzonico, F Claus, KS Kolbert, **KS Martin**, CC Ling, JA Koutcher, JL Humm. "Accuracy and reproducibility of tumor positioning during prolonged and multimodality animal imaging studies" *Physics in Medicine and Biology*. October 2008

Presentations

KS Martin, KM Virgilio, SM Peirce, SS Blemker. "Agent-based model of inflammation and regeneration following contraction-induced muscle injury" American Society of Biomechanics Annual Meeting. August 2015, Columbus, OH

KS Martin "Agent based modeling of skeletal muscle atrophy and inflammation" University of Kentucky, Center for Muscle Biology Forum. May 2015, Lexington, KY

KS Martin. "Vascular adaptations in response to exercise" University of Virginia Graduate Biomedical Engineering Society symposium. September 2012, Charlottesville, VA

Posters

KS Martin, KM Virgilio, JA Passipieri, C Kegelman, G Christ, SM Peirce, SS Blemker. "Computational Model-Driven Design of a Pharmacological Intervention During Muscle Regeneration" BMES annual meeting. October 2016, Minneapolis, Mn

E Mintz, JA Passipieri, **KS Martin**, S Poonam, G Christ. "Satellite Cell Enhancement of Tissue Engineered Muscle Repair Technologies for the Treatment of Volumetric Muscle Loss" BMES annual meeting. October 2016, Minneapolis, Mn

KS Martin, KM Virgilio, JA Passipieri, C Kegelman, G Christ, SM Peirce, SS Blemker. "Guiding muscle injury experiments using an agent based computational model" Advances in Skeletal Muscle Biology in Health and Disease. January 2016, Gainesville, FL

KM Virgilio, **KS Martin**, SM Peirce, SS Blemker. "Multiscale computational models recapitulate progression of fibrosis in dystrophic muscle" Advances in Skeletal Muscle Biology in Health and Disease. January 2016, Gainesville, FL

KM Virgilio, **KS Martin**, SM Peirce, SS Blemker. "Multiscale models predict how accumulated microtears lead to acute muscle injury. August 2015, Columbus, OH

KS Martin, CC Henry, SS Blemker, SM Peirce. "Intramuscular sarcomere length variability in ageing healthy mouse diaphragm muscle" Biomedical Engineering Society Annual Meeting. October 2014, San Antonio, TX

KS Martin, SS Blemker, SM Peirce. "Agent-based model of skeletal muscle tissue predicts immobilization-induced remodeling" World Congress of Biomechanics. July 2014, Boston, MA

CC Henry, **KS Martin**, D Webber, G Handsfield, BB Ward, SM Peirce, SS Blemker. "Structural Analysis of Healthy and Dystrophic Diaphragms" World Congress of Biomechanics. July 2014, Boston, MA

KS Martin, VA Lira, KR Lynch, Z Yan, SM Peirce. "Sphingosine 1 Phosphate in chronic exercise" University of Virginia muscle symposium. November 2012, Charlottesville, VA

B Torstrick, **KS Martin**, SM Peirce. "Induction of murine spinotrapezius ischemia using an affordable cauterization technique" Angiogenesis: Advances in basic science and therapeutic applications. January 2012, Snowbird, UT

Drexel University

Co-ops (6-month internships)

Tetralogic Pharmaceutics. *Research Assistant*, Department of Biology.   2008
    Evaluated novel compounds designed to degrade cIAPs for cancer treatment. Performed western blots, cell culturing, ELISAs, and plasmid transfections to analyze apoptosis inducing compounds

ALS Hope Foundation. *Research Assistant*.   2007
    Performed drug trials, fatigue experiments, and histological analysis of the central nervous system using a mutant SOD1 mouse model. Also tested drugs on motor neuron/glial cell co-cultures

Memorial Sloan-Kettering Cancer Center. *Research Assistant,* Department of Nuclear Physics   2006
    Worked alongside a graduate student on multimodal imaging of rat tumors, and subsequent analysis/alignment of these images. Analyzed data from gamma camera and CT scans.

TEACHING

University of Virginia

Guest lecturer

Human Physiology (BME2102)	2016 - 2017
Assisted in syllabus design, coursework, grading, and teaching	
Engineering Physiology (BME6101)	2013 - 2015
Administered and graded the oral final exam	
Systems Bioengineering Modeling and Experimentation (BME 4550)	2014
Developed and delivered 3 lectures on performing sensitivity analysis and model construction.	
Computational principles of Biomedical engineering (BME 6440)	2014
Taught graduate students various computational techniques (optimization, root finding)	
Motion Biomechanics (BME 4280/6280)	2014
Prepared and lectured on muscle adaptation to stimulation and disease	

Co-Instructor

Biomedical Engineering: Design and Discovery (BME2000)	2013
Created the syllabus, lectured 1/3rd of the course, co-wrote and graded both the midterm and final exams	

Teaching Assistant

Biomedical Engineering: Capstone Design (BME4063/4064)	2011
Lead group discussions and assisted groups during their 4th year design projects	

Undergraduate Student Mentoring

Madeleine McDonald "Reproducibility in creating skeletal muscle constructs"	2017
Katherine Crump and John Hanckel "Modelling muscle atrophy during space flight"	2017
Catherine Henry "Investigation of non-uniform sarcomere lengths in the mouse diaphragm"	2013 - 2016
Chris Kegelman and Ruba Shalhoub "Sarcomere adaptations during muscle-tendon transfer"	2015
Bridget Ward "Microscale muscle analysis of healthy and dystrophic diaphragm"	2013
Brennan Torstrick "Induction of murine spinotrapezius ischemia via cauterization"	2011 - 2012
Julie Kokinos "Diaphragm Modeling in Duchenne Muscular Dystrophy"	2012
Ross Gordon "Immunogenic response to PCL-PEO nanoparticles"	2010
Grace Stuntz "Creation of a novel aortic flow system"	2010
Scott Schubert "Effects of combination drug treatment on smooth muscle cells"	2010
Caryn Just "Evaluation of thin films vs electrospun mats for intraluminal use"	2010

Posters

KS Martin "Works in Progress: Development of a need-based BME design course focused on current NICU challenges" ASEE 121st annual conference, June 2014, Indianapolis, IN

Charlottesville, Virginia

Instructor

SwingCville	2011 - 2017
Taught swing dancing (Lindy hop, Balboa, Charleston, East coast swing, and Blues) to all levels of students.	

PROFESSIONAL SERVICE AND OUTREACH

Affiliations

Biomedical Engineering Society	2014 - Present
American Society for Engineering Education	2014 - Present

Professional Service and outreach

BMES Teaching Panel, *University of Virginia*, Co-organizer and moderator 2014
    Planned a teaching focused panel for undergraduates, graduates, and post docs.
    Invited UVa alumni to share their experiences in teaching and research during their career.

Day in the Life, *Zion Union Baptist Church,* Tutor 2014 - 2015
    Tutored K – 12 students in all subjects

Mini-Med Laboratory Night Best Practices, *University of Virginia* 2011 - 2013
    Educated participants of Mini-Med (a UVa program open to the community) about
    current medical research being conducted at UVa. Participated once a year

Led science demo for 3-5th grade visitors to BME at UVA 2014 - 2015
    Showed students how cell culturing works and looked at cheek cells under a microscope

REFERENCES

Shayn Peirce-Cottler, Professor
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