

# KYLE STEVEN MARTIN, PH.D.

---

## CONTACT INFORMATION

ksm5ha@virginia.edu  
kyle.s.martin@gmail.com  
<http://ksm362.github.io/>

## EDUCATION

---

Ph.D.	<i>University of Virginia</i> , Department of Biomedical Engineering, Charlottesville, VA Dissertation: "Agent-based modeling of skeletal muscle adaptation" Advisers: Shayn Peirce-Cottler and Silvia Salinas Blemker	2015
B.S.	<i>Drexel University</i> , Department of Biomedical Engineering, Philadelphia, PA	2009

## AWARDS

---

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

## 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.

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 Kegelmann, 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**, AF Kahrl, BM Ivanov, MA Johnson. "Copulation rates in anole lizards are correlated with muscle damage" The Society for Integrative and Comparative Biology Annual Meeting. Jan 2018, San Francisco, CA

**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. Aug 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. Sept 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” Biomedical Engineering Society Annual Meeting. Oct 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. Oct 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. Jan 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. Jan 2016, Gainesville, FL

KM Virgilio, **KS Martin**, SM Peirce, SS Blemker. “Multiscale models predict how accumulated microtears lead to acute muscle injury. Aug 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. Oct 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. Nov 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. Jan 2012, Snowbird, UT

### Drexel University

#### Co-ops (6-month internships)

Tetralogic Pharmaceuticals. <i>Research Assistant</i> , 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. <i>Research Assistant</i> .	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/glia cell co-cultures	
Memorial Sloan-Kettering Cancer Center. <i>Research Assistant</i> , 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 1/3 <sup>rd</sup> 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 4 <sup>th</sup> 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 121<sup>st</sup> 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, <i>University of Virginia</i> , Co-organizer and moderator 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.	2014
Day in the Life, <i>Zion Union Baptist Church</i> , Tutor Tutored K – 12 students in all subjects	2014 - 2015
Mini-Med Laboratory Night Best Practices, <i>University of Virginia</i> Educated participants of Mini-Med (a UVa program open to the community) about current medical research being conducted at UVa. Participated once a year	2011 - 2013
Led science demo for 3-5 <sup>th</sup> grade visitors to BME at UVa Showed students how cell culturing works and looked at cheek cells under a microscope	2014 - 2015

## REFERENCES

---

Shayn Peirce-Cottler, Professor  
Department of Biomedical Engineering  
Department of Ophthalmology  
University of Virginia  
Box 800759 Health System, 415 Lane Road  
Charlottesville, VA 22908  
434 243 5795 Office  
shayn@virginia.edu

Jason Papin, Professor  
Department of Biomedical Engineering  
University of Virginia  
Box 800759 Health System, 415 Lane Road  
Charlottesville, VA 22908  
434 924 8195 Office  
papin@virginia.edu

Silvia Salinas Blemker, Professor  
Department of Biomedical Engineering  
Department of Mechanical and Aerospace Engineering  
University of Virginia  
Box 800759 Health System, 415 Lane Road  
Charlottesville, VA 22904  
434 924 6291 Office  
ssblemker@virginia.edu

Zhen Yan, Professor  
School of Medicine  
Robert M. Berne Cardiovascular Research Medicine  
University of Virginia  
409 Lane Road, MR4 – 6041A  
434 982 3139 Office  
zhen.yan@virginia.edu

George J Christ, Professor  
Department of Biomedical Engineering  
Department of Orthopaedic Research  
University of Virginia  
Box 800759 Health System, 415 Lane Road  
Charlottesville, VA 22904  
434 924 5794 Office  
gjc8w@virginia.edu