KYLE STEVEN MARTIN, PH.D.

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

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

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

Tomorrow's Professor Today, *University of Virginia* 2013

Cardiovascular Research Graduate Student Training Grant, NIH 5T32HL007284, *University of Virginia* 2010

Double-Hoo Scholarship, *University of Virginia* 2010

RESEARCH

Positions

Karolinska Institutet, Sweden

Post-Doctoral Researcher, *Jorge Ruas lab* 2017 - present
My research focuses on inter-organ communication. Organs communicate to one another in response to changes in metabolic demands. Through the use of microfluidic devices, I am exploring the interaction between adipocytes and sensory neurons. Specifically, I am interested in how sensory neurons innervate and regulate adipocytes/modify the production of secreted factors.

University of Virginia, USA

Post-Doctoral Researcher, *George Christ Lab* 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 focused on understanding the native vasculature and nervous system in muscle before and after volumetric injury.

Graduate Student, *Labs of Silvia Blemker and Shayn Peirce-Cottler* 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

KM Virgilio, **KS Martin**, SM Peirce, SS Blemker. “Agent-based model illustrates the role of the micro-environment in regeneration in healthy and mdx skeletal muscle” *Journal of Applied Physiology*, August 2018

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, 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. Jan 2012, Snowbird, UT

TEACHING

Guest lecturer

Advanced Physiology (HL2018), *Karolinska Institutet* 2018
Ran a circulation and respiration lab for undergraduates

Human Physiology (BME2102), *University of Virginia* 2016 - 2017
Assisted in syllabus design, coursework, grading, and teaching

Engineering Physiology (BME6101), *University of Virginia* 2013 - 2015
Administered and graded the oral final exam

Systems Bioengineering Modeling and Experimentation (BME 4550), *University of Virginia* 2014
Developed and delivered 3 lectures on performing sensitivity analysis and model construction.

Computational principles of Biomedical engineering (BME 6440), *University of Virginia* 2014
Taught graduate students various computational techniques (optimization, root finding)

Motion Biomechanics (BME 4280/6280), *University of Virginia* 2014
Prepared and lectured on muscle adaptation to stimulation and disease

Co-Instructor

Biomedical Engineering: Design and Discovery (BME2000), *University of Virginia* 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), *University of Virginia* 2011

Undergraduate Student Mentoring, University of Virginia

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

Other Teaching

Instructor

Socialdansutskottet (Swedish Swing Society), *Stockholm, Sweden* 2018 - present
Taught blues dancing to all levels of students.

SwingCville, *Charlottesville, Virginia* 2011 - 2017
Taught swing dancing (Lindy hop, Balboa, Charleston, East coast swing, and Blues) to all levels of students on a weekly basis.

PROFESSIONAL SERVICE AND OUTREACH

Affiliations

Biomedical Engineering Society 2014 - Present
American Society for Engineering Education 2014 - Present
Society of Integrative and Comparative Biology 2017 - 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,* Volunteer 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
Department of Biomedical Engineering
Department of Ophthalmology
University of Virginia
Box 800759 Health System, 415 Lane Road
Charlottesville, VA 22908
434 243 5795 Office
smp6p@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

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

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

Jorge Ruas, Associate Professor
Department of Physiology and Pharmacology
Karolinska Institutet
Solna Vägen 9, C5 171 65 Solna, Sweden
+46 (0) 8-524 872 61 Office
Jorge.Ruas@ki.se