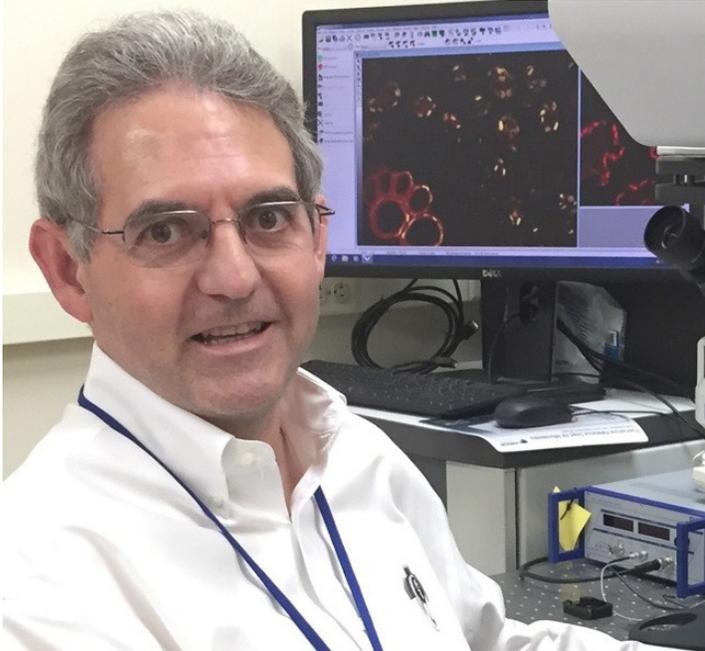


# The Microcirculatory Society

## NEWSLETTER

*Greetings!*



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This has been a very exciting summer for our Society! Our MCS Trainee Committee was formally established and this group has already made major enhancements to our Society's social media presence ([see page 8](#)). I encourage you to visit the various MCS social media sites and send us your comments and suggestions. MCS Council members have been active in recruiting and retaining MCS members; we have seen significant results from their efforts and anticipate these to increase. I encourage all MCS members to follow Council's lead and help incentivize colleagues to join (and/or re-join) our Society. Here is a link ([www.microcirc.info/2015Brochure.pdf](http://www.microcirc.info/2015Brochure.pdf)) to the updated MCS recruitment brochure listing a number of the significant benefits of membership in our Society. Please contact our Executive Director, Bernadette Englert ([executivedirector@microcirc.org](mailto:executivedirector@microcirc.org)) if you wish to receive printed copies of this brochure to distribute to your colleagues. MCS Council has also been exploring strategies to promote member enthusiasm in our Society; two new initiatives will be revealed at the MCS Business meeting at the 10th World Congress for Microcirculation in Kyoto Japan, on September 26, 2015. At that meeting, I will also summarize the MCS strategic planning initiative. The MCS will have a substantial presence at the World Congress, far beyond the two symposia sponsored by our Society. As evident from the program (<http://www.congre.co.jp/wcmic2015/html/program/program.html>), MCS members will participate as chairs and/or speakers in two-third of the symposia in both the satellite symposium and the primary meeting. The world congress represents a fabulous opportunity for all MCS members, particularly trainees. I am very excited about participating in this meeting and I look forward to seeing you in Kyoto!

Best,  
Rolando Rumbaut, MCS President

# MEETINGS

## 10<sup>TH</sup> WORLD CONGRESS FOR MICROCIRCULATION

KYOTO, JAPAN SEPTEMBER 25-27, 2015

<http://www.congre.co.jp/wcmic2015/index.html>

### Symposia

Pericytes and Microcirculation

Endogenous Mediators of Endothelial Barrier stability: Metabolism and Tumor Microcirculation/Angiogenesis

Recent Advances in Angiogenesis & Lymphangiogenesis

Structure and Function of the Endothelial Glycocalyx

New Insights into Immune Cell Regulation in Microcirculation\*

Impact of Mitochondrial Function on Vascular Function and Disease

Microvascular Remodeling in the Coronary Circulation

Recent Advances in Cerebral Microcirculation

The role of EDRF (NO and EDHF), H<sub>2</sub>S and CO in Microcirculation

Young Investigators Symposium

What Can Mass Spectrometric Analysis Offer? -Bridge Between Local Metabolism and Microvascular Functions

Bone Microcirculation: A Potential Therapeutic Target  
Metabolics, Flowmotion and Vascular Control

Microvascular Plasticity and Developmental Priming: Impact on Human Health

Inflammation, Oxidative Stress and microRNAs in Vascularization

TRP Channels and Vascular Disease

Myeloid Cell Trafficking in Disease

Microvascular Plasticity in Health and Disease

Mechanobiology: Roles of Cellular and Non-Cellular Elements\*

Building Vascular Networks: Determination, Randomness and Functional Control

Platelets: Key Mediators of Inflammation in the Microcirculation

Disease Intervention: Targeting the Microcirculation

### Plenary lectures

Targeting Endothelial Metabolism: Principles and Strategies  
Peter Carmeliet  
Katholieke Universiteit Leuven, Belgium

Catching Pathogens in the Microcirculation  
Paul Kubes  
University of Calgary, Alberta, Canada

Mapping Oxygen in the Brain of Awake Resting Mice  
Serge Charpak  
Paris Descartes University, Paris, France

\*Supported by The Microcirculatory Society, Inc.



Also, don't miss the  
Satellite Symposium  
on September 24

The 40th Annual Meeting of the  
Japanese Society for Microcirculation

**Theme: Frontline of Research on  
Organ Microcirculation**

<http://www.congre.co.jp/wcmic2015/html/satellite/satellite.html#Scientific>

# MEETINGS

## EXPERIMENTAL BIOLOGY 2016 APRIL 2-6, 2016

SAN DIEGO CONVENTION CENTER

### PRELIMINARY SCHEDULE

#### SESSIONS

#### SPECIAL EVENTS

Saturday, April 2

#### President's Symposium: Blood Cell- Microvessel Interactions

Chair: Rolando Rumbaut, Baylor  
College of Medicine

#### Signal Integration and Microcirculatory Blood Flow Control

Chair: Dwayne Jackson, University  
of Western Ontario

#### Advances in Microvascular Permeability/Glycocalyx

Chair: Jerome Breslin, University  
of South Florida

Sunday, April 3

#### Highlights of the Journal of Microcirculation

Chair: Jefferson Frisbee, West  
Virginia University

#### RECEPTION & POSTER DISCUSSIONS

Saturday, April 2 & Sunday, April 3

#### LANDIS AWARD DR. STEVEN SEGAL

University of Missouri  
Sunday, April 3

#### MICROCIRCULATORY SOCIETY MEMBERSHIP BUSINESS MEETING

Sunday, April 3

#### GABOR KALEY LECTURE\* DR. SUSSAN NOURSHARGH

Barts and The London  
School of Medicine

Tuesday, April 5

*\*Held in conjunction with the  
American Physiological Society*

Abstract Submission Deadline: Thursday, November 5, 2015

List of MCS Topic Categories available at: <http://www.microcirc.info/AnnMtg2016.html>



## FEATURED YOUNG INVESTIGATOR'S RECENT STUDY IN *MICROCIRCULATION*\*

from Volume 22 Issue 5 - July 2015

### COMPUTATIONAL NETWORK MODEL PREDICTION OF HEMODYNAMIC ALTERATIONS DUE TO ARTERIOLAR RAREFACTION AND ESTIMATION OF SKELETAL MUSCLE PERFUSION IN PERIPHERAL ARTERIAL DISEASE

Featuring: **Joshua Heuslein, Graduate Student, University of Virginia**



Peripheral arterial disease (PAD) is caused by atherosclerotic plaque formation in the peripheral limb vasculature, resulting in reduced blood flow to the lower extremities. While surgical and catheter-based revascularization approaches can restore ankle-brachial index (ABI), many patients experience no significant improvement in tissue perfusion. Emerging therapeutic strategies have entailed the delivery of cells and/or growth factors to restore downstream tissue perfusion via arteriogenesis and angiogenesis. However, to date, large-scale therapeutic clinical trials have been largely unsuccessful. These failures have highlighted a critical need to improve our understanding of the basic mechanisms of vascular remodeling in order to achieve eventual therapeutic success.

The lack of improved perfusion following revascularization highlights an underlying microvascular dysfunction that elevates hydraulic microvascular resistance. While the decreased capillary density observed in PAD patients may contribute toward this impaired reperfusion, blood flow is also largely governed by terminal arterioles upstream of the capillaries. Moreover, though arteriolar rarefaction had been observed in pathological conditions previously, its role in PAD remained unknown. In our study (*Microcirculation* 22 (5):360-369), we adapted a computational network model of the gastrocnemius muscle microcirculation in order to estimate the relative influence of input pressure (ABI) restoration and arteriole rarefaction on perfusion. We found that muscle perfusion becomes disproportionately less sensitive to ABI restoration as arteriole rarefaction increases due to a non-linear increase in microvascular resistance with increasing arteriole rarefaction. Additionally, using arteriolar density measurements from PAD patients, we simulated the isolated effects of exercise and/or percutaneous therapeutic interventions in our model. In model simulations of PAD, perfusion was restored to the greatest extent when exercise training and ABI restoration were simulated simultaneously. These results highlight the importance of restoring both microvascular structure and upstream input pressure in PAD therapy. Future strategies utilizing concomitant targeting of upstream pressure restoration via arteriogenesis or percutaneous intervention and repair of microvascular function may prove a more effective therapeutic approach for patients suffering from PAD.

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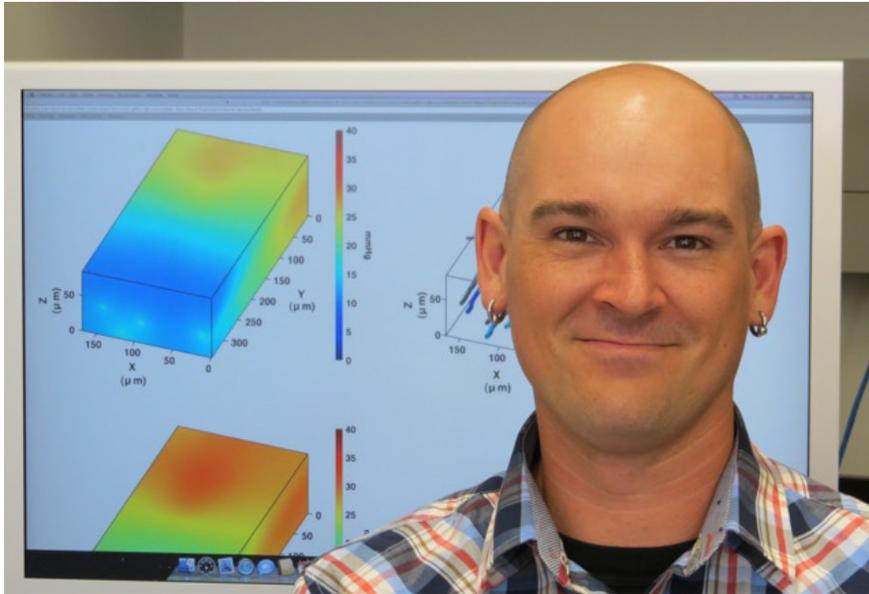
\*Note: Featured Articles by Young Investigators will appear in each MCS Newsletter and will be chosen from recent publications in *Microcirculation* our Official Journal. If you have a recent publication in *Microcirculation*, that includes young investigators as authors, and would like your study to be considered for this Featured Article, then send your study and reference to MCS Secretary, W. Lee Murfee, at [secretary@microcirc.org](mailto:secretary@microcirc.org)

## FEATURED YOUNG INVESTIGATOR'S RECENT STUDY IN *MICROCIRCULATION* \*

from Volume 22 Issue 5 - July 2015

### IMPACT OF INCREMENTAL PERFUSION LOSS ON OXYGEN TRANSPORT IN A CAPILLARY NETWORK MATHEMATICAL MODEL

Featuring: **Graham M. Fraser, Graduate Student, University of Western Ontario**



Our recent article modeling how progressive decreases in functional capillary density affect tissue oxygenation has important implications in mathematical modeling and experimental studies of oxygen delivery. Fundamentally one might consider how a loss of flowing capillaries would impact surface area for O<sub>2</sub> delivery and increase diffusion distance from capillaries to tissue. This translates into a larger radius Krogh tissue cylinder and a decrease in tissue oxygenation even if capillary oxygen supply remained fixed. Our model illustrates that under normal metabolic conditions a loss

of perfused capillaries decreases tissue oxygenation almost entirely due to lower red blood cell (RBC) supply rate. Restoration of total RBC supply to baseline restores oxygen delivery and improves tissue PO<sub>2</sub>. This restoration is possible through diffusional exchange within the tissue and between capillaries distributing O<sub>2</sub> within the volume thus improving oxygenation. Therefore, under normal conditions small changes to supply rate and diffusion distance only alter tissue PO<sub>2</sub> in a supply limited fashion.

In capillary networks, when metabolism is increased the tissue is prone to both supply limited delivery and also to diffusion limitation. Due to the spatial heterogeneity of vascular networks, some capillaries lie beyond the limits of diffusional exchange and the increased diffusion distance is a substantial barrier to oxygen delivery. Using the model we have also examined how this transition affects capillary outflow saturation, analogous to the clinical measure of venous saturation (cvSO<sub>2</sub>), and found recovery of capillary outflow saturation would occur prior to restoration of tissue PO<sub>2</sub>. This is important when considering cvSO<sub>2</sub> as an index of oxygen extraction as it may be confounding in the transition from supply to diffusion limited delivery. In our lab, understanding this interplay between oxygen delivery and metabolism reinforces the importance of collecting detailed experimental data to properly model tissue PO<sub>2</sub> changes in both health and disease.

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\*Note: Featured Articles by Young Investigators will appear in each MCS Newsletter and will be chosen from recent publications in *Microcirculation* our Official Journal. If you have a recent publication in *Microcirculation*, that includes young investigators as authors, and would like your study to be considered for this Featured Article, then send your study and reference to MCS Secretary, W. Lee Murfee, at [secretary@microcirc.org](mailto:secretary@microcirc.org)

# Microcirculation

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[Computational Network Model Prediction of Hemodynamic Alterations Due to Arteriolar Rarefaction and Estimation of Skeletal Muscle Perfusion in Peripheral Arterial Disease](#) (pages 360–369)

Joshua L. Heuslein, Xuanyue Li, Kelsey P. Murrell, Brian H. Annex, Shayn M. Peirce and Richard J. Price

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[Peripheral Microvascular Vasodilatory Response to Estradiol and Genistein in Women with Insulin Resistance](#) (pages 391–399)

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[Skeletal Muscle Vascular Function: A Counterbalance of Insulin Action](#) (pages 327–347)

Abeer M. Mahmoud, Michael D. Brown, Shane A. Phillips and Jacob M. Haus

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## STEVEN SEGAL NAMED 2016 LANDIS AWARDEE

July/Aug 2015

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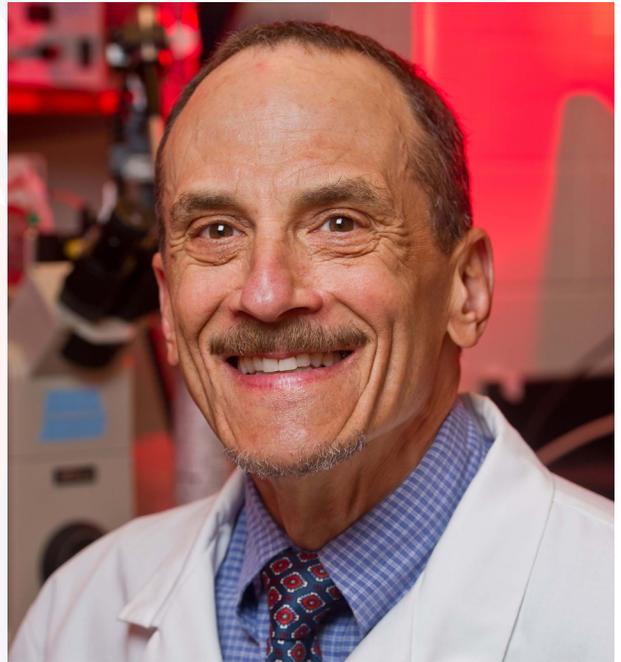
MCS Newsletter

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Dr. Steven Segal received his B.A. and M.A. degrees in Physical Education and Exercise Physiology from the University of California at Berkeley, and a dual Ph.D. in Kinesiology and Physiology from the University of Michigan. He then undertook postdoctoral training at the University of Virginia in the laboratory of Dr. Brian Duling. After spending time on the faculty of the Noll Physiological Research Center at Penn State University, Dr. Segal moved to Yale School of Medicine where he rose through the academic ranks to tenured Professor. He then moved to the Department of Medical Pharmacology and Physiology at the University of Missouri-Columbia, where he currently holds the title of Margaret Proctor Mulligan Professor in Medical Research, and Investigator in the Dalton Cardiovascular Research Center.

Having spent over 35 years in microcirculation research, Dr. Segal has built an international reputation for his foundational work on the local control of blood flow, especially with respect to the role of the microvascular endothelium and smooth muscle in the moment-to-moment control of arteriolar tone. His work on the underlying mechanisms and functional consequences of cell-to-cell communication in the vascular wall have provided new insight into our understanding of how local blood flow is coupled to tissue metabolic demand. Dr. Segal's work is highly valued by his peers for its rigor and technical innovation, and over the years Dr. Segal has successfully integrated a variety of new and powerful tools into his research to more effectively explore the cellular and subcellular processes involved in microvascular control.

Dr. Segal is the author of over 100 peer-reviewed articles and more than 20 invited reviews and book chapters. He has also served as Reviewing Editor for the *Journal of Physiology*, Associate Editor for the *Microcirculatory Society's* journal *Microcirculation*, and on the editorial boards for five other top journals, including the *American Journal of Physiology*, *Heart and Circulatory Physiology*, for more than 20 years.



Dr. Segal has also served on numerous study sections and review groups for the NIH and other funding agencies, and his own research has been continuously funded by the NIH for over 30 years, culminating in a prestigious NIH MERIT Award that has been extended into 2019.

Throughout his career, Dr. Segal has also been an active and fully engaged member of numerous scientific societies. He has served the Microcirculatory Society in a number of important capacities, including President and a member of the MCS Executive Council, and also as a member and chair of several important MCS committees. Dr. Segal is also an Established Investigator of the American Heart Association, a Fellow of the American College of Sports Medicine, a Fellow of the AHA Council on Basic Cardiovascular Sciences, and a Fellow of the American Physiological Society Cardiovascular Section. He has also been the recipient of numerous scientific awards, including the MCS Outstanding Young Investigator Travel Award, the Abbott Microcirculation Award from the European Society for Microcirculation, and the Malpighi award from the European Society for Microcirculation. Dr. Segal's dedication to microvascular research is also embodied in the mentoring he has provided for many students and postdoctoral fellows who have in turn become successful independent scientists in the field.

A big hello to everyone, hopefully your summer is going swell and that you've found time to have some quality R & R. As you know MCS has set up a trainee committee in an effort to encourage the trainee involvement within the MCS society. Based on feedback from our committee members, we have identified that one area MCS can grow is our social media presence. The hope is that by improving our social media relevance we will facilitate the growth of the society as well as offer new, and perhaps more efficient ways, of delivering news to our members, and prospective members. That being said below are the links to our various social media sites



Our Facebook site offers updates on upcoming conferences, abstract deadlines, awards/grants, along with biographies about our members. This site will update almost daily. The beauty of this social media platform is it allows for members to interact with one another as well as the Society. Not sure if they have the date right for an abstract deadline? Leave a comment on our page and someone will get back to you! Not sure whether EB 2019 is in San Diego or Boston? Post on the MCS Facebook page and you'll get a response (By the way I think EB 2019 is in Orlando). Also make sure to like the page so that any updates we make will show on your newsfeed.



Make sure you also follow us on Twitter. Our twitter site offers the similar updates as our Facebook page, but we post general information about what is happening in the world of science! Increased government funding announced to the NIH! We'll tweet that! New imaging technique for cerebral microvasculature! We'll tweet that, too. 10 ways to improve your abstract writing skills, we'll tweet it! Following us on twitter will alert you to happenings within MCS and beyond in real time. Also, if you have twitter, feel free to ask us questions, just tweet to @The\_MCSociety, and we will tweet you back. Where is the location of the San Diego Conference Centre for EB 2016? We'll tweet you back (just so you know its 111 W Harbor Dr, San Diego, CA 92101, United States). Make sure to follow us so that any news we tweet will be displayed on your twitter feed.



The MCS also has other social sites that are currently being improved, so check them out and join our LinkedIn group and Instagram page (@microcirculation\_society).



*Click on the icons to go to the sites.*

## CALL FOR NOMINATIONS FOR OFFICERS 2016-2017

MCS is currently seeking nominations for President-elect, Treasurer and Councilor. At the last Membership Business Meeting, the members voted to change the term of President from one year to two years. Therefore, someone elected to President-elect will serve one year as President-elect, two years as President and one year as Immediate Past President. The position of Treasurer is a 2.25 year term, so that there is overlap with the new Treasurer. Councilors serve three-year terms.

To nominate a colleague, please complete the form on our web site (<http://microcirc.org>) - since only members in good standing can make nominations, you must be logged in. Once logged in, you will see a "Council" menu item at the right, under that menu is the Nominations Form. Complete the form and submit it. The Nominating Committee, chaired by Cynthia Meininger, will review the submissions those with the most votes will be invited to run for office. More details can be found on the web page.

*Thank you for participating in the affairs of the society.*

The current list of officers and Councilors can be found on page 9 and on our web site under "About Us."

# CALENDAR

## UPCOMING MEETINGS

### [The Fourteenth International Conference on Endothelin](#)

Savannah, GA – September 2-5, 2015

### [Physiological Bioenergetics: From Bench to Bedside](#)

Tampa, FL – September 9-12, 2015

### [Hypertension Scientific Sessions 2015](#)

San Francisco, CA – September 9-12, 2015

### [10th World Congress for Microcirculation](#)

Kyoto, Japan – September 25-27, 2015

### [The Third Circulation: Lymphatics as Regulators in Health and Disease](#)

Bethesda, MD - September 29-30, 2015

### [Biomedical Engineering Society Annual Meeting](#)

Tampa, FL – October 7-10, 2015

### [Vascular Biology 2015](#)

Hyannis, MA – October 18-22, 2015

### [AHA Scientific Sessions](#)

Orlando, FL - November 7-11, 2015

### [19th International Vascular Biology Meeting](#)

Boston, MA - October 30-November 3, 2016

## CURRENT MCS OFFICERS & EXECUTIVE COUNCIL, 2015-2016

TITLE	NAME	TERM ENDS	EMAIL
President	Rolando Rumbaut	2016	President@microcirc.org
President-elect	William Chilian	2016	PresidentElect@microcirc.org
Past-President	Mary (Molly) D. Frame	2016	PastPresident@microcirc.org
Secretary	W. Lee Murfee	2017	Secretary@microcirc.org
Treasurer	Shayn Peirce-Cottler	2016	Treasurer@microcirc.org
Councilor	Anatoliy A. Gashev	2016	gashev@tamu.edu
Councilor	Dwayne N. Jackson	2016	dwayne.jackson@schulich.uwo.ca
Councilor	Jerry Breslin	2017	jbreslin@health.usf.edu
Councilor	Kim Dora	2017	kim.dora@pharm.ox.ac.uk
Councilor	Mariappan Muthuchamy	2018	marim@tamu.edu
Councilor	Karen Stokes	2018	kstoke@lsuhsc.edu