

## Special Points of Interest

- **SPECIAL FEATURE -**  
**IVBM 2016 MEETING SUMMARY**
- **PHOTOS FROM IVBM 2016**
- **2017 AWARD RECIPIENTS**
- **VASCULAR BIOLOGY 2017**



It is a particular honor for me to take on the role of NAVBO President in the coming year. In the past 20 years, I have watched NAVBO grow from a few founding members to a strong contingent of scientists from all over the world, and it has become a leading force driving the field of vascular biology forward. At all stages of my career, NAVBO has been right there to help me keep up with current breakthroughs, share my research, network with others, and provide me with leadership experiences and resources to succeed as an investigator in the vascular biology field. NAVBO has forged new bridges between basic scientists, engineers, clinicians, government and industry that make it easier than ever for vascular biology discoveries to be translated to patients. I look forward to expanding the NAVBO culture of inclusivity and innovation, and to continue to bring scientists in different fields together to build the future of vascular biology.

We have an exciting year ahead of us. We kick off with the Lymphatics Forum at Northwestern University on June 8-10, 2017, co-sponsored with the Lymphatic Education and Research Network. Vasculata will follow July 24-27, 2017 at the University of Illinois, Chicago. The NAVBO annual meeting, Vascular Biology, will be held on October 15-19, 2017 at the Asilomar Conference Grounds in Pacific Grove, California. This double header features the Developmental Vascular Biology and Genetics Workshop alongside the Vascular Matrix Biology and Bioengineering Workshop (celebrating its ten-year anniversary!), plus a Pre-Conference Meeting for and organized by trainees. As you can see, NAVBO conferences provide opportunities for all training and career stages, so please consider joining us and sending your trainees!

In closing, I am extremely grateful to Jan Kitajewski, who just completed his term as NAVBO President. Jan has been a thoughtful and inspirational NAVBO leader, and has put us on a great trajectory for future success. Last year's activities, including the 19th International Vascular Biology Meeting in Boston and Vasculata in Uppsala, were great successes and have positioned us well for the coming year's activities. I also want to thank our past president, Joyce Bischoff. After working hard as president in 2015-16, Joyce has been a seasoned voice of guidance on the Council this year. And last but by no means least, I would like to convey our continued thanks to Bernadette Englert, without whose dedication and energy NAVBO would not be what it is today.

*Cecilia Giachelli*

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## Peter Libby Named the 2017 Recipient of the Earl P. Benditt Award

*William R. Huckle, Editor*

The NAVBO Meritorious Awards Committee and Council are pleased to announce the selection of Peter Libby, M.D., as the 2017 recipient of the Earl P. Benditt Award, in recognition of his numerous significant contributions to elucidating the pathogenesis of atherosclerosis and its complications. Dr. Libby is currently Mallinckrodt Professor of Medicine, Harvard Medical School, serving also as Senior Physician at Brigham and Women's Hospital and Consulting Physician in the Department of Medical Oncology at the Dana-Farber Cancer Institute. He will present the Benditt Lecture and receive the award, one of NAVBO's highest honors, at Vascular Biology 2017 in Pacific Grove, California (October 15-19, 2017).

Following undergraduate studies in Biochemistry at the University of California-Berkeley, Dr. Libby received his M.D. from UC-San Diego in 1973 and trained thereafter as an intern, resident and fellow at Peter Bent Brigham Hospital and Harvard Medical School. He has held a series of research and clinical positions at Harvard and Tufts University, rising to the rank of Professor of Medicine at Harvard in 1996. He has held leadership positions in numerous clinical trials and served on a multitude of editorial boards, review panels, and advisory groups. Dr. Libby's research has been supported steadily by the NIH and other agencies for decades, and he serves as the PI of a T32 training grant in cardiovascular research that is in its 32nd year of funding. His scholarly contributions, reported in well more than 350 peer-reviewed publications and over 400 book chapters and reviews, have earned Dr. Libby dozens of honors in the U.S. and internationally, including a MERIT Award from the National Heart, Lung, and Blood Institute (1993-2003), the American Heart Association's Basic Research Prize, (2011), and a Lifetime Achievement Award from the Heart Failure Association of the European Society of Cardiology (2014).

As a basic scientist, Dr. Libby has achieved worldwide recognition for his laboratory's important work on the biology of the endothelium, vascular smooth muscle, and their interactions with inflammatory cells. Of particular note is his contribution to our understanding of the roles of CD40 and CD40L, matrix metalloproteinases and soluble inflammatory



Dr. Libby will give his talk, "Inflammation in Cardiovascular Disease: A Translational Journey" on October 18, 2017 at Vascular Biology 2017 in Pacific Grove, CA (Monterey Peninsula).

mediators. Those writing in support of Dr. Libby's nomination for the Benditt Award laud his willingness to critically evaluate mouse models as predictors of human pathophysiology or fruitful therapeutic approaches. Dr. Libby and his colleagues were the first to discover that vascular wall cells produce pro-inflammatory cytokines and that inflammatory mechanisms change collagen metabolism and control the susceptibility of atheromata to disrupt and cause thrombosis – key elements of our current understanding of the progression of atherosclerotic disease.

Dr. Libby enjoys a stellar reputation as a teacher and mentor and is a highly sought-after speaker both nationally and abroad. His service to NAVBO likewise has been exemplary: as a "founding member," he has played leadership roles on the Steering and Development Committees, on Council (1994-1996, 2012-2015), and has fostered productive relationships between NAVBO and other organizations with common goals and constituencies, particularly the American Heart Association.

Please join us for Vascular Biology 2017 at the Asilomar Conference Grounds this October to honor Dr. Libby as he receives this well-deserved award.

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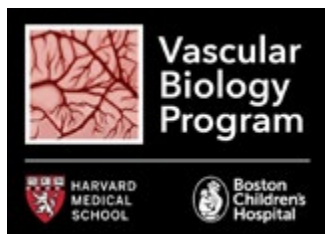
### Gold Level



### Silver Level



### Bronze Level



## Guillermo García-Cardeña is the Judah M. Folkman Award in Vascular Biology Recipient

*William R. Huckle, Editor*



Dr. García-Cardeña will give his talk, "Insights into the Mechano-biology of the Endothelium," on October 18 at Vascular Biology 2017 in Pacific Grove, CA (on the Monterey Peninsula).

The NAVBO Meritorious Awards Committee, the Scientific Advisory Board, and the NAVBO Council announce with pleasure the selection of Guillermo García-Cardeña, Ph.D., as the recipient of the 2017 Judah Folkman Award in Vascular Biology. This award recognizes outstanding contributions from vascular biologists who are at mid-career (within fifteen years of their first faculty appointment). Dr. García-Cardeña will present the Folkman Award Lecture and receive the award at Vascular Biology 2017 in Pacific Grove, California (October 15-19, 2017).

Dr. García-Cardeña received his Ph.D. in Molecular Medicine and Pharmacological Sciences at Yale University in 1997, under the tutelage of Dr. William Sessa. Following post-doctoral studies in the laboratory of Dr. Michael Gimbrone at Harvard Medical School, he joined the faculty of Harvard's Department of Pathology, rising to the rank of Associate Professor in 2010. He currently holds additional appointments as Scientist in the Center for Excellence in

Vascular Biology at Brigham and Women's Hospital, Director of the Laboratory for Systems Mechanobiology in the Center for Excellence in Vascular Biology, Affiliated Faculty Member in the Harvard Stem Cell Institute, and Associate Member of the Broad Institute of Harvard and MIT.

During his doctoral work, Dr. García-Cardeña characterized multiple mechanisms, including covalent modification and subcellular distribution of key proteins, crucial for the regulation of endothelial nitric oxide synthase. These studies identified several novel targets for the regulation of NO production in the vascular system. As a postdoctoral trainee, he undertook investigation of endothelial cell responsiveness to various forms of biomechanical perturbation and their functional consequences for endothelial phenotype. These studies involved the development of high-throughput transcriptional profiling platforms to analyze global gene expression patterns in endothelial cells, as well as the creation of novel devices to simulate *in vitro* the endothelium under shearing blood flow.

As an independent investigator, Dr. García-Cardeña's laboratory has continued to investigate mechano-activated signaling in the endothelium, focusing on transcriptional elements Kruppel-like factors 2 and 4 as integrators of the response to flow and as potential targets for novel cardioprotective therapeutics. Other research in his lab examines the role of blood flow initiation as a developmental trigger, demonstrating that hemodynamic forces present in the arterial tree are capable of changing venous endothelial specification to an arterial endothelial fate. His research group has begun to use induced-pluripotent stem cells (iPSC) as a tool to better understand endothelial cell plasticity and for modeling human disease. Dr. García-Cardeña has earned strong support from the NIH for his research and has published more than 60 peer-reviewed papers, many in top-tier journals.

Dr. Garcia-Cardeña's award nominations describe his scientific studies as "impactful and unique" and "paramount in the field as they have been able to integrate environmental forces with differentiation..." and "...have started a subfield in vascular biology." "Over his short career, Dr. García-Cardeña has been able to effectively bridge multiple fields and provide clear integration between physical forces, transcriptional regulation and cell biology."

Please join us for Vascular Biology 2017 at the Asilomar Conference Grounds this October to honor Dr. García-Cardeña as he receives this award in recognition of his accomplishments and bright future as a vascular biologist.

## IVBM 2016 - A Meeting Summary

*Compilation by Editor, William R. Huckle*

**Editor's Note:** NAVBO President Jan Kitajewski, reprising his successful coordination of a summary of *Vascular Biology 2014* that was published in *Vascular Cell*, assembled a dedicated team of scribes to capture the key points of the IVBM 2016 oral presentations. Excerpts of the meeting summary appear below; the unabridged meeting summary is in the final stages of collation and will be submitted for publication shortly. Many thanks to Dr. Kitajewski and his review crew for their efforts: Naiche Adler, Andreane Cartier, Reyhaan Chaudhri, Sarah Higgins, Yu Hisano, Silvain Galvani, Xun Liu, Mary Wallingford, and Cindy Windhol.

### PLENARY SESSIONS

**Michael Gimbrone**, NAVBO co-founder, opened the 19th IVBM by highlighting the transformation of this meeting from its origins as the relatively informal "Blood Vessel Club" that gathered at FASEB meetings beginning in the 1970s to what it has become today - a beacon for vascular biologists internationally. In October 2016, some 900 attendees from 32 different countries converged on Boston, Massachusetts, to discuss new inroads in our understanding of vascular function and the tremendous translational potential that these discoveries have for human health.

In the opening Plenary Session, **Peter Carmeliet** revisited the concept of angiogenesis with a talk described by one observer as a "tour de force driving a new era of mitochondrial biology." The audience was provided with a first look at the Carmeliet lab's exploration of the functional role of glucose and fatty acid metabolism in vessel normalization, an advance that will aid in the development alternative treatment strategies to mitigate cancer therapy resistance.

**Paul Ridker** led a provocative discussion on inflammation and atherothrombosis from a clinical investigator's perspective. The talk highlighted the translational potential of fundamental biological principles and discoveries - from seminal research that established low-grade inflammation as a risk factor for future vascular events to the first major clinical trial testing anti-inflammatory agents against the NLRP3 inflammasome/CRP axis to reduce cardiovascular events.

**Peter Libby** outlined a "requiem for the vulnerable plaque" and challenged the audience to rethink the thrombotic complications of atherosclerosis in an effort to identify therapeutic targets that are more reflective of the current state of evidence. Libby provided evidence of the inflammatory-mediated mechanisms driving superficial plaque erosion leading to thrombosis, a deeper understanding of which could lead to the development of novel anti-inflammatory treatments to limit cardiovascular events.

In the closing Plenary Session, NAVBO Springer Award recipient **Stefania Nicoli** (Yale) shared results generated

using a multiplexed CRISPR/Cas9-modified zebrafish model that provide evidence of how microRNAs control vascular phenotypic heterogeneity and responses to stress sensitization with functional consequences for human vascular disease.

NAVBO's 2017 Earl P. Benditt Award recipient **Elisabetta Dejana** (University of Milan/Uppsala University) was recognized for her seminal discoveries and pioneering work in transcriptional regulation of endothelial cell plasticity in health and disease. Dejana provided an overview of her research defining the important role of VE-cadherin and its functional binding partners in modulating vascular permeability. Further, the audience was presented with recent data implicating KLF4 as a key driver of endothelial-to-mesenchymal transition (EndMT) and lesion development in cerebral cavernous malformation (CCM).

**Gabriele Bergers**, NAVBO's 2016 Folkman Award winner, presented the concept of "Kairos," the supreme moment in time when a change occurs, as it relates to both career development as well as the biological processes that have piqued her research interest. Bergers outlined work that defines the post-transcriptional control of the angiogenic switch and stage-specific responses to angiogenic inhibitors. This work likely will aid in the development of approaches that overcome evasive resistance to anti-angiogenic therapies.

Bringing the final IVBM 2016 Plenary Session to a conclusion, NAVBO President **Jan Kitajewski** (University of Illinois, Chicago) fittingly presented work on "Closing the Loop." Kitajewski showed how Notch contributes to vascular formation and highlighted the importance of Notch in the endothelium as well as the other cell types comprising the vascular microenvironment. He proposed a 'two-hit' model whereby Notch causes arteriovenous malformation, supporting the use of Notch-targeted biologics to prevent tumorigenesis.

### EMERGING TOPICS

**New Technologies:** One of the highlights of the meeting, the session on New Technologies featured **Donald Ingber** from the Wyss Institute for Biologically Inspired Engineering at Harvard presenting the advancement of their associated start-up company Emulate, which has developed comprehensive *in vitro* systems to model Organs-on-Chips. Dr. Ingber showed some of their developed organ models for studying diseases, for example using lungs-on-chips to study COPD or pulmonary edema, and showed intriguing data that illustrated the predictive nature of the Organ-on-a-Chip approach. **Brian Coon** from the Martin Schwartz lab at the Yale School of Medicine next presented his work on endothelial whole-genome CRISPR screening using a KLF2-GFP promoter system by which responses to shear stress could



be assessed. **Calum MacRae** from Brigham and Women's Hospital at Harvard described the use of zebrafish as a scalable non-omic approach to *in vivo* drug discovery – seeking a more rapid, inexpensive, and versatile predictor of drug effectiveness. **Joana Amado-Azevedo** from the VU University Medical Center in Amsterdam discussed her approach combining ECIS and an RNAi screening of RhoGTPases to identify new regulators of endothelial barrier function and dysfunction.

**Drug Discovery/Gene Therapy:** This year's drug discovery and gene therapy session was centered on targeted therapeutic agents. **Masanori Aikawa** presented the key roles of PARP9 and PARP14 in macrophage activation using proteomics and network analysis. He also shared a similar systems biology method based on vein grafting for the discovery of anti-inflammatory agents. **Stephen Moss** spoke about the pre-clinical development of an antibody against LRG1, an angiogenic gene in TGF $\beta$  signaling. **Grietje Molema** investigated heterogeneity of endothelial cells in the microvasculature and introduced a Laser Microdissection method for biopsies of target cells for the determination of intracellular gene networks. **Myung-Jin Oh** showed that nano-scale materials specifically targeting VCAM-1 could significantly reduce lesion size compared to systemic inhibitors.

**Tissue Engineering:** The Tissue Engineering session mostly focused on *in vitro* modeling of vascular structures in combination with physiologically interacting cell types, i.e. "organ on a chip" technology. **Christopher Hughes** opened the session with the observation that many clinically effective cancer treatments show no effects in monolayer culture, but have clear activity in 3D culture systems. He described his lab's microfluidic tumor model, which comprises a perfused vasculature, pericyte coverage, and surrounding tumor cells, and which can be used to interrogate anti-tumor drug effects on each cell type, including their survival, metabolic changes, and intravasation. **Jerome Robert** used similar techniques to model circulating amyloid AB clearance in a system encompassing endothelial, smooth muscle, and astrocyte interactions. **Ying Zheng** described her lab's advances in pre-patterned vasculature with organ-specific characteristics. A persistent concern that arose in the question and answer periods was the lack of hierarchical vascular structures – most test systems modeled a single diameter of vessel. Diverging from the *in vitro* modeling talks, **Ekene Onwuka** discussed the problem of stenosis in biodegradable vessel grafts in current clinical use and the possibility that macrophage-derived signaling may be causing these occlusions.

**Complexity and Computational Modeling:** **Mete Civelek** discussed systems genetics and the characterization of adipose-specific KLF14 downregulation. It was also demonstrated that the enrichment of KCF binding sites in target genes in metabolic pathways was sex-specific. **Amitabh Sharma** presented a network-based controllable approach for the identification of key regulatory nodes, uncovering some novel mechanistic connections in Type 2 Diabetes.

**Erzsebet Ravasz Regan** showed that the VWF phenotype of endothelium is heterogeneous; the transition or "switch-like" state of VWF+/VWF- cells in the capillary vessels was reflective of the level of DNA methylation.

**Imaging:** **Mark Miller** from Washington University School of Medicine illustrated the merits of 2-photon microscopic imaging for real-time analysis of blood brain barrier function during encephalitis virus infection, noting that viral entry does not directly impact BBB permeability, but the entry of myeloid cells during infection may disrupt the BBB. **Molly Kelly-Goss** from the University of Virginia presented data using photo-acoustic microscopy (PAM) combined with intravital confocal imaging (ICM) *in vivo*. Applying these methods to a corneal angiogenesis model, her lab measured hemodynamics and endothelial gene expression during regeneration. **Eric Osborn** from Beth Israel Deaconess Medical Center at Harvard described intravascular near-infrared fluorescence imaging as a high resolution modality for monitoring biological responses surrounding plaques and stents in coronary arteries. **Mayank Verma** from the University of Minnesota used 2-photon imaging to show endothelial content deep in skeletal muscle and the interactions of endothelial cells and muscle stem cells.

**The "Vasculome?":** In a workshop and discussion forum hosted by **Zorina Galis** of the National Heart Lung and Blood Institute (NHLBI), participants and speakers explored the potential of an exciting proposed initiative to create "The Vasculome", an integrated, multi-dimensional, multi-scale roadmap of the human vasculature.

To this effect, multiple speakers described potential strategies to map the vasculature. **Renata Pasualini** described the use of combinatorial targeting of vascular zip codes for mechanistic insight and ligand-directed delivery. **Anthony Paul Barnes** likened the approach to vascular cartography, drafting molecular maps of known shores and proposed a GENSAT-based approach to allow for cell specific profiling of the vascular endothelial transcriptome that could be utilized for prognostication. **Mark Majesky** described how lineage boundaries and GPS coordinates could be used to develop informative disease susceptibility maps.

In the second half of the session, the group explored breakthrough technologies that could be leveraged to define and utilize natural variation in highly heterogeneous endothelial cells lining the vascular system. Systems biologist **Ravi Iyengar** discussed integrating a computational framework for data integration and predictive modeling to provide an integrated picture of tissue and cell physiology. **Orit Rozenblatt-Rosen** and **Alex Shalek** showed how single-cell genomics and multiplex integrated bar-coding technology could help dissect the tissue ecosystem.

Participants identified and discussed potential challenges that would need to be addressed when drafting

*continues on page 14*

# Vascular Biology

featuring the

## Developmental Vascular Biology & Genetics

and

## Vascular Matrix Biology and Bioengineering Workshops

Image provided by J. Wagenseil

Vascular Biology, the annual meeting of the North American Vascular Biology Organization (NAVBO), will deliver presentations of cutting-edge research findings in molecular control of vascular development, signaling, differentiation, transcriptional control and mechanics, as well as lymphatic and cardiovascular development, vascular progenitors, angiogenesis, tissue engineering, vascular imaging and calcification, mechanotransduction, and extracellular matrix and disease. This unique cross-disciplinary meeting will examine the intersection of vascular development and matrix biology with genetics, vascular regeneration, angiogenesis, stem cell biology, inflammation, vascular differentiation, and bioengineering. In addition, there are special sessions on vascular therapeutics and organ specific vasculatures.

What to expect:

- Fourteen break-out sessions
- Three joint/general sessions
- Travel awards and reduced registration for trainees
- Pre-conference Meeting for Trainees
- Over forty experts invited to present their most recent work
- Short talks from selected abstracts
- Poster sessions
- Exhibit program
- Networking opportunities during meals and receptions
- Beautiful location on the Monterey Peninsula

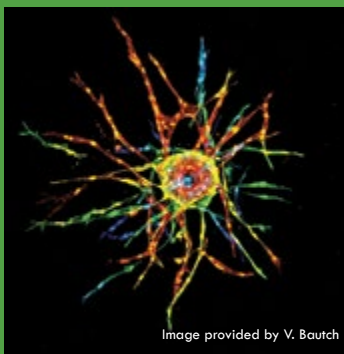


Image provided by V. Bautch

Early bird registration through August 15  
Abstract submission deadline: August 1

**October 15-19, 2017**

Asilomar Conference  
Grounds  
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**Keynote Speaker:**

Nancy Speck  
*University of Pennsylvania*

**Organizers:**

Brian Black, *University of California, San Francisco*  
Victoria Bautch, *University of North Carolina, Chapel Hill*  
Craig Simmons, *University of Toronto*  
Jessica Wagenseil, *Washington University at St. Louis*  
with  
Kayla Bayless, *Texas A&M University*  
Marlene Rabinovitch, *Stanford University*

Exhibit and Sponsorship Opportunities  
Contact: Bernadette Englert  
(301) 760-7745  
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Vascular Biology 2017 is being supported in part by:





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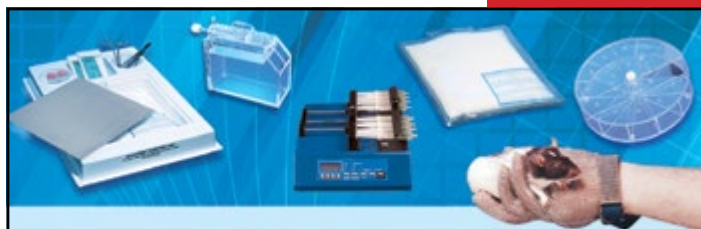
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### Guest Societies

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**SCATBV**

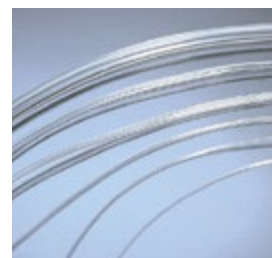


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## Past President's Message

*Jan Kitajewski, Ph.D.*



I'm really excited about the future of NAVBO! Having had a close-up view of the inner workings of our organization and getting to know our members, meeting organizers, supporters, leadership team, and exceptional staff has been a wonderful experience. I learned that this is an awesome organization and we, as vascular biologists, are working in an important and dynamic period of time. The field is as exciting as ever, the impact of our research is undeniable, and our presence in the national dialogue on the importance of science and research has grown significantly.

This past year I learned that NAVBO really knows how to organize meetings. Led by a large group of dedicated organizers and Bernadette, we worked diligently to develop several meetings. The crown-jewel of our effort was putting together IVBM 2016. Thanks to everybody who made this happen and made the IVBM such a huge success. In 2017, we will host the Lymphatic Forum, work with our colleagues in Chicago and national and international participants to stage Vasculata 2017, and will convene in Asilomar for Vascular Biology 2017. While helping with these meetings I learned that we have an outstanding partner in the National Institutes of Health; all of our meetings have received generous support from the

NIH. We fundraised at a clip that made it clear that companies and institutions support our mission. In fact, we often exceeded expectations and can bank funds for future meetings, future travel awards, future trainee support. I learned that when we reach out to find organizers, session developers, presenters, attendees, future council members and leaders, we always have a strong (and strongly positive) response. In planning for meetings to be held in 2018 and onward, members from around the world have expressed their interest in being involved. This, and more, has me so excited about the future of NAVBO!

This past year, I learned what a pleasure it is to work with such a fine set of NAVBO councilors! Thank you Mary Dickinson, Courtney Griffin, Chris Hughes, Rong Wang, Jason Fish, Rosemary Akhurst, and Secretary-Treasurer Bill Muller. Your ideas, your drive, and your problem-solving skills, were imperative to our success. Thank you Joyce Bischoff, our past-President, for your leadership during this last year. Thanks to our incoming President, Cecilia Giachelli, for working along with us this last year and letting us learn of your many talents. We're so excited about the upcoming year. And thanks to our own Bernadette Englert. Your knowledge of our organization, energy for our mission, and tireless work on our behalf is so special to us and much-appreciated. Our overseas members continually comment on how lucky we are to have Bernadette.

Finally, thank you to all of our members. I commend you for continuing to push the field of vascular biology forward. You make our meetings so timely, fun and fulfilling. You do your part and, you've made me so excited about the future of NAVBO!

Thank you,  
Jan

### PHYSIOLOGY AND BIOPHYSICS COLLEGE OF MEDICINE



The Department of Physiology and Biophysics of the University of Illinois at Chicago (UIC) College of Medicine is actively engaged in a multi-year recruitment initiative to selectively expand research activities and enhance interdisciplinary collaborations. Under the leadership of the new Head, Dr. Jan Kitajewski, we seek to recruit talented scientists and educators to join our growing department for tenure track faculty positions at the Assistant, Associate or full Professor levels.

We continuously seek candidates across diverse disciplines and with a record of innovative research; whose research programs have demonstrated excellence and who leverage interdisciplinary approaches for the study of integrative physiology and pathophysiology. Areas of growth include vascular biology, tumor biology, systems biology, cell signaling, and metabolism, with a goal of fostering interactions with UIC's Center for Cardiovascular Research (CCVR) and the UI Health Cancer Center.

UIC offers an intellectually exciting, collegial, and supportive environment with robust graduate, MSTP, and post-doctoral programs, excellent laboratory facilities, and extensive opportunities for interdepartmental collaboration. Resources include outstanding core facilities on campus and through the Chicago Biomedical Consortium; including DNA/RNA sequencing and genomics, imaging, mass spectrometry, flow cytometry and automated screening.

For more information about UIC, the department, and upcoming searches please visit: <http://physiology.uic.edu/>

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# Lymphatic Forum 2017: Exploring the Lymphatic Continuum

June 8-10, 2017  
Northwestern University



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# Highlights from the 19th International Vascular Biology Meeting - O







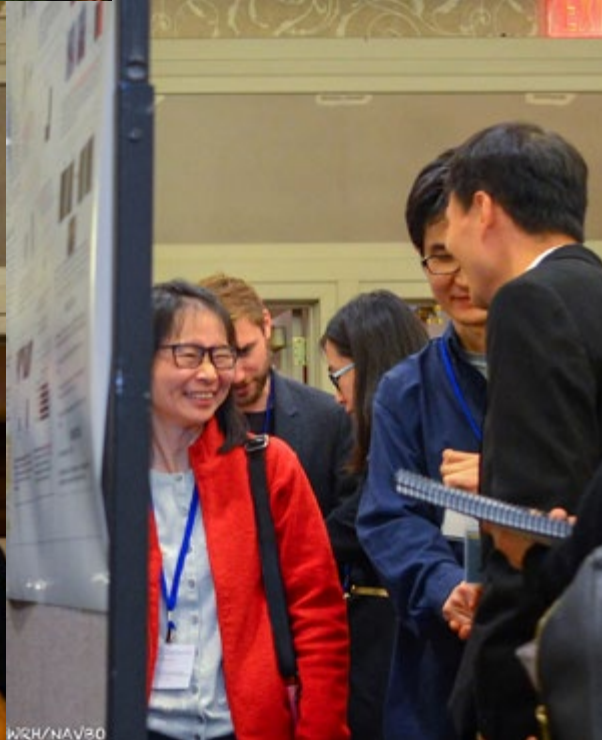
Lectures



Gala



Posters





*continued from page 7*

“The Vasculome” including those related to tissue procurement and storage, analysis and how to control for human sample variability (i.e., age, pharmacology, environment). Overall, the session engaged a wide range of input and left participants with a wealth of opportunities for collaboration and a groundswell of enthusiasm and preparedness for the this exciting initiative.

## VASCULAR DEVELOPMENT, CELL & MOLECULAR BIOLOGY, ORGANS & TISSUES, DISEASE

**Development:** This session highlighted the diversity of mechanisms that control early stages of vessel formation. **Victoria Bautch** presented a complex story regarding the contradictory pro- and anti-angiogenic roles of BMP signaling in vessel sprouting; she revealed that these different effects can be partially explained by underlying Notch regulation of BMP inhibitory molecules. **Holger Gerhardt** presented elegant work describing how vessel identity, endothelial polarity, and vessel attachments in the zebrafish intersomitic vessels are not predetermined but instead controlled by direction of blood flow. **Maulin Patel** focused on work in progress elucidating the downstream signaling pathways affected by the poorly-understood gene ADTRP. **Mary Wallingford** took a different approach, focusing on vascular function in the placenta, and showed that vascular expression of phosphate transporter Slc20a2 is critical in both mother and fetus to prevent intrauterine growth restriction, placental calcification, and preeclampsia-like symptoms.

**Angiogenesis and Regeneration:** Sponsored by Japanese Vascular Biology and Medicine Organization and chaired by Issei Komuro (University of Tokyo) and Ralf Adams (Max-Planck Institute for Molecular Biomedicine), this session spanned angiogenesis and regeneration topics in multiple organ systems. The pronounced variation between stage-specific and cell-type specific molecular responses emerged as a common theme, from VEGF production and sequestration observed in the retina by **Yoshiaki Kubota** (Keio University), to novel contrasting roles for ERK in arterial endothelial differentiation proposed by **Nathan Lawson** (University of Massachusetts Medical School), to a new Droscha-mediated developmental switch in embryonic hematopoiesis discovered by **Akiko Hata** (University of California, San Francisco). A JVBMO Young Scientist **Kohei Yamamizu** (Kyoto University) presented a new model of the blood brain barrier in which cell-type specific interactions correlated with varied electrical resistance, and **Gladys A. Ngoh** (Boston University School of Medicine) shared data supporting a role for Mfn2 as a coordinator of metabolism and angiogenesis in ischemic tissue. The session concluded with a presentation by **Wenling Li** (National Institutes of Health), who posed coordinated regulation of arterial branching regulation by NF- $\kappa$ B, CREB, CXCL12, and VEGF-A.

**Endothelial Cells:** **Ralf Adams** discussed recent work on organ-specific and functional specialization of blood vessels, with particular focus on distinct endothelial cell sub-

sets in bone. His talk centered around the presence and localization of type H and type L blood vessels, which his lab has described as “high” and “low” CD31 and endomucin positivity, respectively; endothelial cells associated with these different vessel types help to control perivascular osteoprogenitors and thus osteogenesis. **Qing Wang** from Huazhong University of Science and Technology described angiogenic growth factor 1 (AGGF1) as essential for angiogenesis and a master regulator of autophagy in vascular tissues. These findings led smoothly to the next talk by **Toren Finkel** (NIH/NHLBI), who discussed the general importance of autophagic flux in metabolic recycling of tissues and specifically in vascular function and aging. Interestingly, his work shows there is an association between a decline in overall autophagy and aging. To close the session on a bright note, **Austin McDonald**, an MSTP trainee from Luisa Iruela-Arispe’s laboratory, described an exciting and novel approach to study arterial lining regeneration *in vivo* using a transient aortic clamping model.

**Lymphatics:** **Stanley Rockson** (Stanford University) opened the session with a focus on a specific clinical problem: lymphedema. He shared exciting data supporting pharmacologically induced abrogation of inflammation in mouse lymphedema models and more recently in the Stanford drug therapy trial. **Laura Santambrogio** (Albert Einstein College of Medicine) took a broader approach to lymphatics, discussing lymphatic disease, edema, and inflammation from bench to bedside. She mapped out the anatomy, function, and importance of the lymphatic compartment and presented cutting edge functional assessments of lymph node filtration. Together, these talks highlighted the importance and emerging understanding of the lymphatic system, which will be explored more completely at the first-ever Lymphatic Forum 2017: Exploring the Continuum.

**Heart:** Speakers in this session demonstrated many ways in which cardiac endothelium creates or controls non-endothelial functions of the heart, including regulating the underlying muscle. The speakers described use of a variety of imaging techniques, but this session very much reminded the audience that traditional H&E histology is still a powerful and informative technique for biological investigation. **Mark Kahn** and **Joyce Bischoff** both focused on the role of mechanical stress in heart valve formation. Dr. Kahn examined downstream effectors of the Klf genes, while Dr. Bischoff revealed that CD45 phosphatase function plays an active role in the endothelial-to-mesenchymal transition in infarction recovery. **Andreas Fischer** and **Riikka Kivelä** discussed endothelial regulation of cardiomyocyte function, with Dr. Fischer discussing trans-endothelial nutrient supply and Dr. Kivelä examining the roles of different VEGF receptors in VEGF-B-mediated cardiac hypertrophy.

**Blood Vessels & Kidney Disease:** The Blood Vessels and Kidney Diseases session was sponsored by the American Society of Nephrology and chaired by Susan Quag-

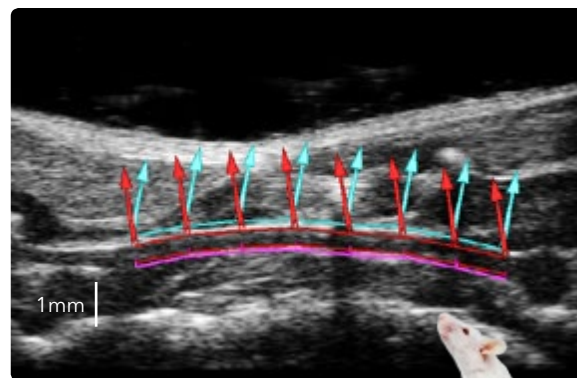


gin, (Northwestern University). **Phil Marsden** (University of Toronto) challenged the audience with some general questions to open the Blood Vessels and Kidney Diseases session. Going back to Gaelen, Harvey, and with frequent references to the hagfish, the first evolutionarily conserved species in which the closed vascular system is completely lined by endothelial cells, Dr. Marsden asked the audience to consider where efferent blood goes outside of the renal medulla, what erythropoietin of the vascular bundle does, why wedge shaped infarcts form, what are the biomechanical forces of open versus closed systems, and what does the blood vessel try to keep constant. Dr. Marsden's talk, filled with more philosophical questions than molecular biology answers, primed the audience for the following presentation by **George King** (Joslin Diabetes Center, Boston). Dr. King discussed mechanisms of diabetic kidney and vascular complications that centered around one main question: why have all MAPK and PKA diabetes trails failed? Dr. King proposed other components to the axiom, as well as a theory of selective insulin resistance in renal and cardiovascular tissues. In closing, Dr. King advised that we need to change our concept of how complications arise in diabetes, and consider elevating glycolytic flux and modulating insulin and VEGF.

Look for more about the IVBM sessions in an upcoming issue of *Angiogenesis* (<http://link.springer.com/journal/10456>) and follow the work of these and other investigators by attending Vascular Biology 2017.

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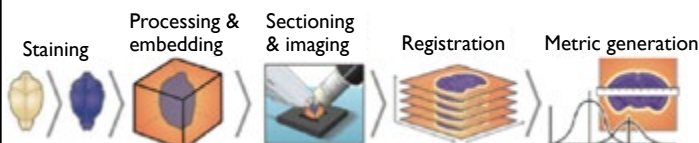
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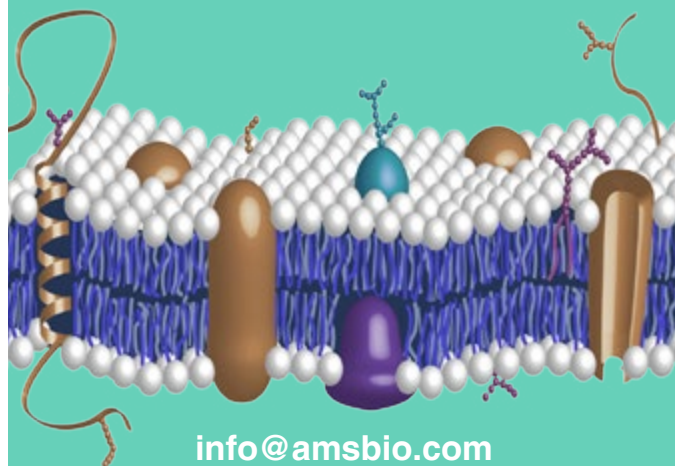
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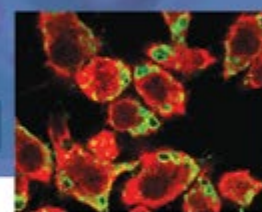
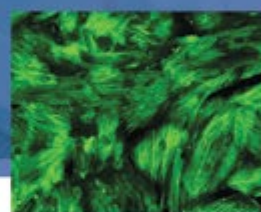
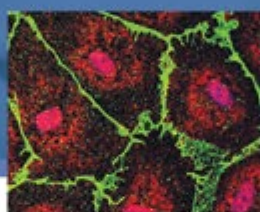
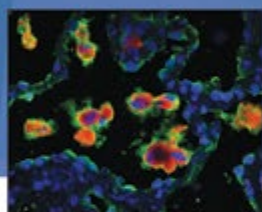
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## Member News



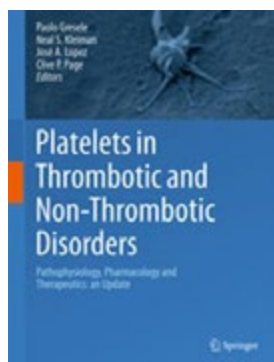
Princess U II Imoukhuede, Ph.D., Assistant Professor of Bioengineering at the University of Illinois at Urbana-Champaign, has been awarded a National Science Foundation CAREER award for her proposal, “qBio+cBio=sBio: Identifying the Role of Cross-Family Signaling in Angiogenesis.” Dr. Imoukhuede also received the Rose Award for Teaching Excellence from the UI College of Engineering.

\*\*\*\*\*

In October of 2016, Iris Jaffe of Tufts University assumed the role of Executive Director of the Molecular Cardiology Research Institute at Tufts Medical Center. In March of this year, Dr. Jaffe was also appointed as the Eliza Kent Mendelsohn Professor of Molecular Cardiology. Dr. Jaffe’s research combines her expertise in gene transcription and vascular biology with her interests as a clinical cardiologist to explore the molecular mechanisms that contribute to common cardiovascular diseases.



\*\*\*\*\*



José López, M.D. Professor of Medicine-Hematology at the University of Washington School of Medicine, has co-edited a book, *Platelets in Thrombotic and Non-Thrombotic Disorders: Pathophysiology, Pharmacology and Therapeutics: an Update*, published in 2017 by Springer (ISBN 978-3-319-47462-5). This volume reviews current science and applications in fields including

thrombosis and hemostasis, signal transduction, and non-thrombotic conditions such as inflammation, allergy and tumor metastasis.



*William R. Huckle, Editor*

Fortune Magazine has recognized Laura Niklason, M.D., Ph.D., Nicholas M. Greene Professor in Anesthesia and Biomedical Engineering at Yale University and founder of Humacyte, Inc., as a member of Fortune’s List of Leaders Transforming Health and Medicine. Dr. Niklason and her colleagues at Humacyte have developed bioengineered blood vessels currently under investigation as vascular grafts in patients with kidney failure. In addition, Dr. Niklason was inducted into the National Academy of Medicine in October of 2016.

\*\*\*\*\*

Hao Wu, Ph.D., of Boston Children’s Hospital has been awarded an AWRP Summer Scientist Development Grant, titled “Role of Epsins in Sepsis,” from the American Heart Association. This AHA funding mechanism aims to support highly promising beginning investigators in cardiovascular and stroke research as they progress from initial research training to complete independence. Dr. Wu’s research in structural immunology focuses on elucidating the molecular mechanism of signal transduction by immune receptors, especially those of the innate immune system.



\*\*\*\*\*

Dr. Bing Zhang has relocated from Boston Children’s Hospital to Shanghai Jiao Tong University as Professor and Principal Investigator in the Shanghai Center for Systems Biomedicine. Dr. Zhang subsequently was recognized through China’s Thousand Talents Plan that seeks to recruit “...strategic scientists or leading talents who can make breakthroughs in key technologies or can enhance China’s high-tech industries and emerging disciplines.”

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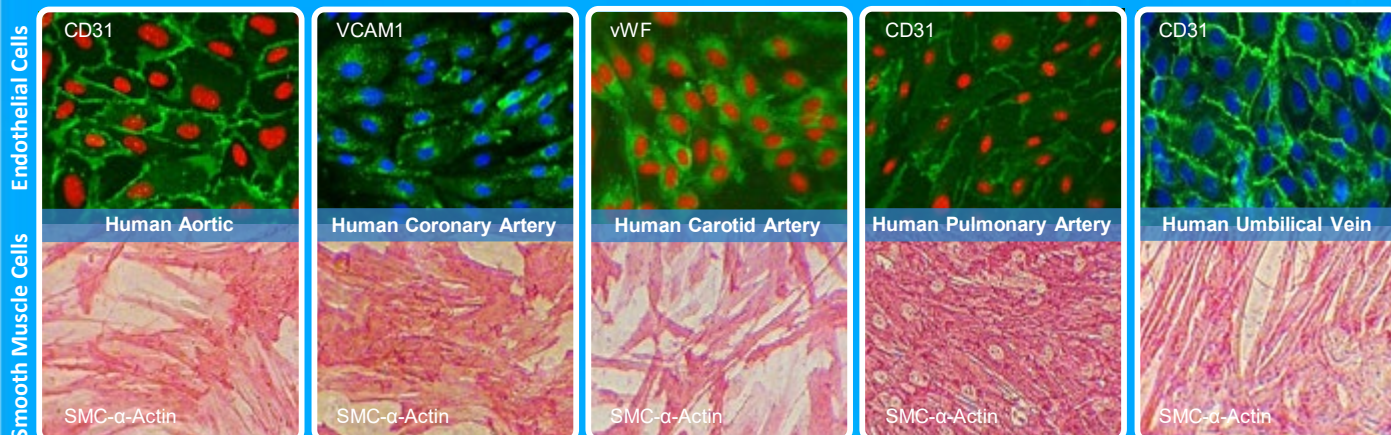
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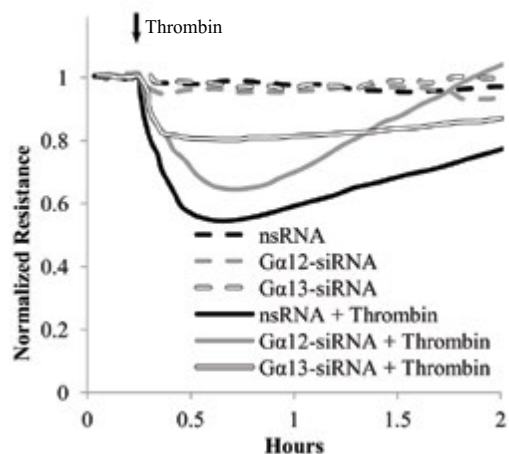
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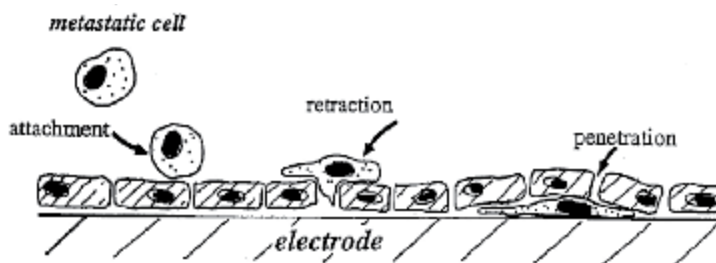
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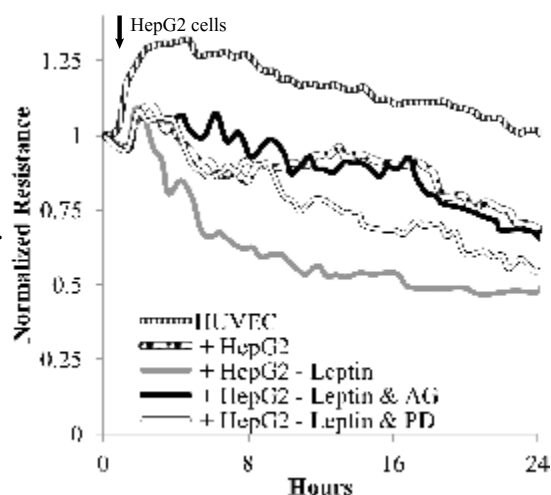
Data derived from Birukova, A. et al., 2004  
FASEB J. 18:1879

## Cell Invasion

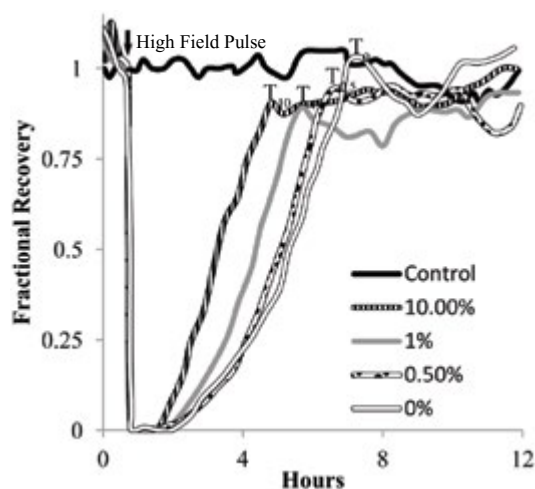


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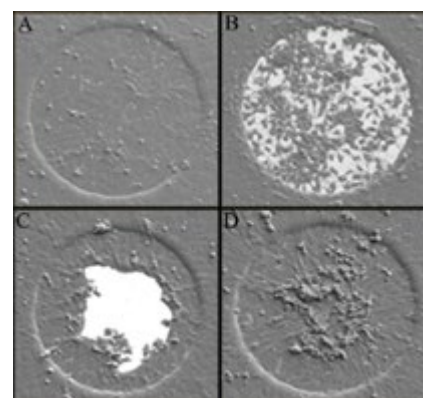
Published examples include metastatic cell and leukocyte trans-endothelial migration as well as the migration of pathogens such as yeast, anthrax, streptococcus, plasmodium, trypanosomes, and spirochetes. Data from Saxena, N.K. et al., 2007, Cancer Res. 67:2497.



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