



biomechanics.  
bioengineering.  
biotransport.

# 2020 Summer Biomechanics, Bioengineering, and Biotransport Conference



*Virtual Meeting*  
June 17-20, 2020  
**Program Book**

Funding for this conference was made possible (in part) by the National Science Foundation's Civil, Mechanical and Manufacturing Innovation Division (Biomechanics and Mechanobiology) #2017872.

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Prizes and other support for the Student Paper Competition were provided by the Bioengineering Division of the American Society of Mechanical Engineers.

**The 2020 Summer Biomechanics, Bioengineering, and Biotransport Conference (SB<sup>3</sup>C) organizers gratefully acknowledge the support of the National Science Foundation, the National Institutes of Health, and American Society of Mechanical Engineers.**



Congratulations to this year's Cover Art Contest winner:

**William Wang, University of Michigan**

*Title: Rainbow Sprouts*

Description: Z-depth encoded endothelial cell sprouts invading into 3D extracellular matrix from a parent vessel using a multiplexed angiogenesis-on-a-chip platform.

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# 1 Forward and Acknowledgement

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Dear SB<sup>3</sup>C Community,

*Opening Remarks:* On behalf of the entire SB<sup>3</sup>C 2020 Organizing Committee, we hope that you and your families have remained safe and healthy during the ongoing COVID-19 pandemic. In an effort to limit person-to-person contact to prevent the spread of the virus, we took the decision in March to cancel our in-person meeting and replace it with a safer alternative. In constructing the conference, we sought to preserve SB<sup>3</sup>C's rich scientific experience in a way that balanced the needs of our community to communicate their research, while respecting their absolute right to stay healthy. The result of our efforts is the 2020 Virtual Summer Biomechanics, Bioengineering, and Biotransport Meeting. We welcome you all and we thank you for your scientific contributions. While we are unable to provide the same intimacy and collegiality for which SB<sup>3</sup>C meetings are typically known, we can promise you that our program will provide SB<sup>3</sup>C's usual high-quality, state of the art bioengineering research along with an enhanced ability to connect (albeit digitally) with our vibrant community.

*In Memoriam:* This year we are saddened by the loss of two giants who helped create the foundational work on which much of our collective fields are based: Dr. Robert Nerem and Dr. YC Fung. Our dear friend and colleague, Dr. Nerem, has been a leader and an agent for change in the field of bioengineering for many years. We would like to thank Ross Ethier for putting together a fitting tribute to Dr. Nerem in this Program Book and we strongly encourage you to take the time to read it and join us in celebrating his life as a world-class researcher, leader, collaborator, and truly wonderful person. Dr. Fung, ostensibly the father of modern biomechanics, was a founder of the Journal of Biomechanics and author of multiple seminal and beloved books on Biosolid and Biofluid mechanics that reside prominently on many of our bookshelves. We would also like to thank Dr. Savio Woo who carefully assembled a wonderful memoriam for Dr. Fung included in this Program Book. Dr. Fung's legacy and visionary contributions to the study of biomechanics are unequaled and will continue to shape the future research of so many of us for years to come.

*Conference Structure:* The program for this year's virtual conference required some re-organization and altered planning that we hope you will enjoy. We continue the tradition of honoring the ASME medal winners through a live, virtual web conference webinar. The H.R. Lissner Medal winner, Dr. Larry Taber, is honored for ground-breaking work that has enabled a new understanding of how mechanics plays a role in growth and development, in addition to his educational impact and service to ASME-BED. Dr. Mehmet Toner, winner of the Savio L-Y. Woo Translational Biomechanics Medal, is honored for his multi-disciplinary research clinical implications to cancer, wound healing, regenerative medicine, burns and trauma, infectious disease, and global health. Dr. Stavros Thomopoulos will receive the Van C. Mow Medal for pioneering research in the development, biomechanics, and healing of tendon-to-bone attachments; Dr. Matthew Fisher will receive the Y.C. Fung Early Career Medal for exceptional translational orthopaedic research; and Dr. Dawn Elliott will receive the Robert M. Nerem Education and Mentorship Medal for investing in the personal and professional development of her trainees and colleagues (including your Conference Chair!). We congratulate all of the awardees and encourage you to attend their live presentations.

*Student Paper Competition:* Continuing our long tradition of elevating the work of our trainees, the ASME PhD Student Paper Competition (SPC) finalists will present their work live during the meeting, please tune in to see their exceptional presentations. The ASME MS and BS competitions will be presented in a recorded asynchronous format. We would like to thank ASME for sponsoring our student competitions – which have become a unique and critical part of our annual conference. The organizing committee would also like to acknowledge the numerous people that have offered their time to serve as SPC judges this year – thank you very much.

*Acknowledgements:* This year has been especially challenging and we would like to thank our SB<sup>3</sup>C Conference Organizing Committee who have worked tirelessly to ensure we have a quality 2020 event that serves our community well. We would also like to thank Pat Cinfici, Debbie Pasquale, Laurie Cruz, and all of the folks at Boscov's Travel for their continued support of SB<sup>3</sup>C. This year's conference (as well as the 2021 conference) would not have been possible without their strong advocacy and generous hard work. Last but certainly not least, we wholeheartedly thank the NIH and the NSF for conference funding and the ASME-BED Technical Committees, the Student Leadership Committee, and the SB<sup>3</sup>C Foundation Board for their continued support. We hope that you will enjoy our virtual conference this year and we look forward to seeing you in person in Vail in June 2021!

**Jonathan Vande Geest, Conference Chair**  
University of Pittsburgh

**Jeffrey Ruberti, Program Chair**  
Northeastern University

## 1.1 Virtual Conference Code of Conduct

All participants, speakers, sponsors and volunteers of this virtual conference are required to agree with the following code of conduct. Conference organizers expect cooperation from all participants to help ensure a safe environment for everybody. Our conference is dedicated to providing a harassment-free conference experience for everyone, regardless of gender, gender identity and expression, age, sexual orientation, disability, physical appearance, body size, race, ethnicity, religion (or lack thereof), or technology choices. We do not tolerate harassment of conference participants in any form. Sexual language and imagery is not appropriate for any conference activity, including talks, comments, Twitter, and other online media. Conference participants violating these rules may be sanctioned or removed from the conference without a refund at the discretion of the conference organizers. Participants that witness or experience violations to the above code of conduct should report these immediately to the conference chair via email (Jonathan Vande Geest; [jpv20@pitt.edu](mailto:jpv20@pitt.edu)).

## 1.2 Program-at-a-Glance

## SB3C 2020 - Virtual Meeting Program At A Glance

	Time	Session
WEDNESDAY June 17, 2020	10:00am - 10:50am EDT	ASME BED Education TCOM Meeting
	11:00am - 11:50am EDT	ASME BED Cell & Tissue Eng TCOM Meeting
	12:00pm - 12:50pm EDT	ASME BED Biotransport TCOM Meeting
	1:00pm - 2:30pm EDT	PhD Student Paper Competition Session 1
	3:00pm - 4:00pm EDT	Fung and Mow Lectures
	4:00pm - 4:30pm EDT	ASME BED Open Meeting
	4:30pm - 6:00pm EDT	PhD Student Paper Competition Session 2

	Time	Session
THURSDAY June 18, 2020	10:00am - 10:50am EDT	ASME BED Solids TCOM Meeting
	11:00am - 12:30pm EDT	PhD Student Paper Competition Session 3
	1:00pm - 2:00pm EDT	Woo and Nerem Lectures
	2:30pm - 4:00pm EDT	PhD Student Paper Competition Session 4
	4:00pm - 5:00pm EDT	MS Student Paper Competition Live Q&A
	5:00pm - 6:30pm EDT	DMME Virtual Meeting

	Time	Session
FRIDAY June 19, 2020	10:00am - 10:50am EDT	ASME BED Fluids TCOM Meeting
	11:00am - 12:30pm EDT	PhD Student Paper Competition Session 5
	1:00pm - 2:00pm EDT	Lissner Lecture
	2:30pm - 4:00pm EDT	PhD Student Paper Competition Session 6
	4:00pm - 5:00pm EDT	BS Student Paper Competition Live Q&A
	5:30pm - 6:30pm EDT	Student Leadership Committee Meeting
	6:30pm - 8:30pm EDT	Student Trivia Night

	Time	Session
SATURDAY June 20, 2020	10:00am - 10:50am EDT	ASME BED Design, Dyn & Rehab TCOM Meeting
	11:00am - 12:30pm EDT	Undergraduate Design Competition
	1:00pm - 3:00pm EDT	Women's Networking Event

## 2 Conference Organizing Committees

### 2.1 Organizing Committee



**Jonathan Vande Geest, Conference Chair**  
University of Pittsburgh



**Jeffrey Ruberti, Program Chair**  
Northeastern University

**Brittany Coats**, Information Chair, University of Utah  
**Craig Goergen**, Publications Chair, Purdue University  
**Spencer Lake**, Local Arrangements and Finance Chair, Washington University in St. Louis  
**Luke Timmins**, Exhibits Chair, University of Utah  
**Rebecca Heise**, Diversity Chair, Virginia Commonwealth University  
**Sara Roccabianca**, Student Paper Competition Chair, Michigan State University  
**Joel Boerckel**, Media Chair, University of Pennsylvania  
**Justin Scott**, Student Leadership Chair, Michigan State University

## 2.2 Program Committee

**Jeffrey Ruberti**, Chair, Program Committee, Northeastern University  
**Xiaoming (Shawn) He**, Chair, Biotransport Technical Committee, University of Maryland  
**Rafael Davalos**, Co-Chair, Biotransport Technical Committee, Virginia Tech University  
**Michael Moreno**, Chair, Design, Dynamics, & Rehab Tech. Committee, Texas A&M University  
**Anita Singh**, Co-Chair, Design, Dynamics, & Rehab Tech. Committee, Widener University  
**Stephanie George**, Chair, Education Committee, East Carolina University  
**Victor Lai**, Co-Chair, Education Committee, University of Minnesota Duluth  
**John LaDisa**, Chair, Fluids Tech. Committee, Marquette University  
**Alejandro Roldan-Alzate**, Co-Chair, Fluids Tech. Committee, University of Wisconsin-Madison  
**Suresh M. L. Raghavan**, Chair, Industry Committee, University of Iowa  
**Ethan Kung**, Co-Chair, Industry Committee, Clemson University  
**Vicky Nguyen**, Chair, Solid Mechanics Committee, Johns Hopkins University  
**Kristin Myers**, Co-Chair, Solid Mechanics Committee, Columbia University  
**Ed Guo**, Chair, Cell & Tissue Engineering Technical Committee, Columbia University  
**Grace O'Connell**, Co-Chair, Cell & Tissue Engineering Technical Committee, UC Berkeley  
**Justin Scott**, Chair, Student Leadership Chair, Michigan State University

## 2.3 Student Paper Competition Committee

**Sara Roccabianca**, Chair, PhD Level, Michigan State University  
**Ian Sigal**, PhD Level, University of Pittsburgh  
**Joao Soares**, MS Level, Virginia Commonwealth University  
**Kristin Miller**, BS Level, Tulane University

## 2.4 Undergraduate Design Competition Committee

**Michael Moreno**, Chair, Texas A&M University  
**Ted Conway**, Co-Chair, Florida Institute of Technology

Thank you to all committee members!

### 3 Awards



1977 Robert W. Mann  
 1978 Y.C. Fung  
 1979 Robert F. Rushmer  
 1980 F. Gaynor Evans  
 1981 Max Anliker  
 1982 R.M. Kenedi  
 1983 Henning E. von Gierke  
 1984 Perry L. Blackshear  
 1985 Richard Skalak  
 1986 Albert H. Burstein  
 1987 Van C. Mow  
 1988 Alf Louis Nachemson  
 1989 Robert M. Nerem  
 1990 Albert B. Schultz  
 1991 Savio Lau-Yuen Woo  
 1992 John C. Chato  
 1993 Don P. Giddens  
 1994 Sheldon Weinbaum  
 1995 Robert E. Mates  
 1996 Albert I. King  
 1997 Ajit P. Yoganathan  
 1998 Malcolm H. Pope  
 1999 Stephen C. Cowin  
 2000 Morton H. Friedman  
 2001 W. Michael Lai  
 2002 Kenneth R. Diller  
 2003 Vijay K. Goel  
 2004 John M. Tarbell  
 2005 Steven A. Goldstein  
 2006 Peter A. Torzilli  
 2007 Maury L. Hull  
 2008 Noshir A. Langrana  
 2009 Thomas P. Andriacchi  
 2010 Roger D. Kamm  
 2011 Jay D. Humphrey  
 2012 David Butler  
 2013 Mehmet Toner  
 2014 Kyriacos A. Athanasiou  
 2015 James A. Ashton-Miller  
 2016 Roger C. Haut  
 2017 Gerard A. Ateshian  
 2018 Louis J. Soslowsky  
 2019 Jennifer S. Wayne  
 2020 Larry A. Taber

### H. R. Lissner Medal

The H.R. Lissner Medal recognizes outstanding achievements in the field of bioengineering. These achievements may be in the form of (1) significant research contributions in bioengineering; (2) development of new methods of measuring in bioengineering; (3) design of new equipment and instrumentation in bioengineering; (4) educational impact in the training of bioengineers; and/or (5) service to the bioengineering community, in general, and to the Bioengineering Division of ASME, in particular. The Bioengineering Division of ASME established the H. R. Lissner Award as a divisional award in 1977. It was upgraded to a society award in 1987, made possible by a donation from Wayne State University and is named in honor of Professor H. R. Lissner of Wayne State University for his pioneering work in biomechanics that began in 1939.

### 2020 Larry A. Taber, PhD

Larry A. Taber, Ph.D., for seminal work that has enabled a new understanding of the mechanics of growth and development, particularly for rigorous models, based on nonlinear elasticity and mechanical feedback and supported by clear experiments, that explain how the embryonic heart and brain take shape. He is a Senior Professor of Biomedical Engineering and of Mechanical Engineering and Materials Science at Washington University in St. Louis. From 2007 until his retirement in 2017, he was the Dennis and Barbara Kessler Professor of Biomedical Engineering. He moved to Washington University in 1997, after spending four years at the General Motors Research Laboratories and 15 years at the University of Rochester.

Dr. Taber is a fellow of ASME and the American Institute for Medical and Biological Engineering. Three times he won the Richard Skalak Award for the best paper published in the Journal of Biomechanical Engineering (2004, 2007, 2015). From 2011-2016, he served as co-editor-in-chief of the journal Biomechanics and Modeling in Mechanobiology. Although his formal training is in aerospace engineering (B.A.E., Georgia Tech; Ph.D., Stanford University), he has published more than 100 journal articles on a wide range of topics including cochlear mechanics, nonlinear shell theory, cardiovascular mechanics, and the mechanics of growth and development. He has published two books: Non-linear Theory of Elasticity: Applications in Biomechanics (2004) and Continuum Modeling in Mechanobiology (2020). Beginning in 1990, he pioneered studies of the mechanics of organogenesis. His work integrates theoretical/computational modeling with experiments on embryos to study the role of mechanical forces in heart, brain, and eye morphogenesis. Understanding the mechanics of embryonic development could one day lead to new strategies for tissue engineering, tissue regeneration, and the prevention and treatment of congenital malformations.





## Savio L-Y. Woo Medal



2016 Baruch Barry Lieber  
 2017 Arthur Erdman  
 2018 Kyriacos A. Athanasiou  
 2019 Rita M. Patterson  
 2020 Mehmet Toner

The Savio L-Y. Woo Translational Biomechanics Medal was established in June 2015 as a society-level award and recognizes a sustained level of meritorious contributions in translating bioengineering research to clinical application, to improve the quality of life. This award is named in honor of Savio Lau-Yuen Woo, Ph.D., Distinguished University Professor of Bioengineering and the Founder and Director of the Musculoskeletal Research Center (MSRC), a diverse multidisciplinary research and educational center in the Department of Bioengineering at the University of Pittsburgh. Beyond pioneering and world-renowned scholarly contributions, Professor Woo has made an enormous impact in 40 years of translational research that has significantly contributed to the delivery of healthcare. Any member of ASME who has demonstrated a sustained level of outstanding achievement in translating bioengineering findings to the clinical community may be eligible for this medal.

## 2020 Mehmet Toner, PhD

Mehmet Toner, PhD, holds the Helen Andrus Benedict Professor of Biomedical Engineering at the Massachusetts General Hospital, Harvard Medical School, and Harvard-MIT Division of Health Sciences and Technology. He serves as the Director of Research at the Shriners Hospitals for Children in Boston, the Co-Director of the Center for Engineering in Medicine and Surgery, and the Director of Bio-MicroElectroMechanical Systems Resource Center at the MGH.

His biomedical engineering contributions represent examples of multidisciplinary research or the so-called convergence science with clinical implications in cancer, wound healing, regenerative medicine, burns and trauma, infectious disease, and global health. His work in low temperature thermodynamics and biopreservation of cellular systems spans both fundamental and applied aspects of cryopreservation of cells, gametes, tissue constructs, engineered tissues, and whole organs. In microelectromechanical devices, his group was the first to use microfluidics to isolate extremely rare circulating tumor cells (CTCs) from peripheral blood with applications in the diagnosis and monitoring of cancer patients. Dr. Toner has also pioneered using inertia in microfluidic systems by demonstrating that inertia is not only critical to low Reynolds number flows in microchannels but it is also extremely useful and easily exploited in these systems to achieve amazing control over manipulation of bioparticles and cells. In tissue engineering, Dr. Toner pioneered a "lift-off" concept to make largely inorganic microfabrication approaches compatible with biological systems. Direct descendants of these methods are now being used today throughout the world to create cellular patterns and engineered tissues of various sorts. Dr. Toner also led the development of a microengineered bioartificial liver system that overcomes the major transport-related shortcomings of the current clinical bioartificial liver systems through the use of a flat plate hepatocyte microreactor.



One of the most important accomplishments of Dr. Toner is his dedication to the training of the next generation biomedical engineers. Many of his trainees are now leading their own independent research groups or companies. Dr. Toner has received acclaim for his ability to converge academic-clinical-industrial interactions and holds more than 50 patents emerged from his group that resulted in the creation of multiple companies. In 1994, he was recognized by the "YC Fung Young Award" in Bioengineering. In 1998, Dr. Toner was selected to become a "Fellow of the American Institute of Medical and Biological Engineering." In 2007, he became a "Fellow of the American Society of Mechanical Engineers." In 2008, he also became a "Fellow of the Society for Cryobiology." In 2012, he was given the "Luyet Medal" by the Society for Cryobiology. In 2013, he received the "H.R. Lissner Medal" for his contributions to bioengineering. Dr. Toner is inducted to the Turkish Academy of Science, National Academy of Inventors, the National Academy of Engineering, and the National Academy of Medicine.

### Robert M. Nerem Education and Mentorship Medal

The Robert M. Nerem Education and Mentorship Medal is given to an individual who has demonstrated a sustained level of outstanding achievement in education and mentoring of trainees. Examples of meritorious activities include leadership within the nominee's institution, mentoring activities that are above and beyond those expected from others employed in similar positions, mentoring activities tailored to meet the needs of the trainees, and innovative mentoring activities.

#### 2020 Dawn M. Elliott, PhD

Dawn Elliott, PhD, Blue and Gold Distinguished Professor and Chair of Biomedical Engineering at the University of Delaware, for exemplary mentorship, including her students, individuals in her academic community, and educational workshops; for contributions to excellence in engineering education, including starting a new department and leadership in professional societies; and for impact to diversity in engineering. Dr. Elliott is a leader in the field of musculoskeletal biomechanics. She investigates the changes that occur in load-bearing fibrous tissues, such as disc, meniscus, and tendon with degeneration, injury, and following interventions. Her multi-scale approach, from the entire joint-level, to the tissue-scale and micro-scale, integrates mechanical testing, mathematical modeling, and multi-modal imaging. In 2015 she was awarded the American Society of Mechanical Engineers (ASME) Van C. Mow Medal for significant contributions to the field of bioengineering and in 2018 she was awarded the inaugural Orthopaedic Research Society Adele L. Boskey Award for excellence in impactful research and mentorship.



2018 Roger D. Kamm  
2019 Kenneth R. Diller  
2020 Dawn M. Elliott

Dr. Elliott has been an outstanding teacher, mentor, and contributor to the professions of biomedical engineering and orthopaedics. After twelve years faculty in Orthopaedics at the University of Pennsylvania, where she was promoted to full professor, she joined the University of Delaware in 2011 to start their Biomedical Engineering Department. Under her leadership, over the last ten years the department has grown in size and impact, twice earned ABET accreditation, and is already ranked among the top third of U.S. BME departments. In recognition for these contributions, Dr. Elliott was



awarded the inaugural Outstanding Achievement in Mentoring Award from the Orthopaedic Research Society. Dr. Elliott is a Fellow of ASME and the American Institute for Medical and Biological Engineering (AIMBE). She had made many contributions to the ASME Bioengineering Division, including: chair of the Solid Mechanics committee (2007-2010), Program Chair of the Summer Bioengineering Conference (SBC, 2009), Conference Chair of SBC (2012), and Executive Committee member at large (2009-2012). She is currently the Chair of the Mow Medal Awards committee. Outside of ASME, Dr. Elliott is currently President of the Biomedical Engineering Society (BMES) where she previously served as Treasurer and on the Board. She is on the Board of Directors of The Perry Initiative, a non-profit organization dedicated to increasing role of women in engineering and medicine. She was on the founding Board and past President of the SB<sup>3</sup>C Foundation.

## Van C. Mow Medal

The Van C. Mow Medal is bestowed upon an individual who has made significant contributions to the field of bioengineering through research, education, professional development, leadership in the development of the profession, as a mentor to young bioengineers, and with service to the bioengineering community. The individual must have earned a PhD or equivalent degree between ten and twenty years prior to June 1 of the year of the award. The award was established by the Bioengineering Division in 2004.

### 2020 Stavros Thomopoulos, PhD

Stavros Thomopoulos, PhD, is the Robert E. Carroll and Jane Chace Carroll Professor of Biomechanics (in Orthopedic Surgery and Biomedical Engineering), the Director of Carroll Laboratories for Orthopedic Surgery, and the Vice Chair of Basic Research in Orthopedic Surgery at Columbia University. As the director of the Carroll Laboratories and the vice chair of basic research, he is leading an effort to engage orthopedic surgeons in basic and translational research by enhancing collaborations between engineering faculty and clinical faculty and by expanding core facilities for musculoskeletal research. His laboratory is studying the development, biomechanics, and healing of the tendon-to-bone attachment (the “enthesis”), with a focus on solving the clinical challenge of repairing torn rotator cuff tendons. This collaborative effort includes a team of mechanical engineers, biomedical engineers, orthopaedic surgeons, and developmental biologists. The research, funded by several NIH grants, is motivated by the mechanical challenge of attaching dissimilar materials such as tendon and bone. To develop successful strategies for tendon-to-bone repair, the team is focusing on understanding enthesis biomechanics, understanding enthesis developmental biology, implementing this understanding using regenerative medicine strategies, and testing these strategies in clinically relevant animal models. These four research themes inform each other and will be translated to clinical therapies for tendon-to-bone repair.



2005 Kyriacos A. Athanasiou  
 2006 Robert Lie-Yuan Sah  
 2007 Lori A. Setton  
 2008 Scott L. Delp  
 2009 Michael Sacks  
 2010 Tony M. Keaveny  
 2011 David A. Vorp  
 2012 John Bischof  
 2013 Jeffrey Weiss  
 2014 Christopher R. Jacobs  
 2015 Dawn M. Elliott  
 2016 Beth A. Winkelstein  
 2017 Richard R. Neptune  
 2018 Jeffrey W. Holmes  
 2019 Tony Jun Huang  
 2020 Stavros Thomopoulos

Dr. Thomopoulos has mentored 75 trainees, including undergraduate, masters, and PhD students as well as postdoctoral fellows. He has been a member of ASME since his undergraduate junior year in 1993, and is currently an ASME fellow and the treasurer of the ASME Bioengineering Division. Previously, he served as local arrangements chair and publications chair for ASME Summer Bioengineering meetings. He will be the Conference Chair for the 2023 SB<sup>3</sup>C Meeting. Dr. Thomopoulos has received awards from the ASME, the American Shoulder and Elbow Surgeons Society, and the American Academy of Orthopaedic Surgeons. He is a fellow of The American Institute for Medical and Biological Engineering. He is an Associate Editor for the Journal of Orthopaedic Research, handling all papers related to tendon, ligament, and muscle.



## Y.C. Fung Early Career Medal

The Y. C. Fung Early Career Award is given to young investigators who are committed to pursuing research in the field of Bioengineering and have demonstrated significant potential to make substantial contributions to the field of Bioengineering. Such accomplishments may take the form of, but are not limited to, design or development of new methods, equipment or instrumentation in bioengineering; and research publications in peer-reviewed journals. The award was established by the Bioengineering Division in 1985 and operated as a division award until 1998 when it was elevated to a society award.



1986 Mark H. Holmes  
 1987 Steven A. Goldstein  
 1989 David N. Ku  
 1990 Jay D. Humphrey  
 1991 Michael Kwan  
 1992 Cheng Zhu  
 1993 John A. Frangos  
 1994 Mehmet Toner  
 1995 Cheng Dong  
 1996 Antony Keaveny  
 1997 Gerard A. Ateshian  
 1998 Louis J. Soslowsky  
 1999 Rebecca Richards-Kortum  
 2000 Farshid Guilak  
 2001 David F. Meaney  
 2002 Jeffrey A. Weiss  
 2003 Sangeeta N. Bhatia  
 2004 Richard E. Debski  
 2005 Jeffrey W. Holmes  
 2006 Beth A. Winkelstein  
 2007 Stavros Thomopoulos  
 2008 Gabriel A. Silva  
 2009 Robert Mauck  
 2010 Matthew J. Gounis  
 2011 Ali Khademhosseini  
 2012 Marissa Nichole Rylander  
 2013 Jonathan Vande Geest  
 2014 W. David Merryman  
 2015 Adam J. Engler  
 2016 Triantafyllos Stylianopoulos  
 2017 Kristin Myers  
 2018 Spencer P. Lake  
 2019 Grace D. O'Connell  
 2020 Matthew B. Fisher

## 2020 Matthew B. Fisher, PhD

Matthew B. Fisher is an Assistant Professor in the Joint Department of Biomedical Engineering at North Carolina State University and the University of North Carolina-Chapel Hill. After receiving a BS in Biomedical Engineering from Columbia University, he completed his PhD degree under the mentorship of Dr. Savio L-Y. Woo at the University of Pittsburgh. His dissertation research focused on the use of extracellular matrix bioscaffolds for anterior cruciate ligament healing as well as the use of robotic testing systems for biomechanical evaluation. He then moved to the University of Pennsylvania as a post-doctoral fellow under the mentorship of Dr. Robert Mauck. At Penn, his work focused on tissue engineering of the knee meniscus and articular cartilage, with a focus on implementation in large animal models.

Since 2014, Dr. Fisher has directed the Translational Orthopaedic Research Laboratory. Through a team science approach, Dr. Fisher and colleagues have 1) advanced the understanding of anterior cruciate ligament function during growth, 2) designed scaffold fabrication approaches for fibrous tissue engineering, and 3) developed translational animal models to study biomechanics of healing and engineered tissues. Dr. Fisher has published more than 40 peer-reviewed journal articles and more than 100 conference abstracts. His team's research has been supported by the NIH, NSF, and several research foundations. He is thankful to have interacted with truly remarkable



people in the laboratory, classroom, and community, including many years at the ASME Summer Bioengineering Conference and SB<sup>3</sup>C meeting. Dr. Fisher has been a member of ASME since 2008 and has been active in the Bioengineering Division since then. He is the recipient of the 2012 Junior Investigator Award from the Musculoskeletal Transplant Foundation and a 2020 Rising Star Awardee from the BMES Cellular and Molecular Bioengineering Special Interest Group. He lives happily in Apex, NC with his wife and two young children.



## Award Lecture Abstracts

**Wednesday, June 17, 2020**

Matthew B. Fisher, *Y. C. Fung Early Career Award*

Title: Anterior Cruciate Ligament Function During Growth

The anterior cruciate ligament (ACL) is a primary soft tissue stabilizer of the knee. ACL injuries are rising in children and adolescents, with many undergoing surgical treatment. Yet, changes within the ACL during growth, including biomechanical properties, are less understood. Over the past few years, we have studied how age and sex impact the biomechanics of the ACL and its distinct sub-regions using a large animal model. We have also explored the impact of complete and partial injuries on resulting joint function. As we continue to translate our findings to the human condition, we hope to inform clinical treatment strategies in the pediatric population.

Stavros Thomopoulos, *Van C. Mow Medal*

Title: The Attachment of Dissimilar Materials: Lessons from the Tendon Enthesis

The attachment of dissimilar materials is a major challenge because of stress concentrations that develop at such interfaces. An effective solution to this problem can be seen at the attachment of tendon to bone (the enthesis). This transitional tissue is not recreated during healing, so surgical reattachment of these two dissimilar tissues often fails. To develop strategies for tendon-to-bone repair, we are focusing on: (i) defining the design criteria for attachment by studying the multiscale load transfer mechanisms at the healthy enthesis, (ii) defining the roadmap for building an attachment by studying the signals necessary for forming a functional enthesis, (iii) implementing the design criteria and the roadmap using regenerative medicine, and (iv) testing these strategies in animal models. Basic science studies have identified the critical biomechanical and developmental features necessary for tendon-to-bone attachment. These results now inform translational studies using cell- and growth factor-based regeneration for tendon-to-bone repair.

**Thursday, June 18, 2020**

Mehmet Toner, *Savio L-Y. Woo Medal*

Title: My Journey in Bioengineering on the Shoulders of Early Visionaries

Dr. Toner will review some of his major research contributions to biomedical engineering. Dr. Toner's work in low temperature thermodynamics of cellular systems includes both fundamental and applied aspects of cryopreservation of cells, gametes, tissue constructs, engineered tissues, and whole organs. In tissue engineering, he developed cell patterning techniques to interrogate heterotypic and homotypic cell-cell communications. He also micro-engineered the complex topographical features of the skin. Dr. Toner led the development of a micro-engineered bioartificial liver system that overcomes the major transport-related shortcomings of the clinical bioartificial liver systems. His group was the first to use microfluidics to isolate extremely rare circulating tumor cells from peripheral blood with applications in personalized oncology. Dr. Toner has also pioneered using inertia in microfluidic systems by demonstrating that inertia is extremely useful and easily exploited in these systems to achieve amazing control over manipulation of bioparticles and cells.

Dawn M. Elliott, *Robert M. Nerem Education and Mentorship Medal*

Title: White Privilege and Racial Injustice: What a Person in the Academy Can Do

I tried. But I could not prepare a light-hearted retrospective of my career to date in the midst of what is happening in our country. What will I say about white privilege? What will I say about racial injustice? What can a person in the academy do? Today as I write this abstract I am uncomfortable and confused and so many other emotions that I have not processed. I do not know what I will say. By the time I give my talk, I will still be uncomfortable. But I will have something to say and a message that provides each of us a path to *do something*.

**Friday, June 19, 2020**

Larry Taber, *H. R. Lissner Medal*

Title: From Rockets to Embryos

The purpose of this talk is to discuss the winding road I have traveled during my career. (Apparently, this is the tradition for the Lissner Medal lecture.) So, I will spend some time documenting how my career ambitions evolved from baseball play-by-play announcer to meteorologist to designing manned spacecraft to working with embryos. Then, I will discuss some of work that my lab has conducted on the mechanics of organ morphogenesis during the past 20+ years. Our research has involved a combination of experiments and computational modeling. The focus will be on heart, brain, and eye development.

## 4 Reviewers

**The SB<sup>3</sup>C Conference and Program Committees thank all of our abstract reviewers!**

Vinay Abhyankar	Steven Abramowitch	Claire Acevedo	Aylin Acun
Douglas Adams	Akinjide Akintunde	Ali Akyildiz	Patrick Alford
Alberto Aliseda	Rouzbeh Amini	Dennis Andrews	Shyam Aravamudhan
Vahid Arbabi	Amirhossein Arzani	Reza Avaz	Seungik Baek
Brendon Baker	Ehsan Ban	Victor Barocas	Philip Bayly
Rebecca Bell	Chiara Bellini	Joel Berry	Matthew Bersi
Scott Bevil	Kimberly Bigelow	Kristen Billiar	Joel Boerckel
Alessandro Borghi	Mathias Brieu	Amanda Buck	Christine Buffinton
Adrian Buganza Tepole	Alyssa Burke	Tamara Bush	Sarah Calve
Ian Campbell	Eamon Campolettano	Tejas Canchi	Joel Canino
Gador Canton	Carlos Castro	Daniel Cavanagh	Nilay Chakraborty
Deva Chan	Pen-hsiu Grace Chao	Fanette Chassagne	Kellen Chen
Sheng Chen	Naomi Chesler	Claudio Chiastra	Lik Chuan
Alisa Clyne	Stephanie Cone	Brianne Connizzo	David Corr
Daniel Cortes	Federica Cuomo	Joanna Dahl	Guohao Dai
Elvis Danso	Lakshmi Dasi	Rafael Davalos	Matthew DeWitt
Alix Deymier	Elena Di Martino	Adina Draghici	Jing Du
Nathaniel Dymnt	Alan Eberhardt	Eno Ebong	Yeliz Elalmis
Ben Ellis	Shady Elmasry	Adam Engler	Mona Eskandari
Alejandro Espinoza	Ross Ethier	Gloria Fabris	Lei Fan
Masoud Farahmand	Yuan Feng	Andrew Feola	Virginia Ferguson
Jacopo Ferruzzi	Ender Finol	Kristine Fischenich	Ken Fischer
Matthew Fisher	Catherine Florio	Diego Gallo	John Gardiner
Thomas Gardner	Guy Genin	Soham Ghosh	Craig Goergen
Selda Goktas	Bryan Good	Pedro Gouveia	Anna Grosberg
Qimei Gu	X. Edward Guo	Jonathan Gustafson	Ahmad Haider
Fatemeh Hassanipour	Hamed Hatami-Marbini	Hoda Hatoum	Xiaoming He
Yong He	Rebecca Heise	Corinne Henak	Heath Henninger
Luke Herbertson	Yiemeng Hoi	Maria Holland	Lyle Hood
Seyedhadi Hosseini	Daniel Howsmon	Jingjie Hu	Yi Hua
Chun-Yuh Huang	Zhongping Huang	Choon Hwai Yap	Jeffrey Jacot
Kartik Jain	Songbai Ji	Juan Jimenez	Jae Joong Ryu
Brandis Keller	Andrew Kemper	Mariana Kersh	Ata Kiapour
Megan Killian	Vipul Kishore	Kranthi Kolli	Joon Kong
Calvin Kuo	Nicholas Kurniawan	Mehmet Kurt	John LaDisa
Victor Lai	Spencer Lake	Kaveh Laksari	Kent Leach
Chi-Seung Lee	Chung-Hao Lee	Ying Lei	Emma Lejeune
Susan Lessner	Kewei Li	Zhe Li	Yuan-Chiao Lu
Spandan Maiti	Keefe Manning	Haojie Mao	Ria Mazumder
Kirk McGilvray	Andrew Merryweather	Eric Meyer	Art Michalek
Kristin Miller	Kristen Mills	Raheleh Miralami	Ken Monson
Emily Moore	James Moore	Christopher Moraes	Umberto Morbiducci
Michael Moreno	Elise Morgan	Tessa Morris	Debanjan Mukherjee
Jay Muthusamy	Kristin Myers	Arun Nair	David NedreLOW
Nandan Nerurkar	Corey Neu	Thao Nguyen	Grace O'Connell
Pim Oomen	Alican Ozkan	Nikhil Paliwal	Wu Pan Zagorski
Sourav Patnaik	Rita Patterson	Ryan Pedrigi	Anita Penkova
Carrie Peterson	David Pierce	Senol Piskin	Kamran Poorbahrami
Christopher Price	Zhenpeng Qin	Julia Quindlen-Hotek	Ramesh Raghupathy
Ellie Rahbar	Abhay Ramachandra	Anand Ramasubramanian	Sharan Ramaswamy

Manuel Rausch	Will Richardson	Andrew Robbins	Sara Roccabianca
Alejandro Roldan Alzate	Joshua Roth	Steve Rowson	Jeffrey Ruberti
Bradley Rutledge	Babak Safa	Edward Sander	Malisa Sarntinoranont
Sudeep Sastry	Nathan Schiele	Patrick Segers	Mary Kathryn Sewell-Loftin
Jawaad Sheriff	William Sherman	Snehal Shetye	Andrew Siefert
Ian Sigal	Sagar Singh	Joshua Smith	Joao Soares
Giovanni Solitro	Govind Srimathveeravalli	Brett Steineman	David Steinman
Amber Stern	Joel Stitzel	Shannon Stott	Antonis Stylianou
Philippe Sucosky	Mingrui Sun	Wei Sun	Yubing Sun
Spencer Szczesny	Jifu Tan	Dalin Tang	Stavros Thomopoulos
James Thunes	Luke Timmins	Nicolas Tobin	Francesco Travascio
Mustafa Unal	Jill Urban	Jonathan Vande Geest	Victor Varner
Vijay Vedula	Liming Voo	Amy Wagoner Johnson	Joseph Wallace
Lai Wang	Liang Wang	Sihong Wang	Vincent Wang
Zhenyu Wang	Zhijie Wang	Dar Weiss	Jeffrey Weiss
Jonathan Wenk	John Wilson	Sara Wilson	Beth Winkelstein
Colleen Witzenburg	Scott Wood	Neil Wright	Lyndia Wu
Ying Xin	Jiangsheng Xu	Yue Xuan	Bin Yang
Eda Yildirim	Kyoko Yoshida	Atieh Yousefi	Rana Zakerzadeh
Mingzi Zhang	Wujie Zhang	Wei Zhao	Jiangbing Zhou
Yilu Zhou			



## 5 In Memorium

# Yuan-Cheng “Bert” Fung, Ph.D. September 15, 1919 – December 15, 2019

The Father of Modern Biomechanics  
and  
a 5G Man  
(*Genius, Giant, Generous, Genuine and Gentle*)

Written by:

Savio L-Y. Woo, Ph.D.

Distinguished University Professor Emeritus and Director  
Musculoskeletal Research Center  
Department of Bioengineering  
University of Pittsburgh

May 25, 2020

At exactly three months after our Bioengineering Field celebrated Dr. Fung’s centennial birthday, we lost our most recognized and respected pioneer on December 15, 2019! It is impossible to do justice to memorialize Dr. Fung’s long, productive and impactful life on all of us. Thus, this writer would encourage everyone to read those articles on the reference list in order to get to know more about Dr. Fung [1-4]. Briefly, Dr. Fung was known as a pioneer and brilliant researcher, a distinguished scholar and consummate teacher, a quintessential leader and visionary role model and above all, a respected mentor and cherished friend. The writer suggests that we might all want to remember him in the following way.

Fung was a Genius! With his visionary thinking and thorough understanding of the laws of physics as well as mastery of applied mathematics, Fung made seminal contributions in both Aeroelasticity and Biomechanics. With his distinct and clear writing skills, he taught us lessons on the sphering of red cells, sheet flow for pulmonary alveolar microcirculation, strain energy density function for living soft tissues, quasi-linear viscoelastic theory for soft tissues, stress-dependent homeostasis as well as residual stress and wave propagation to reduce impact trauma and so much more.

Fung was a Giant! He was elected to all three U.S. National Academies (Engineering, Science and Medicine) and also the Chinese Academy of Engineering and Academia Sinica. He received a National Medal of Science from President Clinton and also won the Founders Award and Russ Prize from the National Academy of Engineering. The International Astronomical Union named an Asteroid (210434 Fungyuancheng) after him. Our distinguished colleague, Shu Chien wrote that “Dr. Fung opened up a new vista for bioengineering... Dr. Fung is not only a superb scientist and engineer, but also a wonderful artist. He has excellent command in Chinese calligraphy and poetry. He is a Renaissance man” [2].



Fung was Generous! He loved to share his vast knowledge freely and his time with all his students, colleagues and friends. He had written many outstanding treatises in Applied Mechanics and Biomechanics. He was personable and easily approachable to all and was very liberal with his time to dispense his advice. He also devoted his best efforts

toward his profession and its promotion. The ASME Biomechanics Symposium (the predecessor of our SB<sup>3</sup>C), the World Congress of Biomechanics, the U.S. National Committee of Biomechanics and our Journal of Biomechanical Engineering were all started by Fung. He also taught many of us the needed steps to do research properly.

Fung was Genuine! Those of us who are lucky enough to know him well will always remember him fondly in that way! Geert Schmid-Schoenbein, one of Fung's mentees from UCSD said, "He was the most joyful individual. When you stepped into a building, you could tell where he was just by the sound of his laughter" [5]. Mike Yen, another mentee, accompanied Fung on a trip to China after the Cultural Revolution and Yen said, "Everywhere we went, he wanted to help the poor and the needy. I learned from him to be concerned about people's humanity" [5].

Fung was Gentle! Many have fondly called Fung "a gentleman and a scholar". Pin Tong, his mentee said, that "he believes in harmony and gentility. He treats everyone collegially and does not compete with anyone" [4]. Ghassan Kassab, another mentee, has written a beautiful article on Fung [6]. When reading it, one would learn what a gentle professor Fung was. Peter Chen, his student and colleague said that "Fung treats his students like family and takes care of all their needs. As such, students could focus on their studies while learning to respect, admire, and love him" [7]. Below is one of the treasured notes Dr. Fung had written to me in 2011 [3]:

*"... it has been such a joy to be your friend and colleague for such a long time - a combined 82 years if we count in both directions - and to see your career and family blossom. Our scientific discoveries during our long collaboration, and your pioneering work in the years since, have accumulated to an extraordinary contribution to humanity. Each discovery, and each interaction, has been personally satisfying. The personal connection is most precious. How rare is the chance to combine work and friendship, so deeply, and for so long! We have been blessed with more than our share of harmony and opportunities. Living close by for 20 years enabled our families to become fast friends, and bioengineering conference organizers pick such great venues that our community has remained close for decades since." Luna, Dr. Fung's beloved wife and partner for almost 70 years shared: "He laughs frequently and heartily. He loves deeply. He loves his family. He loves his friends. He lives simply. He does not demand anything. He does not compete with anyone and never tries to keep up with the Jones" [8].*

Conrad and Brenda took great care of their parents for a number of years. They revealed ten years ago that "...our father's diary, a personal record begun in school three quarter of a century ago and updated daily ever since ... intervening days number over twenty-seven thousand ... feelings were recorded, as were guest lists of innumerable parties... . 'What dedication,' we once wondered aloud in his presence, to which he replied, 'I decided to do it, and I did it' " [9]. They also wrote, "To understand our father's inner harmony and how he could achieve so much with such apparent ease, we cite one of his favorite sayings. 'Easy to do. Hard to Know,' as a unifying theme for his life as a model of Choice coupled with Commitment" [9]. Dr. Fung is survived by Conrad A. Fung and Brenda Fung Manos and three grandsons, Nicholas Manos (wife Claire Bazley), Anthony Fung and Michael Fung.

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## Robert M. Nerem, Ph.D. July 20, 1937 – March 6, 2020

Written by:

C. Ross Ethier, Ph.D.

Professor

Georgia Research Alliance Lawrence L. Gellerstedt, Jr. Eminent Scholar in Bioengineering

Wallace H. Coulter Department of Biomedical Engineering

Georgia Institute of Technology and Emory University

May 18, 2020

Our community lost a founding member with the passing of Robert (“Bob”) Nerem in Atlanta on March 6, 2020. Like many biomechanical engineers of his generation, Bob began his academic career in a traditional engineering field (in his case, as an aeronautical engineer), graduating in 1959 from the University of Oklahoma with a B.S. degree and in 1964 from The Ohio State University with his Ph.D. His research started out in the area of hypersonic flow and heat transfer, but took a fortuitous detour into biomechanics through a project with NASA. This piqued his interest, and to advance his knowledge in this relatively new field he spent a sabbatical in 1970 at Imperial College of Science and Technology, in London. This converted him into a biomedical engineer, a field he worked in for the rest of his remarkable career.

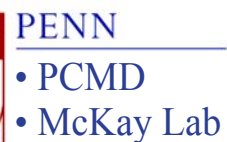
In 1979, Bob moved to the University of Houston to take up the role of Chairman of the Department of Mechanical Engineering, and then moved to Georgia Tech in 1987. His productivity was remarkable, and in recognition of his impact and stature he received many accolades, including three honorary degrees. Further, he was elected to both the National Academy of Engineering and the National Academy of Medicine; was a Foreign Member of the Polish Academy of Sciences, a Fellow of the American Academy of Arts and Sciences, a Foreign Member of the Royal Swedish Academy of Engineering Sciences, and a Honorary Member of ASME. He sat on nearly 30 advisory boards. Relevant to our community, Bob chaired the Bioengineering Division of ASME, chaired the ASME Board of Editors, and served the ASME Journal of Biomechanical Engineering for many years, first as Associate Editor (1977 – 1983) and then as Technical Editor (1988-1997). He also served on the editorial boards of 9 other journals. He sat on the Board of BMES, was the Founding President of both the International Academy for Medical and Biological Engineering (IAMBE) and the American Institute for Medical and Biological Engineering (AIMBE), was a co-founder of Tissue Engineering and Regenerative Medicine International Society (TERMIS), President of the International Federation for Medical and Biological Engineering, President of the International Union for Physical and Engineering Sciences in Medicine, Chair of the National Academy of Engineering Bioengineering Section, Chair of the U. S. National Committee on Biomechanics, and a member of the World Council on Biomechanics. One of the achievements that he was most proud of was co-founding Project ENGAGES, a program that provides a full year research experience for African-American high school students from Atlanta Public Schools.



Many of us were fortunate to know Bob personally. He always had a wise word for colleagues, and was endlessly supportive of our community. In recognition of his remarkable work, the Bioengineering Division of ASME recently established the Robert M. Nerem Education and Mentorship Medal.

A fuller accounting of the professional life of Bob Nerem has been published in ASME J Biomechanical Engineering (Ethier et al., “In Memoriam Robert M. Nerem, 1937-2020”, Vol. 142, article 060101, 2020. <https://doi.org/10.1115/1.4046990>).

The 2020 Summer Biomechanics, Bioengineering and Biotransport Conference (SB<sup>3</sup>C) organizers gratefully acknowledge the support of our Industry and Academic Sponsors.



Many thanks to the SB<sup>3</sup>C 2020 Sponsors!



# SB<sup>3</sup>C 2020 Virtual Meeting Abstract Presentations

Wednesday, June 17	1:00PM – 2:30PM EDT
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## PhD Paper Competition: Session 1

- 1:00PM**      **Protease Signaling and Matrix Fibers Drive Myofibroblast Differentiation in 3D Interstitial Tissue Mimetics**  
Daniel Matera, University of Michigan
- 1:15PM**      **Cell Mechanotype Dictates Rigidity-Sensing and Enables Metastatic Cells to Become Adurotactic**  
Benjamin Yeoman, University of California, San Diego
- 1:30PM**      **Exposure of Muscle Stem Cells to a Stiff Microenvironment Drives an “Aged” Mitochondrial Phenotype**  
Hikaru Mamiya, University of Pittsburgh
- 1:45PM**      **Cellular Response to Transient Stretch Pulses Is Modulated by Extracellular Matrix Stiffness**  
Suzanne Stasiak, Northeastern University
- 2:00PM**      **Anatomically Relevant Spatial Gradients Improve Early Detection and Prediction of Osteoarthritis: Data from Human Explants and the Osteoarthritis Initiative**  
Robert Wilson, *University of Colorado Boulder*
- 2:15PM**      **Active Sorting of Platelets and Red Blood Cells in Contracting Blood Clots Is Driven by Platelet-Generated Forces that Stiffen Fibrin**  
Xingyu Chen, *University of Pennsylvania*

Wednesday, June 17	4:30PM – 6:00PM EDT
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## PhD Paper Competition: Session 2

- 4:30PM**      **The Role of Extracellular Mechanics in Skin Tissue Engineering and Ageing**  
Eve Hunter-Featherstone, Durham University
- 4:45PM**      **Biomimetic Proteoglycans Modulate and Molecularly Engineer Cartilage Pericellular Matrix**  
Elizabeth Kahle, Drexel University
- 5:00PM**      **YAP and TAZ Mediate Mechanical Regulation of Embryonic Bone Development**  
Joseph Collins, University of Pennsylvania
- 5:15PM**      **Cell-Cell Adhesion Links Cell Rearrangement and Cell Shape During Epithelial Morphogenesis**  
Xun Wang, Columbia University

- 5:30PM      Vascularized Hepatocellular Carcinoma-on-a-chip for Assessment of Drug Transport and Chemotherapy Efficacy**  
Alican Ozkan, The University of Texas at Austin
- 5:45PM      FGF10-Induced Buckling Morphogenesis of the Embryonic Airway Epithelium**  
Kara Peak, the University of Texas at Dallas

<b>Wednesday, June 17</b>	<b>Tissue and Cellular Engineering Lightning Talks</b>
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## **Bioprinting and Biomanufacturing**

### **Torpedo-Shaped Bioreactor Design for Flow Conditioning of Cell-Seeded Tubular Heart-Valve Bioscaffolds**

Manuel Perez-Nevarez, Florida International University

### **Gelatin and Acetic Acid Concentrations Along with Needle Gauge and Height Affect the Morphology and Diameter of Direct-Write, Near-Field Electrospun Gelatin Solution**

Zachary Davis, North Carolina State University and University of North Carolina - Chapel Hill

### **Fabricating Multicellular Tumor Spheroids in Non-Aggregating Cell Lines via Laser Direct-Write Bioprinting**

Cassandra Roberge, Rensselaer Polytechnic Institute

### **Endothelial Cells Promote Osteogenesis in an in Vitro Vascularized Bone Model Developed by 3D Bioprinting**

Riccardo Gottardi, University of Pennsylvania

### **Bioprinted Vascularized Tissue Construct Functionality Under Simulated Microgravity Environment**

Likitha Somasekhar, Florida Tech

## **Development and Morphogenesis**

### **Actomyosin Activity Drives Organ-Scale Buckling Morphogenesis of the Small Intestine**

Nandan Nerurkar, Columbia University

### **Origin and Differentiation of Airway Smooth Muscle During Branching Morphogenesis in the Embryonic Mouse Lung**

Katharine Goodwin, Princeton University

### **Complete Regeneration of Neochordae Component of Bio-Scaffold Mitral Valve Apparatus in a Non-Human Primate Model**

Brittany A. Gonzalez, Florida International University

### **Compartments Along the Developing Intestinal Tract Have Distinct Lumen Wrinkling Patterns and Tissue Mechanics**

Hasreet Gill, Harvard Medical School

**Steering Apical-Basal Polarization in Mature Renal Epithelial Cells by Modulating Substrate Stiffness**

Marjan Hagelaars, Eindhoven University of Technology

**DNA-Based Micropatterning Approach to Create Spatial Interfaces Between Multiple Cell Types**

Louis Prah, University of Pennsylvania

**ECM Stiffness Regulates the Proliferation of Kidney Collecting Duct Epithelial Cells via Changes in YAP Signaling**

Somdutta Chakraborty, the University of Texas at Dallas

**High-Resolution Imaging of Collagen formation in an Engineered Model of Human Corneal Development: Evidence of Surface-Induced Fibrillogenesis and Molecular Crowding**

Ebraheim Ismail, Northeastern University

**Spatiotemporal Control of Body Axis Elongation by Optogenetic Manipulation of Actomyosin Contractility**

Karen Kasza, Columbia University

**Aortic Architecture, Loading, and Function During Development**

Sae-Il Murtada, Yale University

**Temporal Modulations of Nodal, Bmp and Wnt Signals Guide the Spatial Patterning in Self-Organized Human Ectoderm Tissues**

Tianfa Xie, University of Massachusetts Amherst

**Emerging Topics in Cell and Tissue Engineering**

**Frap Combined with Genetic Manipulation Reveals the Kinetics of Actin-Binding Proteins in Cells**

Takumi Saito, University of Osaka

**A Comparison of Exosome Production and Uptake for the Repair of Intervertebral Disc Degeneration in Sheep**

Peter Linde, Colorado State University

**A Prevascularized Polyurethane-Reinforced Fibrin Gel Patch Improves Regenerative Remodeling in a Rat Right Ventricle Replacement Model**

Ze-Wei Tao, University of Colorado Anschutz Medical Campus

**Hemodynamics-Driven Mechanobiological Crosstalk During Vascular Tissue Regeneration**

Nicholas Kurniawan, Eindhoven University of Technology

**Epigenetic Regulation Influences Cell Fate in Tissue Regeneration Procedures**

Adrienne Scott, University of Colorado Boulder

**Control Over 3D Cell Migration Mode via Tuning of Stromal Fibrous Architecture**

Harrison Hiraki, University of Michigan

# Mechanobiology

## **Protein Micropatterning on 2.5D Substrates: A n Approach to Investigate Cellular Behavior in Multi-cue Environments**

Cas van der Putten, Eindhoven University of Technology

## **Matrix Rigidity Regulates Histone H3 Lysine 9 Methylation During Epithelial-Mesenchymal Transition**

Chinmay Sanjay Sankhe, the Pennsylvania State University

## **Targeted Gq-GPCR Activation Drives Enhanced Collagen and Proteoglycan Deposition via Er-Dependent Ca<sup>2+</sup> Oscillations in Chondrocytes**

Ryan McDonough, University of Delaware

## **A 3-D Constitutive Model for Finite Element Analyses of Agrose with a Range of Gel Concentrations**

Xiaogang Wang, University of Connecticut

## **Fibroblast Mechanotransduction Model Identifies Mechano-Adaptive Drug Targets for Post-Infarct Therapy**

Jesse Rogers, Clemson University

## **Cell Contractility and an Actin Gradient Drive Polar Alignment of Fibroblasts in Constrained Geometries**

Sarah St. Pierre, University of Massachusetts Amherst

## **Role of Substrate Stiffness on Proliferation and Foam Cell formation in Primary Human Macrophages**

Manasvini Ammanamanchi, University of Texas at Dallas

## **An in Vitro Model of Bone formation in a Porous Titanium Scaffold**

Alyssa Oberman, University of Notre Dame

## **Examining the Effects of Mechanical Strain on the Degradation of Collagen**

Ryan Jamieson, Northeastern University

## **Molecular Dynamics Simulations Reveal Fibrillin-1 Calcium Binding is Mechanosensitive**

Stephen Haller, University of Nebraska Medical Center

## **Modeling the Effects of Applied Mechanical Loading in Bone Marrow with Bone Metastatic Breast Cancer**

Chet Falk, University of Colorado Boulder

## **Wavy Morphology Regulates Vascular Smooth Muscle Cell Phenotype**

Pen-hsiu Grace Chao, National Taiwan University

## **Investigating the Effect of Cyclic Stretch on Multicellular Aggregates**

Leo Sutter, Worcester Polytechnic Institute

## **Quantitative Characterization of Changes in Actin Cytoskeleton and Cell Nucleus Associated with Osteogenic and Adipogenic Differentiation of Human Mesenchymal Stem Cell**

Hiroshi Miyoshi, Tokyo Metropolitan University

**Disruption of Mechanotransduction Signaling Promotes Tissue Regeneration in Healing Wounds by Changing Fibroblast Heterogeneity**

Kellen Chen, Stanford University

**Differential Effects of Pressure Cycling on Urothelial Cell Function in Vitro.**

Jiro Nagatomi, Clemson University

**Development of an Automatic Computational Machine Learning Pipeline to Process Confocal Fluorescence Images for Virtual Cell Generation**

Miguel Contreras, Wichita State University

**Effect of Mechanical Strain on Collagen Degradation Depends on Protease Type**

Amirreza Yeganegi, Clemson University

**Mechanically-Induced Cell Senescence and Senolytic Drug Treatment in Pulmonary Epithelium**

Franck Kamga Gninzeko, Virginia Commonwealth University

**Glial Cells React to Heightened Fluid forces by Upregulating Sphingosine-1-Phosphate Receptor 3**

Chase Cornelison, University of Massachusetts Amherst

**The Interrelationship Between Aortic Valve Interstitial Cell Shape and Local Deformation in Peg Hydrogels**

Alex Khang, the University of Texas at Austin

**3D Contractile Responses of Normal and Diseased Human Aortic Valve Interstitial Cells**

Alex Khang, the University of Texas at Austin

**Three Dimensional Culture Model Utilizing Cell Spheroids to Study the Impact of Extracellular Matrix Stiffness on Dormancy in Metastatic Breast Cancer**

Raghu Vamsi Kondapaneni, the University of Alabama

**Hydrostatic Pressure Loading of Macrophages Regulates Immune Function**

Kevin Burt, Columbia University

**A Single High Impulse on Neural Cultures Results in Divergent Biophysical Nuclear Responses**

Stephanie E. Schneider, University of Colorado at Boulder

**The Role of Primary Cilia and Hedgehog Signaling on Tenocyte Mechanotransduction in Vitro**

McKenzie Sup, Columbia University

**Fiber Alignment and Density Regulate Endothelial Tip Cell formation and Guide Sprout Directionality**

William Wang, University of Michigan

**Pge2-Induced Osteocyte Signaling is Mediated by 3D Culture Environments**

Rachel Wilmoth, University of Colorado Boulder

**Regulation of Nuclear Architecture, Mechanics and Nucleo-Cytoplasmic Shuttling of Epigenetic Factors by Cell Geometric Constraints**

Farid Alisafaei, University of Pennsylvania



### **Fabricating Heterogeneous Collagen Gels for in Vitro Studies of Cell-Matrix Interactions**

Michael Potter, Clemson University

### **Increased Stiffness of the Extracellular Matrix is Sufficient to Drive a Healthy Airway to Become Hypercontractile**

Ryan Jamieson, Northeastern University

### **Effect of ECM Stiffness on the Motility and Proliferation of Cultured Primary Corneal Keratocytes in an in Vitro Model of Corneal Wound Healing**

Krithika Iyer, the University of Texas at Dallas

### **Simvastatin, but Not Losartan, Reduces Cell Contractility and Viability in Fibroblast-Seeded Collagen Gels**

Michael David, Washington University in St. Louis

### **Developing a Computational Framework to Construct a Finite Element Model of an Isolated Cell Nucleus**

Zeke Kennedy, Mechanical Adaptations Laboratory

### **ECM Stiffness Regulates the Myofibroblastic Differentiation of Cultured Primary Corneal Keratocytes via Subcellular Changes in Contractility and Focal Adhesion Assembly**

Daniel Maruri, the University of Texas at Dallas

### **Analysis of a Novel Bioreactor to Investigate Akt/gsk3-Beta Intracellular Signaling in Response to Ultrasound**

Jacob Crapps, Saint Louis University

## **Mineralized Tissue Engineering**

### **The Effect of Ph and Buffer Capacity on the Dissolution of Carbonate-Substituted Calcium Apatite**

Stephanie Wong, University of Connecticut

### **Developmentally Inspired Micro-Aggregate Tissue Assemblies for Long Bone Healing**

Liesbet Geris, University of Liege

## **Tissue and Cell Engineering: Other Topics**

### **Cell Response in a 3-Dimensional in Vitro Multi-Protein Collagen/kerateine Network for Thermal Stress Studies**

Marissa Rylander, University of Texas at Austin

### **Longitudinal, Label-Free Assessment of Cell Density and Viability in Multicellular Tumor Spheroids via Optical Coherence Tomography**

Cassandra Roberge, Rensselaer Polytechnic Institute

### **Neuronal Architecture Influences Severity of Mechanically-Induced Tau Pathology**

Nicholas Braun, University of Minnesota - Twin Cities

### **Assessment of Various Bone Marrow Aspirate Collection Sites in the Sheep Model**

Katie Bisazza, Colorado State University

**Cells Establish Spatially Heterogeneous and Anisotropic Stiffness Landscapes - Direct Measurements**

Alicja Jagiello, University of California, Irvine

**A Thermodynamic Model for Actin-Myosin Cross-Bridge Cycling and Dynamic Cell Contractility**

Patrick McGarry, National University of Ireland Galway

**A Correlative Method to Measure Collagen Fibril Diameter in Differential Interference Contrast Microscopy**

Sayed Mohammad Siadat, Northeastern University

**Z-Line Architecture and force Production in Muscle Tissues**

Anna Grosberg, University of California, Irvine

**Toward Defining the Role of the Synovium in Mitigating Normal Articular Cartilage Wear and Tear**

Lance Murphy, Columbia University

**Rapid Fabrication of Microscale Collagen Bundles and Their Application in Studies of Tumor Cell-Matrix Interactions**

Kristen Mills, Rensselaer Polytechnic Institute

**Soft Tissue Engineering**

**Chondrocyte Morphology is Maintained Long-Term by a Micropatterned Composite Platform with Physiological Stiffness Designed to Promote Adhesion**

Ram Saraswat, South Dakota School of Mines and Technology

**Stromal Cells Promote Neovascular Invasion Across Tissue Interfaces**

Hannah Strobel, Advanced Solutions Life Sciences

**Controlling the Compliance of a Biomimetic Tissue Engineered Vascular Graft in a Rat Model**

Kenneth Furdella, University of Pittsburgh

**Dynamic Mechanical Culturing of Additive Manufactured Annulus Fibrosus Tissue Scaffolds**

Mitchell Page, Colorado State University

**Multilayer in Vitro Human Skin Tissue Platform for Quantitative Contact Burn Testing**

Sean Brocklehurst, University of Texas

**A Modular Approach to Create Anisotropic Collagen Fiber Domains and Interfaces Within a Microfluidic System**

Adeel Ahmed, Rochester Institute of Technology

**Fibrous Matrices with Tunable Nonlinear Mechanics via Functionalization with Hydrophilic Peptides**

Christopher Davidson, University of Michigan

**Tgf $\beta$ 2-Induced Tenogenesis of Stem Cells May Activate P70s6k Signaling**

Sophia K Theodossiou, University of Idaho

**Determining the Signal for Cell Contact Guidance in Aligned Fibril Networks Through a Computational Microstructural Model,**

Robert Tranquillo, University of Minnesota- Twin Cities

**Dynamic and Static Elastomers to Drive Cardiomyocyte Maturation**

Wade Stewart, University of Delaware

**Regulation of Contractile forces in Heart Valve Tissue Constructs via TGF- $\beta$ 1 and FGF-2 Treatments**

Ying Lei, Worcester Polytechnic Institute

**Quantification of Simultaneous Structure, Strain, and Stress Behaviors in Layered Soft Tissues**

Coinneach Mackenzie Dover, University of Texas at Austin

**A Custom Bioreactor for Concurrent Mechanical and Electrical Stimulation of Scaffold-Free Engineered Skeletal Muscle Fibers**

Sarah Van Houten, Rennselaer Polytechnic Institute

**Development, Implantation and Initial Performance of a Bi-Stable, Liquid Crystal, Active-Collagen Patch for Tendon Repair**

Patrick Bradley, Northeastern University

<b>Wednesday, June 17</b>	<b>Biotransport Lightning Talks</b>
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**Biotechnology Applications: Biosensors**

**3D Printed Graphene Biosensors for Measuring Electrochemical Properties of Neuronal Cells**

Amir Ehsan Niaraki Asli, Iowa State University

**Biotechnology Applications: Cryopreservation**

**Photothermal Conversion of Gold Nanoparticles for Fast and Uniform Laser Warming of Vitrified Droplets**

Yilin Liu, University of Minnesota at Twin Cities

**Diagnostics: Cardiovascular and Lung Diagnostics**

**Agent-Based Computational Model to Elucidate the Mechanistic Events During Leukocyte Transmigration and Plaque Progression**

Rita Bhui, University of Texas at Dallas

**Nanoparticle Accumulation in a Mouse Model of Disturbed Blood Flow-Induced Advanced Atherosclerosis**

Morgan A. Schake, University of Nebraska-Lincoln

**Performance of Supervised Classifiers for Classification of the Four Chambers of the Heart**

Rohit C. Philip, University of Arizona

## **Diagnostics: Infectious Diseases**

### **Laser Induced Vapor Nanobubble for Diagnosis of Respiratory Syncytial Virus**

Yaning Liu, University of Texas at Dallas

## **Drug Delivery: Cancer**

### **Enhanced Nanoparticle Deposition in P3 Tumors by Mild Whole Body Hyperthermia: A Theoretical Simulation**

Manpreet Singh, University of Maryland Baltimore County

### **Characterization of a Fiberoptic Microneedle Device for Codelivering Laser and Drug**

Forhad Akhter, University of Texas at San Antonio

### **Increased Infusion Dispersal Volume by a Moving Catheter: Predictions Using a 2D Axisymmetric Biphasic Computational Model**

Jason N. Mehta, the University of Texas at Austin

### **Methods to Improve Fiberoptic Microneedle Visibility on Magnetic Resonance Imaging**

Brianna Morales, University of Texas at Austin

### **Computer-Aided Design of Photosensitizer Molecule for Photodynamic Therapy**

Farhana Abedin, California State Polytechnic University, Pomona

## **Drug Delivery: Central Nervous System**

### **Phospholipase A2 Inhibitor-Loaded Phospholipid Micelles Abolish Neuropathic Pain & Associated Microglial Activation**

Sonia Kartha, University of Pennsylvania

## **Drug Delivery: Ocular**

### **Antioxidant Activity and Improved Stability of Vitamin C in Hydrogel Vitreous Substitutes**

Nguyen Tram, the Ohio State University

## **Nano and Microfluidics: Hemodynamics and Lymphatics**

### **Sickle-Cell-Disease-Induced Changes in Blood Viscosity Can Alter Arterial Wall Shear Stress Profiles**

Marisa Bazzi, University of Minnesota

### **The Hemodynamics of the Umbilical Vein**

Alexandria Mallinos, Cleveland State University

### **Microfluidic Chip Design Through Simulation for Viscosity Measurements**

Senol Piskin, Istinye University

### **Customized Counting Chambers via Soft Lithography for Standardized Estimation of Sperm Concentration**

Todd Monroe, Louisiana State University

**Modelling Lymph Propulsion in a Series of Contracting Lymphangions: from Idealized 2D to Reconstructed 3D**

Ghazal Adeli Koudehi, Ghent University

**Nano and Microfluidics: Tumor Microenvironment**

**Angiogenesis is Driven by Mechanical Activity of Cancer-Associated Fibroblasts in a 3D Microtissue Model**

M.K. Sewell-Loftin, University of Alabama at Birmingham

**Regulation of Hepatocellular Carcinoma Angiogenesis by Tumor Associated Macrophages in an in Vitro Microfluidic Tumor Platform**

Danielle Stolley, the University of Texas at Austin

**Non-Ionizing Energy/Electric Field Assisted Drug Delivery**

**The Potential of Microsecond Pulsed Electric Fields for Breast Cancer Treatment**

Zahra Safaei, Rowan University

**Electro-Diffusive Transport of Cationic Peptides in Cartilage for Applications in Drug Delivery**

Armin Vedadghavami, Northeastern University

**Electric Pulse Assisted Nanoparticle Delivery to Bronchial Wall with Microporous Balloon Catheter**

Neeraj Raghuraman Rajagopalan, University of Massachusetts Amherst

**Biotransport: Other Topics**

**Optimizing a Fluidic Oscillator for Organ and Limb Preservation**

Daniel Portillo, the University of Texas at San Antonio

**Size-Dependent Diffusive Transport Through Porcine and Human Joint Synovium**

Young Guang, Washington University in St. Louis

**A Computationally Efficient Convolution Based Approach to Modeling Complex Diffusion Problems**

Arlynn Baker, University of Virginia

**3D Thermal Model of Magnetic Insertion of a Cochlear Implant**

Fateme Esmailie, University of Utah

**Managing Cooling Penetration and Minimizing Systemic Hypothermia After Surgery Using a Cooling Pad – Whole Body Heat Transfer Simulation**

Manpreet Singh, University of Maryland Baltimore County

**Effects of Therapeutic Chemical Modifications on Oligonucleotide Polyelectrolyte Complex Properties**

Alexander Marras, University of Chicago



## Therapeutics and Biotransport: Nanotherapeutics and Bioelectricity

### **Superhydrophobic Hemostatic Nanofiber Composite Patch Enables Fast Clotting and Minimal Adhesion After Clotting**

Choon Hwai Yap, National University of Singapore

### **Mpep-Loaded Micelles Attenuate Hyperactivity in Cortical Neurons: A Novel Effective Therapeutic Approach for Pain**

Sonia Kartha, University of Pennsylvania

### **Multi-Arm Avidin Nano-Construct for Intra-Cartilage Delivery of Small Molecule Drugs**

Tengfei He, Northeastern University

### **Pentagalloyl Glucose Nanoparticles Are Not Cytotoxic and do Not Alter Reactive Oxygen Species Expression**

Sourav Patnaik, University of Texas at San Antonio

## Therapeutics and Biotransport: Thermal Treatment

### **Computational Analysis of Protein Photoinactivation by Molecular Hyperthermia**

Chen Xie, University of Texas at Dallas

### **Extraction of Baseline Blood Perfusion Rates in Mouse Body and Implanted Pc3 Tumor Using Infrared Images and Theoretical Simulation**

Manpreet Singh, University of Maryland Baltimore County

### **Characterizing Miniature Probes for Preclinical Cancer Focal Therapy**

Pegah Ranjbarkehrani, University of Minnesota

Thursday, June 18	11:00AM – 12:30PM EDT
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## PhD Paper Competition: Session 3

11:00AM	<b>Tensile and Compressive Anisotropic and Time Dependent Material Properties of Human Cervical Tissue</b> Lei Shi, Columbia University
11:15AM	<b>Age-Related Changes in Aortic Stiffness and Hemodynamics in Humans and Mice</b> Sara Hopper, University of Michigan
11:30AM	<b>Microvascular Growth Increases with Matrix Anisotropy in 3D Aligned Collagen Hydrogels</b> Steven LaBelle, University of Utah
11:45AM	<b>Biaxial Contractions of the Rat Vagina</b> Alyssa Huntington, Virginia Tech

- 12:00PM**      **Use of Reflected Quantitative Polarized Light Imaging in Detection of Progressive Microstructural Changes in Biologically Degraded Tendon**  
Leanne Iannucci, Washington University in St. Louis
- 12:15PM**      **The Effect of Fibulin-5 Haploinsufficiency on Vaginal Elastic and Viscoelastic Mechanical Response**  
Gabrielle Clark-Patterson, Tulane University

<b>Thursday, June 18</b>	<b>2:30PM – 4:00PM EDT</b>
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### **PhD Paper Competition: Session 4**

- 2:30PM**      **A Biphasic-Fluid Structure Interaction Mixture formulation and Its Finite Element Implementation in FEBio**  
Jay Shim, Columbia University
- 2:45PM**      **Computational Models to Evaluate the Impact of Coronary Collateral Artery Flow In Adult Mice**  
Suhaas Anbazhakan, Stanford University
- 3:00PM**      **Modeling the Porcine Mitral Valve Posterior Leaflet Using Manifold Learning-Based Data-Driven Mechanics**  
Devin Laurence, University of Oklahoma
- 3:15PM**      **Multi-scale Computational Analysis of Estrogen-Mediated Right Ventricular Remodeling in Pulmonary Hypertension**  
Madison Freeman, University of Wisconsin-Madison
- 3:30PM**      **Hill-Type Active Fiber Model to Describe the Dynamic Mechanical Properties of Vascular Smooth Muscle Cells**  
Taylor Rothermel, University of Minnesota - Twin Cities
- 3:45PM**      **A Predictive Analysis of Wall Stress in Abdominal Aortic Aneurysms Using a Neural Network**  
Balaji Rengarajan, the University of Texas at San Antonio

<b>Thursday, June 18</b>	<b>MS ASME Student Paper Competition Lightning Talks</b>
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### **MS Level Competition: Group A Musculoskeletal, Bone, and Head Injury Biomechanics**

**Quantitative Analysis of Nuclear Local Viscoelastic Changes in Human Mesenchymal Stem Cells During Osteoblast Differentiation**  
Kojiro Matsushita, Tokyo Metropolitan University

**Characterizing the Relationship Between Shear Wave Speed and Tension in Collateral Ligaments Following Release During Total Knee Arthroplasty**

Matthew Blomquist, University of Wisconsin-Madison

**Evaluation of Hard Hats for the Reduction of Head Injuries Due to Falls**

Maura McCartney, Virginia Tech

**Investigating the Immediate EEG Changes from Soccer Head Impacts**

Timothy Yi Lun Wang, University of British Columbia

**Hedgehog Signaling Promotes Zonal Tendon-To-Bone Integration**

Timur Kamalidinov, University of Pennsylvania

**Estimation of Labral and Cartilage Contact Mechanics During Gait in Patients with Cam Femoroacetabular Impingement Syndrome**

Lindsay Schuring, University of Utah

**The Effect of Coach Knowledge of Head Impact Exposure on Practice Structure in Youth Football**

Daniella DiGuglielmo, Wake Forest School of Medicine

**Viscoelastic Properties of Porcine Menisci for Future Modeling**

Christopher Norberg, University of Miami

**Improved Head Cooling System Using Phase Change Material for Thermoregulation of Brain Temperature**

Sathyaprabha Rakkimuthu, University of Cincinnati

**Head Impact Exposure in Youth Hockey**

Abigail Swenson, Wake Forest School of Medicine

**Use of Virtual Reality for Assessing Gross Hand Dexterity in Young Healthy Individuals**

Sheridan Parker, University of Nebraska at Omaha

**Predicting Subacromial Impingement of Greater Tuberosity Fractures with Lightweight, Patient-Specific, Computational Models**

Kayley Dear, University of Pennsylvania

**Novel Method to Measure in Vitro Volumetric Wear of Meniscus Using a 3D Optical Scanner**

Kate Benfield, Boise State University

**The Effect of Infant Cranial Bone Thickness on Skull Fracture**

Jiawei Yan, University of Utah

**MS Level Competition: Group B  
Heart, Lung, Blood, and Cell Biomechanics**

**Low Intensity Vibrations Counteract Effects of Simulated Microgravity on YAP Nuclear Levels in Mesenchymal Stem Cells**

Matthew Thompson, Boise State University

**Machine Learning for Segmentation of Echocardiography**

Taeouk Kim, Texas A&M University

**Development of Numerical Models for Interstitial Flow Under the Skin from Cell to Tissue Scale**

Kensuke Horikawa, Osaka University

**Rapid, Automated Generation and Solution of 0-D Surrogate Models from 3-D Vascular Models**

Jonathan Pham, Stanford University

**A Computational Sensitivity Study on Oxygen Transport in Abdominal Aortic Aneurysm**

Tanja Cupac, Duquesne University

**Flow-induced Compression of Collagen Gels: Experimental Data vs. Biphasic Model Prediction**

Christopher Vidmar, University of Minnesota-Duluth

**Modular System for the Macroscale Mechanical Characterization of Soft Biomaterials and Small Tissues**

Julian Jimenez, Purdue University

**Mechanical Properties of Spinal Cord Grey Matter and White Matter in Confined Compression**

Justin Yu, University of British Columbia

**Comparison of Early and Late Clinical-Trial-Outcomes Between Fractional Flow Reserve and Pressure Drop Coefficient in Patients with Coronary Artery Dysfunction**

Sruthi Ramadurai, University of Cincinnati

**Novel Endotracheal Tube System Utilizing Unique Geometries**

David Berard, University of Texas at San Antonio

**Characterization of Post-Operative Hemodynamics Following the Norwood Procedure Using Multi-Scale Modeling**

Jonathan Primeaux, University of Michigan

**Towards Experimental Validation of Multi-Venc 4D Flow MRI in a Patient-Specific Model of a Left Ventricle Using Tomographic Particle Image Velocimetry**

James Rice, University of Wisconsin-Madison

**Quantification of Load-Dependent Collagen Fiber Reorientations in the Chordae-Leaflet Insertion Region of Atrioventricular Heart Valves**

Colton Ross, University of Oklahoma

**Modeling Cell Interior Viscosity: Continuum and Molecular Approaches**

Michael Hood, Northern Illinois University

## **Biomechanics of Human Motion**

### **Estimated Forces and Moments Experienced by Osseointegrated Endoprotheses for Lower Extremity Amputees**

Carolyn Taylor, University of Utah

### **Machine Learning System for Gait Event Identification, Locomotion Classification and Prediction**

Seth Donahue, University of Oregon

### **Using Magneto-Inertial Measurements Units to Measure Hip Joint Motion During Sport Practices**

Rachel Horenstein, Northeastern University

### **Integration of Neural Architecture Within a Finite Element Framework for Improved Neuromusculoskeletal Modeling**

Victoria Volk, Boise State University

### **What Are the Tibiofemoral Joint Forces During Fes Rowing in Individuals with SCI**

Vishnu Chandran, New Jersey Institute of Technology

### **Evaluation of a Dimensional Analysis Derived, EMG-Based Constitutive Law to Quantify Muscle Forces: A Pilot Study**

Nathan Knodel, Purdue University

### **Effects of Prosthetic Socket Design on Residual Limb Motion Using Dynamic Stereo X-Ray**

John Chomack, Manhattan Veteran Affairs New York Harbor Healthcare System

### **Use of Inertial Measurement Units to Quantify Skier Performance**

Sarah Wilson, Steadman Philippon Research Institute

## **Cardiovascular and Musculoskeletal Device Design**

### **Power-Assisted Pedicle Screw Placement Decreases Pedicle Screw Wobble**

Amy Claeson, Zimmer Biomet Spine

### **Validation of a Custom Device for Knee Laxity Measurement Using Stereo Radiography**

Thor Andreassen, University of Denver

### **Treatment Analysis of Coronary Artery Stenosis by Stent or Bypass Graft for Diabetes Mellitus Patients: A Computational Hemodynamics Perspective**

Senol Piskin, Istinye University

### **Nitinol, Stainless Steel, and Titanium Kirschner Wire Durability**

Peter Gustafson, Western Michigan University

### **Fluid-Structure Interaction Model of Blood Flow Through a Novel Double-Walled Aortic Stent-Graft**

Shannen B. Kizilski, University of Minnesota



## **Design Dynamics and Rehabilitation: Other Topics**

### **Development of a Neural Network Based Markerless Motion Capture System**

Travis Eliason, Southwest Research Institute

## **Design of Global Health Solutions**

### **Towards the Development of a Bubble Cpap Device for Premature Infants in Low to Middle Income Countries**

Raymond Laguerre, Therapeutic Innovations

## **Design of Medical Technologies**

### **Early Detection of Breast Cancer Through an Inverse Problem Approach to Stiffness Mapping: Simulations and Experimental Validation with Force Data and Phantom Experiments with Improved Cost Functions**

Lorraine Olson, Rose-Hulman Institute of Technology

### **Power-Assisted Pedicle Screw Technique Protects Against Risk of Surgeon Overuse Injury: A Comparative Emg Study of the Neck and Upper Extremity Muscle Groups**

Amy Claeson, Zimmer Biomet Spine

### **Optimizing Tether Retention in a Novel Device for Insertion of Intrauterine Devices in the Postpartum Period**

Etse-Oghena Campbell, University of Texas at Austin

### **Analysis of a Novel Head Support for People with Hypermobility-Type Ehlers-Danlos Syndrome**

Robert Pierce, Western Carolina University

### **Two Screws Provide Superior Resistance to Bending Than a Plate with an Integrated Compression Screw: A Cadaveric Study of Talonavicular Arthrodesis**

Danielle Cristino, University of Pennsylvania

## **Rehabilitative and Assistive Technologies**

### **Design Evolution of a Motorized Elliptical Machine for Children with Mobility Impairments**

Alan Eberhardt, the University of Alabama at Birmingham

### **Effect of Temperature Control Prosthesis Liners on Gait Speed and Activity Levels of People with Lower Limb Loss**

Anita Singh, Widener University

<b>Thursday, June 18</b>	<b>Biomedical Engineering Education Lightning Talks</b>
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## **Active Learning**

### **Active Learning Modules for Training Engineers to Develop Innovative Orthopedics Applications**

Eric G. Meyer, Lawrence Technological University

### **Interactive Digital Experience as an Alternative Laboratory**

Valerie A. Troutman, Michigan State University

### **Assessing the Efficacy of Biomedical Engineering Education in Multidisciplinary Environment**

Anita Singh, Widener University

## **Biomedical Engineering Education: General**

### **Enhanced Engineering and Design in a Senior Capstone: The Pendulum Swings Back**

Alan Eberhardt, the University of Alabama at Birmingham

### **Development of DNA Education Modules for Middle School, High School, and Undergraduate Students and Educators**

Michael Hudoba, Otterbein University

## **Outreach and Community-Based Teaching**

### **Follow-Up on Long-Term Engagement in Stem+m by Underrepresented Minority Groups**

### **Following Biomechanics and Sports-Based Stem+m Education**

Brittany Marshall, Columbia University

### **Youth Education Outreach Programs at the Steadman Philippon Research Institute**

Travis Turnbull, Steadman Philippon Research Institute

<b>Thursday, June 18</b>	<b>Fluid Mechanics Lightning Talks</b>
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## **Data Driven Imaging Modeling and Visualization**

### **Data Driven Approach of Coronary Vessel Reconstruction Using X-Ray Angiography**

Kritika Iyer, University of Michigan

### **Automatic Alignment and Compounding of Multiple 4D Fetal Echo Scans for Improved Image Quality and Resolution**

Choon Hwai Yap, National University of Singapore

### **Flexible Framework for Reaction-Advection-Diffusion Problems in Cardiovascular Hemodynamics**

Sabrina R. Lynch, University of Michigan

**Characterization of Flow-Mediated Platelet Activation and Adhesion Dynamics via Semi-Unsupervised Learning**

Jawaad Sheriff, Stony Brook University

**The Link Between Shear Stress and Human Carotid Atherosclerotic Plaque Composition**

Kim van der Heiden, Erasmus MC

**Imaging and Computational Assessment of Ventricular and Valvular Flow**

**Effects of Implantation Orientation of Bileaflet Mechanical Heart Valves in an Anatomic Left Ventricle-Aorta Ensemble**

Hossein Asadi, Texas A&M University

**Virtual Reality (VR) Surgical Planning with Bio-Mechanical Computational Modeling in Hypoplastic Left Heart Syndrome (HLHS)**

Siyeong Ju, GE Research

**Automating Model Generation for Image-Based Simulations of Cardiac Flow**

Fanwei Kong, University of California, Berkeley

**Towards Non-Invasive Computational-Mechanics and Imaging-Based Diagnostic Framework for Patients with Transcatheter Aortic Valve Replacement**

Jason Kuiper, Colorado State University

**Thrombogenic Risk of Paravalvular Leak in Transcatheter Aortic Valve Replacement: Utilizing in Vitro and in Silico Models**

Brandon Kovarovic, Stony Brook University

**Impact of Aortoseptal Angle on Left Ventricular Outflow Tract Hemodynamics: A Computational Study**

Jason Shar, Wright State University

**Experimental Assessment of Cardiac Output Effects on Bioprosthetic Pulmonary Valve Hemodynamics and Leaflet Motion**

Nicole Schiavone, Stanford University

**Computational Comparison of Clinical Fluid-Dynamics Characteristics of Several Patient-Specific Fontan Anatomies**

Nicolas Tobin, the Pennsylvania State University

**Cardiac Contraction Modeling Using a Variational Multiscale Approach**

Chi Zhu, University of California, Berkeley

**Computational Assessment of Aortic Valve Function and Mechanics Under Hypertension**

Saurav Kadel, Wright State University

**Effect of Mitraclip on Turbulence and Vortex Formation: A n in Vitro Study**

Shelley Gooden, Georgia Institute of Technology

**Predicting the Risk of Coronary Obstruction Using Computational Fluid Dynamics**

Sri Krishna Sivakumar, Georgia Institute of Technology

## **Patient-specific Flow and Physiology**

### **Computational Evaluation of Surgical Revascularization Techniques in Coronary Artery Bypass Graft Surgery**

Jongmin Seo , Stanford University

### **Computational Study of Hemodynamics Alteration Induced by Different Aortic Valve Morphotypes in Ascending Thoracic Aortic Aneurysm**

Jayendiran Raja, Mines Saint-Etienne

### **Impact of Stenosis During Rest and Exercise on Fontan Patients with TEVGS**

Erica Schwarz, Stanford University

### **Unveiling Wall Shear Stress Spatiotemporal Heterogeneity in Coronary Arteries**

Karol Calo, Politecnico di Torino

### **Flow Characteristics in a Deformable Full-Scale Patient-Specific Cerebral Aneurysm**

Ryuhei Yamaguchi, Tohoku University

### **Closed-Loop Coupling Systemic Circulation and Coronary Perfusion for Modeling Mechanical Dyssynchrony and Ischemia**

Lei Fan, Michigan State University

### **Patient-Specific Simulation of Tavr (transcatheter Aortic Valve Replacement) in Bicuspid Aortic Valve and Its Validation**

Salwa Anam, Stony Brook University

### **A Hemodynamic Comparison of Myocardial Bridging and Coronary Atherosclerotic Stenosis**

Mohammadali Sharzehee, the University of Texas at San Antonio

### **Development of a CFD Model to Study Hemorrhagic Shock with Evac Implementation**

Antonio Renaldo, Wake Forest School of Medicine

### **Patient-Specific Hemodynamic Assessment of Anomalous Aortic Origin of a Coronary Artery (AAOCA) in Children**

Hoda Hatoum, Georgia Institute of Technology

### **Towards a Predictive Model of Atherosclerosis Progress: Validation Against Clinical Data of Coupled Bio-Hemodynamics Simulations of Leukocyte Adhesion in a Coronary Artery**

Umberto Ciri, the University of Texas at Dallas

### **Unappreciated Benefits of Anterior-Posterior Pulse Wave Interaction at the Circle of Willis**

Joseph Muskat, Purdue University

### **MRI-Based Blood Residence Time in Intracranial Aneurysms**

Yinghui Li, University of Minnesota

### **Animal-Specific Hemodynamic Compensation Following Myocardial Infarction**

Colleen Witzenburg, University of Wisconsin – Madison

### **Image-Based Modeling of Arteriovenous Malformation-Related Aneurysms**

Kimberly A. S. Boster, Purdue University

**Combining Fluid and Solid Dynamics to Better Characterize Pulmonary Artery Hemodynamics**

Daniel Pearce, East Carolina University

**Comparison of Prospective and Retrospective Gated Imaging Protocols for the Acquisition of 4D Flow Imaging Data to Evaluate the Focal Hemodynamics in the Carotid Artery**

Elliott Hurd, University of Utah

**Computational Fluid Dynamic Simulation in Dogs with Tricuspid Valve Dysplasia**

Banafsheh Zebhi, Colorado State University

**Automatic Creation of One-Dimensional Flow Models from Three-Dimensional Anatomical Geometries**

Martin Pfaller, Stanford University

**Image-Based Patient-Specific Computational Analysis of Hemodynamics and Wall Mechanics in Pulmonary**

Byron Zambrano, Texas A&M University

**An Open Data Model Repository for Large Scale Data Curation of Vascular Models and Blood Flow Simulation Results**

Nathan Wilson, Open Source Medical Software Corporation

**Dehydration and Anesthesia Influence on the Relationship Between Arterial and Venous Pressure Waveforms**

Lauren Crimmins, University of Arkansas

**Assessment of Pulmonary Arterial Structure and Its Association with Right Ventricular Function in Pulmonary Arterial Hypertension**

Frankangel Servin, University of Arizona

**Thrombosis Hemolysis and Mechanical Circulatory Support**

**The Effect of Pulsatility on Thrombus Risk in Trans-Aortic Stent Geometries**

Asad Mirza, Florida International University

**Atrial and Ventricular Flows Across a Transcatheter Mitral Valve**

Hoda Hatoum, Georgia Institute of Technology

**VWF Cleavage in Turbulent Flow**

Alireza Sharifi, Colorado State University

**Simulation of Clot Mechanics Consisting of Blood Cells and Fibrin Network**

Kacper Ostalowski, Northern Illinois University

**A New Resultant Stress for Hemolysis Prediction Based on Experiments in Extensional Flow**

M Keith Sharp, University of Louisville

**Experimental and Computational Investigation of Hemodynamics Within the Penn State Failing Fontan Centrifugal Blood Pump**

Bryan Good, Pennsylvania State University



### **Limitations of Eulerian Hemolysis Prediction Using the Power-Law Model**

M Keith Sharp, University of Louisville

### **Mechanical Characterization of Acute Ischaemic Stroke Thrombi**

Frank Gijzen, Erasmus MC

### **Simulation of Thrombus Growth Considering Platelet Activation and Red Blood Cell Collision**

Jifu Tan, Northern Illinois University

### **Testing the Clutch Hypothesis in Driving a Platelet's Mechanical Response**

Iain Macleod Briongos, Colorado State University

## **Translational Cardiovascular Diagnosis and Treatment**

### **Noninvasive Aortic Hemodynamics and End-Systolic Elastance Using Machine Learning**

Vasiliki Bikia, Ecole polytechnique federale de Lausanne

### **Implications of Scaling on Trileaflet Fetal Valve Hemodynamics**

Hoda Hatoum, Georgia Institute of Technology

### **Comparison of Static and Cyclic Aspiration Hydrodynamics in Acute Ischemic Stroke Catheters**

Bryan Good, Pennsylvania State University

### **Investigation of a Passive-Filling VAD Concept for Cavopulmonary Assist of Fontan Circulation**

Joshua Umo, Clemson University

## **Vascular Mechanobiology**

### **A Multiscale Computational Framework of In-Stent Restenosis: Linking Gene Dynamics and Hemodynamics to an Agent-Based Model of Cellular Dynamics**

Anna Corti, Politecnico di Milano

### **The Effect of Nuclear Stiffness on the Endothelial Cell Response to Shear Stress**

Brooke Danielsson, Virginia Commonwealth University

### **Computational Modeling of Atherosclerosis: Sensitivity Analysis Towards a Quantitative Calibration**

Stefano Casarin, Houston Methodist Hospital

### **A New Network Model of Mechanically-Induced Gene Expression in Pulmonary Arterial Adventitial Fibroblasts**

Ariel Wang, University of California San Diego

### **Empagliflozin Restores the Normal Mechanotransduction of the Endothelial Glycocalyx**

Marc-Antoine Campeau, McGill University

### **Endothelial Glycocalyx Integrity in Atherosclerotic-Relevant Flow Conditions for Targeted Intravenous Nanoparticle Delivery**

Ronodeep Mitra, Northeastern University

## **Vascular Pathology and Disease Progression**

### **Wall Shear Stress Topological Skeleton Predicts Long-Term Restenosis Risk After Surgery in the Carotid Bifurcation**

Valentina Mazzi, Politecnico di Torino

### **In-Stent Restenosis in Superficial Femoral Arteries: Dynamic Vessel Remodeling and Impact of Local Hemodynamics**

Claudio Chiastra, Politecnico di Torino

### **The Effects of Shear Rate and Enzyme Activity on Deposition of von Willebrand Factor in a Microfluidic Channel**

Connor Watson, Penn State University

### **Effective Impact of One Decade of Ageing on Arterial System Properties: What Cross-Sectional Studies Don't Tell**

Daime Campos, Ghent University

### **The Wall Shear Stress Topological Skeleton Predicts Atherosclerotic Plaque Initiation and Progression in Coronary Arteries**

Valentina Mazzi, Politecnico di Torino

### **Shear Stress Related Plaque Progression of Lipid Rich Plaques in Human Coronary Arteries**

Jolanda J Wentzel, ErasmusMC

### **Optimization of Staining with Collagen Hybridizing Peptide to Evaluate Mechanical Induced Collagen Damage in the Murine Aorta**

Kelly Smith, University of Utah

### **Effects of Interstitial Growth and Remodeling on Tissue Engineered Vascular Graft Growth & Remodeling**

Stephanie E Lindsey, Stanford University

### **Cadherin-11 Blockade Exacerbates Neointima Formation Following Vascular Injury**

Matthew Bersi, Vanderbilt University

### **Ventricular Dynamics in Patients with Pulmonary Arterial Hypertension**

Anna Agosto, University of Arizona

## **Biofluid Mechanics: Other**

### **Fluid Dynamics of Hypersonic and Guillotine Vitrectomy Probes**

Irene Nepita, University of Genoa

### **Analysis of Bladder Wall Perfusion, Deformation and Urodynamics in Bph Patients from MRI and CFD**

Ryan Pewowaruk, University of Wisconsin – Madison

### **Compensation for a Posterior Glottal Opening Leads to Vocal Fold Trauma: Measurements of Contact Force as a Function of Aerodynamic and Kinematic Measures**

Mohsen Motieshirazi, Clarkson University

### **Modeling Particle Transport in Mucus Layer with Flow Driven by Beating Slender Structure**

Michael Roeing-Donna, Northern Illinois University

### **Fluid Mechanics of Aortic Heart Valves: 70 Years of Evolution**

Hoda Hatoum, Georgia Institute of Technology

### **Peristaltic Transport of Cerebrospinal Fluid Through Perivascular Spaces in the Brain**

Jia Liu, University of Rochester

## **Congenital and Pediatric**

### **Early vs Delayed Stent Interventions for Pulmonary Artery Stenosis Management**

Ryan Pewowaruk, University of Wisconsin – Madison

### **Biomechanics of Human Fetal Hearts with Evolving Hypoplastic Left Heart Syndrome**

Choon Hwai Yap, National University of Singapore

### **Biomechanics Analysis and Single-Cell RNA-Seq of the Left-Atrial-Ligation Chick Embryonic Model of Hypoplastic Left Heart Syndrome**

Choon Hwai Yap, National University of Singapore

### **Numerical Analysis of Airflow in Abnormal Curved Trachea**

Naoki Takeishi, Osaka University

## **Emerging Imaging Computational and Experimental Methods**

### **Solution Adaptive Refinement of Cut-Cell Cartesian Meshes Improves FDA Nozzle CFD Performance**

Ryan Pewowaruk, University of Wisconsin – Madison

### **Fluid-Structure Interaction Framework for Fluid Flow Through the Bone Lacunar-Canalicular System with Morphological Variations**

Debanjan Mukherjee, University of Colorado, Boulder

### **Magnetic Resonance Imaging and Analysis of Interstitial Fluid Flow in Preclinical and Clinical Glioblastoma**

Krishnashis Chatterjee, Virginia Tech

## **Lymphatics**

### **Morphological Alignment of Lymphatic Endothelial Cells Under Steady Flow or Simultaneous Flow and Stretch in Vitro**

Caleb Davis, Texas A&M University

### **The Effect of Domain Length on Simulations of Peristaltic Pumping in the Perivascular Space**

J. Brennen Carr, University of Rochester

## Reproductive and Embryonic

### **Ultrasound Based CFD Assessment of Brachial Artery Wall Shear Stress in Preeclamptic Pregnancy**

Ryan Pewowaruk, University of Wisconsin – Madison

## Respiratory

### **Lung Mechanics, with Methacholine Challenge, Following Chronic Cigarette Exposure in Apoe-/- Mice**

Jacqueline Matz, Northeastern University

### **3D Printed Synthetic, Self-Oscillating Vocal Fold Models and Subglottic Airway**

Taylor Greenwood, Brigham Young University

<b>Friday, June 19</b>	<b>11:00AM – 12:30PM EDT</b>
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## PhD Paper Competition: Session 5

**11:00AM      Early, Unrestricted Motion Is Essential to Preventing Post-traumatic Joint Contracture in a Rat Elbow Model**

J Alex, Washington University in St. Louis

**11:15AM      A Non-Biased Approach to Quantify the 3d Fiber Orientation Distribution in Fibrous Tissues from Image Data**

Adam Rauff, University of Utah

**11:30AM      Architecture-Dependent Mechano-Adaptation in Single Vascular Smooth Muscle Cells**

Bernard Cook, University of Minnesota - Twin Cities

**11:45AM      Soft Tissue Properties of the Buttocks and Thighs: A Comparison Between Able-Bodied Individuals and Individuals with a Spinal Cord Injury**

Justin Scott, Michigan State University

**12:00PM      Simulation of Human Locomotion with a Semi-Active Variable Stiffness Foot Prosthesis**

Michael McGeehan, University of Oregon

**12:15PM      Different Viscoelastic Properties Between the Left and Right Ventricles in Healthy Adult Ovine**

Wenqiang Liu, Colorado State University

Friday, June 19	2:30PM – 4:00PM EDT
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### PhD Paper Competition: Session 6

- 2:30PM**      **Collagenase Exposure that Disrupts Collagen Microstructure in a Co-Culture Model of Ligament Also Alters Neuronal Activity & MMP-1 Expression**  
Meagan Ita, University of Pennsylvania
- 2:45PM**      **Validation and Optimization of Image-Based Structural Assessment of Ovine Tibial Fracture Healing with Biomechanical Testing**  
Peter Schwarzenberg, Lehigh University
- 3:00PM**      **Python-Teeth-Inspired Device to Enhance Tendon-To-Bone Repair**  
Iden Kurtaliaj, Columbia University
- 3:15PM**      **Natural Modes of Oscillation of the Human Brain in Vivo**  
Jordan Escarcega, Washington University in St. Louis
- 3:30PM**      **Evaluating Brain Strain Response in Paired Opposition Youth Football Players in Competition**  
Gabriella Milef, Wake Forest School of Medicine
- 3:45PM**      **Multi-physics Computational Model of Ventricular-arterial Interactions in Pulmonary Hypertension**  
Christopher Tossas-Betancourt, University of Michigan

Friday, June 19	BS ASME Student Paper Competition Lightning Talks
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### BS Level Competition: Group A Musculoskeletal, Reproductive, Ocular, and Mechanobiology

- The Impact of Pregnancy and Childbirth on the Shape of the Maternal Sacrum and Coccyx**  
Liam Martin, University of Pittsburgh
- Do Young and Older Adults have Increased Muscle Co-contractions During Walking Over Uneven Compared to Even Surfaces?**  
Matthew Dasilva, New Jersey Institute of Technology
- Differential Mechanics and Healing Outcomes of Small and Large Partial-Width Defects in the Tendon Attachment of the Rat Rotator Cuff**  
Anna Lia Sullivan, University of Delaware
- Depth-Dependent Shear Modulus of TMJ Cartilage Varies with Anatomic Location**  
Cassandra Gologorsky, Cornell University
- Finite Element Analysis of the Human Lens Capsule After Cataract Surgery Demonstrates a Perturbed Stress Field**  
Kurt Ameku, University of Nebraska-Lincoln

**Mechanical Properties and Microstructural Alignment of the Palmaris Longus and Gracilis Tendons During Dynamic Loading**

Lorenzo Solon, Washington University in St. Louis

**Quantification of Heterotopic Ossification in a Rat Elbow Model of Post-Traumatic Joint Contracture**

Hayden Schott, Washington University in St. Louis

**Mechanoadaptation of Obese Bones in Response to Cyclical Loading in Murine Model After High Fat Diet Induced Obesity**

Kerry Eller, Northeastern University

**Interferon Regulatory Factor 6 Affects Keratinocyte Mechanobiology**

Spencer Halberg, University of Iowa

**Joint Distance, Coverage and Congruency Analysis of the Tibiotalar Joint**

Andrew Cory Peterson, University of Utah

**Efficacy of Reconstruction Surgery in Preventing Changes to Subchondral Bone Composition and Architecture Following Traumatic ACL Injury**

Gabriel Brown, University of Massachusetts

**Changes in Energy Dissipation of the Knee Meniscus in a Novel Closed Joint Animal Impact and Surgical Model**

Ryan Ek, University of Massachusetts

**Extracellular Matrix Remodeling During Neovessel Growth**

Jason Manning, University of Utah

**Cationic Drug Carriers Increase Stiffness and Induce Osmotic Deswelling in Articular Cartilage**

Matthew Warren, Northeastern University

**Live-Cell, Dynamic Imaging of Matrix Assembly and Organized Fibril Network Evolution in an in Vitro Model of Human Corneal Development**

Alexandra Spak, Northeastern University

**BS Level Competition: Group B  
Cardiovascular, Cerebrospinal, Biofluids, and Biotransport**

**Printing Hippocampi to Depict Atrophy-Related Alzheimer's Biomarkers**

Frederick Xu, Johns Hopkins University

**Investigating Melanocyte Dielectric Permittivity of Melanoma on Skin Using a Radio Frequency (RF) Resonator**

Subash Bhandari, Wichita State University

**Analysis of Geometry and Flow in Atrial Fibrillation Patients: Image Analysis and Flow Phantom Fabrication**

Colin Keunyoung Kim, University of Wisconsin-Madison

**GBT440 Increases Hematocrit and Improves Left and Right Ventricular Function in Berkeley Sickle Cell Disease Mice**

Ryan Richard Gassner, University of Wisconsin-Madison

**Prestin Dynamics in Response to Electric Field and Membrane Cholesterol**

Jashan Sandhu, University of Utah

**Human dermal microvascular endothelial cells morphological response to fluid shear stress**

Tabatha Polk, Wichita State University

**Designing a Physical Model to Investigate the Role of Cerebrospinal Fluid in Head Impact Biomechanics**

Yi Yi Du, University of British Columbia

**Fluid Dynamics of Fricative Consonants and Their Implication on Virus Propagation**

Hannah Wendling, Clarkson University

**Characterization of in Vivo Murine Aortic Valve Dynamics Using Four-Dimensional Ultrasound**

Daniel Paul Gramling, Purdue University

**Non-Contact Electroporation for Treatment of Exophytic Esophageal Tumors**

Scott Collins, University of Massachusetts Amherst

**Analyzing the Performance of the Berlin Heart EXCOR under Variable Operating Conditions Using a Novel Mechanistic Lumped Parameter Model**

Victoria Yuan, Stanford University

**Characterization of Mucus in Digital Image Analysis of Cystic Fibrosis Lungs**

Amanda Lee, San Diego State University

**Computational Fluid Dynamics and Histological Analysis of Intraluminal Thrombus**

Pete Gueldner, University of Texas at San Antonio

**Restoration of Laminar Blood Flow in Atherosclerotic Arteries Reduces Plaque Burden**

Ian McCue, University of Nebraska-Lincoln

**On the Derivation of Geometric Surrogates of Abdominal Aortic Aneurysm Wall Stress**

Emma Yanoviak, the University of Texas at San Antonio

**An Investigation of the Microstructural and Biaxial Mechanical Properties of Porcine Aortic Valve Cusps**

Luke T Hudson, the University of Oklahoma

## **Bone Mechanics**

### **Variation of Stress and Associated FRI in Femoral Neck Due to Lateral Load in Different Directions Simulating Fall Postures**

Rabina Awal, University of Louisiana at Lafayette

### **Early Fracture Healing Prediction by in Vivo Direct Electromagnetic Coupling**

Jakob Wolynski, Colorado State University

### **Strain Distribution Inside Non-Arthritic and Arthritic Human Glenoid Under Eccentric Loading**

Yuxiao Zhou, the Pennsylvania State University

### **Morphometry and Density Analysis of the Fifth Metacarpal**

Amrita Unnikumaran, University of South Florida

### **Ovine Cortical Bone Responds to Moderate Exercise with Increased Density but Not Bone Area Fraction**

Sara Moshage, University of Illinois at Urbana-Champaign

### **Structural Mechanics of Nonunion Tibial Fractures**

Hannah Dailey, Lehigh University

### **Simulating Mechanobiological Bone Growth with Finite Element Analysis**

Mahsa Sadeghian, Northeastern University

### **Including Muscle Forces in FEA Decreases Strain and Prevents Bending of the Femoral Neck During Walking**

Michael Rogalski, University of Illinois at Urbana – Champaign

### **Effects of Chronic Acidosis on Murine Bone Composition, Structure, and Mechanics**

Anna Peterson, UConn Health

### **Patient-Specific Alignment Fixture Improves Agreement Between Physical and Virtual Biomechanical Tests**

Jordan Inacio, Lehigh University

### **The Effect of Fatigue Loading on Impact Mechanics and Bone Composition of Rodent Ulnae**

Chenxi Yan, University of Illinois Urbana Champaign

### **Yap and Taz Promote Periosteal Progenitor Cell Expansion and Endochondral Bone Fracture Repair**

Joel Boerckel, University of Pennsylvania

### **Compressive Stress and Strain in the Equine Third Metacarpal During Growth**

Sara Moshage, University of Illinois at Urbana-Champaign

### **Influence of Hyaluronan Synthesis on Bone Morphology and Mechanical Properties**

Meghana Pendyala, Rensselaer Polytechnic Institute



**Quantitative Comparison of Peri-Implant Strain in Bone Measured by Micro-Ct Based Experiment and Numerical Analysis**

Jing Du, Pennsylvania State University

**Novel, Micrometer Scale Assessment of Peri-Lacunar Bone Mineral Density in 3D**

Virginia Ferguson, University of Colorado, Boulder

## **Aneurysms**

**Pentagalloyl Glucose (pgg) Partially Prevents Arterial Mechanical Changes Due to Elastin Degradation**

Jessica Wagenseil, Washington University

**Amplified Flow Imaging (aflow): A Novel Technique to Visualize Intracranial Aneurysm Dynamics**

Javid Abderezaei, Stevens Institute of Technology

**A New Method for the Construction of Rabbit Elastase Induced Aneurysm that Includes Inflammation and Aneurysm Growth**

Robert King, University of Massachusetts Medical School

**Computational Investigation on the Pathological Weakening of the Aortic Media in Dissection**

Malte Rolf-Pissarczyk, Institute of Biomechanics

**Multi-Modal Imaging Motivated In-Situ Structural Model of Calcified Cerebral Aneurysmal Tissue**

Ronald Fortunato, University of Pittsburgh

**Wall Stresses Are Significantly Higher for Aortic Dissection Patients Than Non-Dissected Patients with Comparable Aortic Diameter**

Spandan Maiti, University of Pittsburgh

**A Novel Combined Fluid Dynamic and In-Vivo Strain Analysis Approach for Non-Invasive Estimate of Local Aortic Wall Properties and Aortic Strength Mapping**

Elena S. Di Martino, University of Calgary

**A Comparative Biomechanical Evaluation of Chronically Dissected and Non-Dissected Human Thoracic Ascending Aortic Wall with Aneurysm Enlargement**

James Moore, Imperial College London

**A Physics-Based Deep Learning to Predict Abdominal Aortic Aneurysm Expansion**

Seungik Baek, Michigan State University

**Novel Biaxial Mechanical and Collagen Structural Characterizations of a Resected Human Aneurysm Tissue**

Chung-Hao Lee, University of Oklahoma

## **Atherosclerosis**

**Mechanical Characterization of Atherosclerotic Human Carotid Arteries: A Bayesian Optimization Based Inverse Finite Element Approach**

Su Guvenir, Erasmus Medical Center

**Case Specific Virtual Stent Deployment: Effects of Different Modelling Approaches for Atherosclerotic Porcine Coronary Wall**

Luca Antonini, Politecnico di Milano

**Coronary Artery Plaque Characterization Using Optical Coherence Tomography and Uniaxial Extension Testing**

Arash Ghorbanniahassankiadeh, Medical College of Wisconsin & Marquette University

**Structural and Functional Remodeling of the Aorta in Female Apoe<sup>-/-</sup> Mice Exposed to Chronic Cigarette Smoking**

Yasmeen Farra, Northeastern University

## **Cardiovascular Design and Devices**

**Multiobjective Geometry Optimization of the Nitinol Stent of Transcatheter Aortic Valves: A Computational Study**

Dario Carbonaro, Politecnico di Torino

**Modeling Percutaneous Intervention of Coronary Artery Bifurcation**

Maxwell Bean, University of Arkansas

**Towards the Establishment of Lesion-Specific Stenting Strategies: Validation of a Coupled Balloon-Stent Finite Element Framework for Vascular Stent Deployment**

David Jiang, University of Utah

**Computational Study on Flattening Phenomena of the Braded Stent During Deployment into Curved Arteries**

Tomohiro Otani, Osaka University

**How Hydrogel Inclusions Modulate the Local 3D Mechanical Behavior of Post-Infarcted Myocardium**

David Li, the University of Texas at Austin

**Fluid Flow Through a Porohyperelastic Bilayered Tissue Engineered Vascular Graft: A Sensitivity Study**

Ali Behrangzade, University of Pittsburgh

## **Cardiovascular Imaging**

**Elastic Foundation as Heterogeneous Adventitial Boundary Condition for the Determination of Aortic Wall Stiffness**

Johane Bracamonte, Virginia Commonwealth University

**Spatiotemporal Strain Mapping of Cardiac Hypertrophy Using Four-Dimensional Ultrasound**

Frederick Damen, Purdue University

**Influence of Wall Thickness and Unpressurized Geometry on Abdominal Aortic Aneurysm Wall Stress**

Sourav Patnaik, University of Texas at San Antonio

**Quantifying Relationship Between Aortic Cusp Asymmetry and Aortic Arch Curvature**

Breandan Yeats, Georgia Institute of Technology

**Evaluating the Feasibility and Repeatability of in Vivo Assessments of Regional Aortic Wall Radial and Shear Strain Using Displacement Encoding with Stimulated Echoes MRI**  
Patrick Jones, Virginia Commonwealth University

## **Cardiovascular Tissue Engineering**

**Collagen Fiber Orientation in Tissue Engineered Vascular Grafts: An in-Silico Study**  
Maziyar Keshavarzian, the University of Texas at Dallas

**Right Ventricular Functional Remodeling in a Longitudinal Animal Model Study of Pulmonary Arterial Hypertension**  
Ethan Kwan, University of California San Diego

**Forced Inflation of the Early Zebrafish Heart to Determine Material Properties of the Embryonic Myocardium**  
Alex Gendernalik, Colorado State University

**Effects of Varying Incubation Time on the Foreign Body Reaction to Etvgs Obtained from Vsmc-Seeded Electrospun Pcl Scaffolds**  
Sarah Saunders, Virginia Commonwealth University

**Compliant and Aligned Fibrous Matrices Promote Cardiac Maturation**  
Samuel DePalma, University of Michigan

## **Heart Valves**

**Tricuspid Valve Mechanics After Surgical Repair: A n in Vivo Study in Sheep**  
Manuel Rausch, University of Texas at Austin

**A First Computational Model of Mitral Valve Plasticity**  
Bruno Rego, the University of Texas at Austin

**A Method to Quantify Tensile Biaxial Properties of Mouse Aortic Valve Leaflets**  
Daniel Chaparro, Florida International University

**Longitudinal Change in the Left Ventricular Myocardial Mechanical Properties in a Rodent Model of Mitral Valve Regurgitation**  
Daniella Corporan, Emory University

**Transcatheter Aortic Valve Replacement in Bicuspid Valves: The Synergistic Impact of Eccentric and Incomplete Stent Deployment**  
Dong Qiu, University of Denver

**Functional Mechanics of the Murine Pulmonary Heart Valve**  
Xinzeng Feng, University of Texas at Austin

**Insights into Ischemic Mitral Valve Regurgitation Induced by Left Ventricular Remodeling Following Myocardial Infarction**  
Hao Liu, University of Texas at Austin

**A Simulation of Heart Valve Interstitial Cell Contractile Behavior in 3D Gels**

Xinzeng Feng, University of Texas at Austin

**Patient-Specific in-Silico Predictions of Mitral Valve Repair Success**

Harshita Narang, the University of Texas at Austin

**Radiofrequency Ablation Alters the Structure of Healthy and Enzymatically Digested Porcine Mitral Valves**

Matthew Bersi, Vanderbilt University

**Comparison of Transcatheter Mitral Valve and Surgical Mitral Valve Leaflet Mechanical Properties**

Saba Ravaghi, University of Denver

**Biaxial Mechanical Properties of Collagen- and Elastin-Deficient Porcine Atrioventricular Heart Valves**

Grace Duginski, University of Oklahoma

**Growth Remodeling and Repair**

**Role of FGF9 in Bone Shape and Attachment Cell Morphology During Embryonic Growth**

Connor Leek, University of Delaware

**Mechanical Changes in Human Elastic and Muscular Arteries with Age**

Majid Jadidi, University of Nebraska-Lincoln

**Numerical Investigation of Biomechanically-Coupled Growth in Brain Gyrfication**

Shuolun Wang, University of Notre Dame

**Mitochondrial Genes Are Differentially Expressed in Mouse Achilles Tendons During Postnatal Growth and Following Injury**

Ryan Locke, University of Delaware

**Cervical Biaxial Contractility and Passive Mechanics During Pregnancy**

Cassandra Conway, Tulane University

**Age-Related Collagen Remodeling Occurs in the Absence of Hypertension in Aortas of Nos3 Heterozygous Mice**

Liya Du, University of South Carolina

**Passive Transmural Myocardial Fiber Kinematics in the Right Ventricle: Effects of Pressure Overload**

Danial Sharifikia, University of Pittsburgh

**Quantifying Incompatibility in Growing Tissues and Its Connection to Residual Stresses**

Taeksang Lee, Purdue University

**Predicting the Outcome of Cardiac Resynchronization Therapy Using a Fast Electro-Mechanical Model**

Pim Oomen, University of Virginia

**Proximity Control of Callus Formation in Mechanoregulation Models of Fracture Healing**

Tianyi Ren, Lehigh University

**Modeling Chondrocyte Death Caused by Microscale Strain in Cartilage**

Muhammed Rahman, University of Connecticut

**Using Stereolithography (sla) to Manufacture Hydrogels with Specific Mechanical Properties for Scaffolding in Tissue Engineering**

Victor Crespo-Cuevas, University of Colorado Boulder

**Pentagalloyl Glucose Mediates Biomechanical Properties in a Topical Elastase Model of Murine Abdominal Aortic Aneurysm**

Sourav Patnaik, University of Texas at San Antonio

**Cleft Palate Closure Device -An Applied Oral Mucosa Expansion and Growth Model**

David Nedrelow, University of Minnesota

**An Integrated Inverse Modeling Approach to Characterize Subject-Specific Remodeling of Left Ventricular Free Wall Under Myocardial Infarction**

Reza Avaz, Texas A&M University

**Computational Modeling of 3D-Printable, Bone Ingrowth Friendly and Stress-Shielding Resistant Lattice Structures**

Ata Babazadeh, Rice University

**Mechanobiology in Growth and Remodeling**

**Anisotropic Material Properties of the Human Uterus**

Shuyang Fang, Columbia University

**Subcellular Exploration of Mechanical Properties in Aortic Smooth Muscle Cells**

Stephane Avril, Mines Saint-Etienne

**Genetic Background Dominates Fibrotic Aortic Remodeling During Angiotensin-Induced Hypertension in Mice**

Bart Spronck, Yale University

**Modeling the Role of Interlamellar Shear in Aortic Growth, Remodeling, and Dissection**

Ryan Mahutga, University of Minnesota

**Modeling the Influence of Limb Flexion on Cartilage Growth in a Regenerating Axolotl Humerus**

Ester Comellas, Northeastern University

**Mitral Valve Leaflet Response to Myocardial Infarction: from Gene Expression to Tissue Remodeling**

Daniel P. Howsmon, the University of Texas at Austin

**Differential Responses to Biomechanical and Biochemical Stimuli in a Computational Model of Vascular Wall Signaling**

Linda Irons, Yale University

## **Growth Remodeling and Repair: Cellular Microenvironment**

### **Single-Cell Biaxial Stretching to Study Effects of Extracellular Mechanics on Vascular Smooth Muscle Cell Strain Energy Density**

Elizabeth Shih, University of Minnesota

### **Discrete Fiber Network Models Reveal Fibroblast-Induced Collagen Contraction is a Potential Source of Low Back Pain**

Jill Middendorf, University of Minnesota

### **Characterization of the Macroscale and Mesoscale Mechanics of the Extracellular Matrix in Developing Tendons**

Andrea Acuna, Purdue University

### **Mechanical Force in the Metastatic Microenvironment: Development of a Biomimetic Actuating Platform**

Sarah Libring, Purdue University

### **Jamming and Unjamming Transitions Govern the Invasion of Tumor Spheroids Within 3D Extracellular Matrices**

Jacopo Ferruzzi, Boston University

## **Tissue Damage Healing and Repair**

### **A Comparison of Fiber Based Material Laws for Myocardial Scar**

Laura Caggiano, University of Virginia

### **A Volumetric Growth Model with Reference Configuration Updates for Healing Post-Infarction Scar**

Derek Bivona, University of Virginia

### **Strain Rate Dependence of Molecular-Level Collagen Damage in Cerebral Arteries**

Noah Pearson, University of Utah

### **A Residual Stiffness-Based Damage Model for Biological Collagenous Tissues Under Long-Term Cyclic-Loading**

Hai Dong, Georgia Institute of Technology

### **Preparation and Characterization of Natural Hydroxyapatite Powder from Bovine Bone at Different Temperatures**

Mahsa Shabani, University of Tehran

### **Mechanical Push-Out Evaluation of Bioactive Self-Fitting Shape Memory Polymer Scaffolds to Treat Cranial Bone Defects**

Zachary Lawson, Texas A&M University

### **Shear Wave Speed and Local Stress Vary as a Factor of Fiber Stiffness and Orientation in Patellar Tendons with Modeled Scar Tissue**

Stephanie Cone, University of Wisconsin

## **Body and Extremity Injury Mechanics**

### **Development of an Experimental Model of Bone Marrow Lesions Using the Ovine Femoral Condyle**

Holly Stewart, Colorado State University

### **Computational Knee Models Predict Increased ACL Force in Female and Male Subjects Suffering Non-Contact ACL Rupture Compared to Age, Sex, and Sport-Matched Controls**

Swithin Razu, Hospital for Special Surgery

### **Vertical Hand, Stirrup, and Ground Reaction Force in Occupational Railcar Ascent**

Rosemarie Figueroa Jacinto, Explico Engineering

### **A Finite Element Model of Human Arm for Studying Relaxed and Tensed Response of Human Volunteers Using Active Muscles**

Karan Devane, Wake Forest School of Medicine

### **Measurement of Fracture Stability via Electromagnetic Coupling to Monitor Healing: Benchtop and Pilot Patient Tests**

Kevin Labus, Colorado State University

### **Functional Changes in Neonatal Brachial Plexus After Stretch**

Anita Singh, Widener University

### **Enhancement and Hierarchical Validation of a Human Thoracic Spine Model**

Wei Zeng, University of Virginia

## **Head Injury Mechanics**

### **A Reanalysis of Cerebrovascular Stiffening Effect on Dynamic Brain Strain Responses**

Wei Zhao, WPI

### **Assessing the Performance of MIPS in Snowsport Helmets Under Varying Impact Surface Friction Conditions**

Summer Keim, Virginia Polytechnic Institute and State University

### **Real-Time Visualization of Brain Strain Using Neural Network**

Xianghao Zhan, Stanford University

### **Rate and Region-Dependent Mechanical Properties of Gottingen Minipig Brain Tissue in Simple Shear**

Gregory Boiczuk, University of Utah

### **Head Impact Exposure in Women's Artistic Gymnastics**

Nicholas Pritchard, Wake Forest University School of Medicine

### **Characterization of Head Impact Exposure in Collegiate Women's Soccer with a Custom Instrumented Mouthpiece**

Tanner Filben, Wake Forest School of Medicine

**Deployment and Usability of Instrumented Mouthguards to Measure Head Impacts in Non-Helmeted Athletes**

Emily Kieffer, Virginia Tech

**The Range of Bicycle Helmet Performance at Real-World Impact Locations**

Ann Harlos, Virginia Tech

**The Relationship Between Time Weighted Cumulative Head Impact Exposure and Abnormal White Matter Changes in the Brain**

Suraj Puvvada, Wake Forest School of Medicine

**Anisotropic and Region-Dependent Fracture Toughness in Porcine and Human Infant Cranial Bone**

Robert Metcalf, University of Utah

**Development and Characterization of a New Network Model of the Hippocampus in the Context of Traumatic Brain Injury**

Samantha Schumm, University of Pennsylvania

**Human Head Acceleration During Blast Loading: Understanding Acceleration-Induced Brain Pressure**

Haojie Mao, Western University

**Multi-Excitation Methods for MR Elastography of the in Vivo Porcine Brain**

Charlotte A. Guertler, Washington University in St. Louis

**Reducing Cervical Sprain/strain Injury Potential Through Active Positioning of the Head During Sub-Concussive Level Impacts**

Mohammad Homayounpour, University of Utah

**Towards a Fundamental Understanding of Nonlinear Dynamics in the Human Brain**

Mehmet Kurt, Stevens Institute of Technology

**Atlas of in Vivo Human Brain Mechanical Properties**

Curtis Johnson, University of Delaware

**Design and Evaluation of a Lateral Head Excitation Device for MR Elastography of the Brain**

Keshav Kailash, Washington University in St. Louis

**Characterizing the Dynamics of Soccer Headers with a Custom Instrumented Mouthguard**

Daniel Nasti, Stevens Institute of Technology

## **Joints and System Mechanics**

**Rule-Based Knee Joint Modeling for Estimation of Internal-External Rotation Range During Passive Flexion**

Neda Abdollahi Nohouji, Cleveland Clinic

**The Effects of Synovial Fluid Pressure on Stresses in Subchondral Bone Cysts of the Medial Femoral Condyle**

Nolan Norton, University of Kansas



**Bacterial Collagenase Exposure Decreases Macromechanical Properties & Local Fiber Realignment in the C6/c7 Rat Facet Joint Capsule Under Tensile Load**

Sagar Singh, University of Pennsylvania

**MMP Levels Relate to Pain More Than to Measures of Joint Damage in Painful TMJ Disorders**

Meagan Ita, University of Pennsylvania

**Friction Reducing Ability of Synovial Fluid Components for Cartilage-Cartilage Compared to Cartilage-Metal**

Corrinus van Donkelaar, Eindhoven University of Technology

**Influence of Posterior Femoral Component Configuration on the Knee Kinematics and Laxity in Bi-Cruciate Retaining Total Knee Arthroplasty**

Yasuraku Shibata, Tokyo Metropolitan University

**Biomechanical Significance of the Collateral Ligaments in Transolecranon Fracture-Dislocations**

Jonathan Miles, Steadman Philippon Research Institute

## **Lower Extremity Mechanics**

**Stress Distribution During Pivot Shift Trauma of the Knee Depends on Skeletal Maturity**

Satoshi Yamakawa, University of Pittsburgh

**Tibial Bony Morphology Correlates with Knee Kinematics in Response to External Loads Following Lateral Extraarticular Tenodesis**

Sene Polamalu, University of Pittsburgh

**Biomechanical Evaluation of Hip Microinstability Caused by Capsular and Labral Insufficiency Using a 6 Degrees of Freedom Robotic System: A Cadaveric Study**

Alex Brady, Steadman Philippon Research Institute

**Broström Procedure With and Without Internalbrace Augmentation Versus Reconstruction Using a Semitendinosus Allograft for Chronic Lateral Ankle Instability: A Biomechanical Study**

Alex Brady, Steadman Philippon Research Institute

**Quantifying the Art of Gap Assessment Exam in Total Knee Arthroplasty**

Shady Elmasry, Hospital for Special Surgery

**Effects of Tibial Fixation Design on Bone-Implant Micromotion in Total Ankle Replacements**

Fernando Quevedo Gonzalez, Hospital for Special Surgery

**Biomechanical Evaluation of Achilles Tendon Midsubstance Repair: The Effects of Anchor Angle and Position**

Jonathan Miles, Steadman Philippon Research Institute

## **Spine Mechanics**

**Linear Stiffness and Moment Contributions of the Distracted Lumbar Spine in Oblique Bending**

Joseph Avila, Medical College of Wisconsin and Marquette University

**Changes in Applied Laryngoscope Force Affect Peak Spinal Cord Strain in the Presence of a Type II Odontoid Fracture**

Benjamin Gadomski, Colorado State University

**Measuring Through-Thickness Variations in Mechanical Characteristics of Lumbar Facet Capsular Ligament Tissue Regions Using a Novel Stretch-and-Bend Method**

Elizabeth Gacek, University of Minnesota - Twin Cities

**Overstuffing a Cervical Total Disc Replacement Device Diminishes Flexion/extension Range of Motion**

Vijay Permeswaran, Zimmer Biomet Spine

## **Upper Extremity Mechanics**

**Examining the Novel Use of Continuous Compression Implants in Clavicle Reconstruction: A Cadaveric Study**

Elaine Schmidt, University of Pennsylvania

**Biodegradable Subacromial Balloon Spacer for Irreparable Rotator Cuff Tears Reduces Superior Migration, Maintains External Rotation Biomechanics and Does Not Impact External Rotational Torques**

Linda Effiong, Columbia University

**Superior Capsule Reconstruction Partially Restores Native Glenohumeral Stability in Posterosuperior Rotator Cuff Deficiency - a Dynamic Robotic Shoulder Model**

Alex Brady, Steadman Philippon Research Institute

**Contribution of Rotator Cuff Muscle Fibers During Abduction. a Comparative Biomechanical Study of Intact Rc, Superior Capsular Reconstruction, and Reverse Shoulder Arthroplasty**

Martine Dolan, University of Illinois at Chicago

## **Cartilage Mechanics**

**Tribological Rehydration as a Tool for Studying Cartilage Mechanobiology: The Influence of Physiological Frictions and Strains on Chondrocyte Health**

Margot Farnham, University of Delaware

**Regarding the Temperature-Dependent Mechanics of Cartilage and Collagen Under Large-Strain Shear**

David Pierce, University of Connecticut

**Experimental Measurement and Finite Element Prediction of Dynamic Transchondral Strain in the Human Hip**

Jocelyn Todd, University of Utah

**Evolution of the Collagen Network of Human Cartilage During Progression of Osteoarthritis: Implications for Potential Biomarkers, Intra-Tissue Mechanics, and Mechanical Modeling**

Phoebe Szarek, University of Connecticut

**Comparative Tribology: Articulation-Induced Rehydration of Cartilage Across Species**

Meghan Kupratis, University of Delaware

**The Effects of Storage Temperature and Duration on Cartilage Surface and Bulk Properties**

Gabriela Espinosa, University of California, Irvine

**Resveratrol and Curcumin Inhibit Advanced Glycation Endproduct (age) Induced Collagen Crosslinking and Cellular Senescence in Osteoarthritic Cartilage**

Shikhar Mehta, Northeastern University

**Nanomechanical Signatures of Developing Intercellular Matrix in Embryonic Cartilage and Meniscus**

Bryan Kwok, Drexel University

**Aggrecan Modulates Mechanical Properties and Matrix Release of Growth Plate Chondrocytes**

Donghee Lee, University of Nebraska Medical Center

**Diffusive Transport in Human Knee Cartilage: Effect of Solute Size and Tissue Composition**

Floriane Devaux, University of Miami

**Quantifying Talus Medial and Lateral Gutter Cartilage for Treatment of Ankle Joint Osteochondral Defects**

Alex Brady, Steadman Philippon Research Institute

**Adaptively Conforming Osteochondral Patellar Allografts for Joint Resurfacing: A Finite Element Analysis of Congruence**

Courtney Shaeffer, Columbia University

**Mechanical Characterization of Creep Compliance Response in Dual Network Hydrogels for Articular Cartilage Repair in Osteochondral Defects**

Zachary Lawson, Texas A&M University

## **Intervertebral Disc Mechanics**

**Effect of Subtissue Level Fiber-Matrix Stiffness Gradient on Annulus Fibrosus Mechanics**

Minhao Zhou, University of California, Berkeley

**Hydration and Fiber Architecture Affect Failure Initiation and Accumulation at the Fiber-Matrix Interface**

Minhao Zhou, University of California, Berkeley

**Tnf-Alpha Alters the Elastic and Viscoelastic Material Properties of the Nucleus Pulposus**

Timothy Jacobsen, Columbia University

## **Ligament and Tendon Mechanics**

**Gene Expression Changes Secondary to Chronic Rotator Cuff Degeneration: A Study in a Novel Ovine Model**

James Johnson, Colorado State University

**Malformed Elastic Fibers Induce a Tendon-Specific Increase in Elastic Modulus in Fibulin-5 Knockout Mice**

Jeremy Eekhoff, Washington University in St. Louis

**Effects of Strain Rate on the Accumulation of Collagen Molecular Damage in Tendon Fascicles During Fatigue Loading**

Jared Zitnay, University of Utah

**Knockout of FGF9 in Scx-Lineage Cells Leads to Impairments in Enthesis Structure**

Elahe Ganji, Stevens Institute of Technology

**Validation of a Loading Protocol that Creates Multiscale Fatigue Damage While Maintaining Cell Viability in Tendon Explants**

Krishna Pedaprolu, Pennsylvania State University

**Challenges of Arfi Imaging for Musculoskeletal Tissues: A Computational and Experimental Approach**

Gerald A. Ferrer, University of Pittsburgh

**Investigation of Effect of Fiber Alignment on Shear Wave Propagations in Non-Uniformly Loaded Collateral Ligaments**

Jonathon Blank, University of Wisconsin-Madison

**A Hitchhiker's Guide to Surgical Sutures and Bi-Material Attachment**

Ethan Hoppe, Washington University in St. Louis

**Tendon Multiscale Mechanics is Dependent on Sample Gauge Length**

Ben Peterson, Penn State University

**Posterior Medial Meniscus Root Tears Potentiate the Effect of Increased Tibial Slope on Anterior Cruciate Ligament Graft Forces**

Travis Turnbull, Steadman Philippon Research Institute

**Anterior Cruciate Ligament Function is Similar but Achieved in Different Ways in Yorkshire and Yucatan Porcine Breeds During Adolescence**

Danielle Howe, North Carolina State University and the University of North Carolina- Chapel Hill

**Posture-Dependent Recruitment of Collagen Fibers Determines Rotator Cuff Toughness**

Mikhail Golman, Columbia University

**Residual Stress and Osmotic Swelling of the Periodontal Ligament**

David Nedrelov, University of Minnesota

**Biomechanics of ACL Grafts Compared to the Quadriceps Tendon: Full-Thickness vs. Partial-Thickness Graft**

Jonathan Miles, Steadman Philippon Research Institute

**Meniscus/TMJ Mechanics**

**Mechanical Properties of the Ovine Temporomandibular Joint Disc: Development of a Disc Replacement**

Jason Kuiper, Colorado State University

### **How Age Affects the Failure Properties of Human Meniscus: High-Speed Strain Mapping of Tears**

Derek Nesbitt, Boise State University

### **Dynamic Changes in the Porcine Meniscus and Articular Cartilage After Meniscal Injury**

Sonia Bansal, University of Pennsylvania

### **Mechanical Characterization and Constitutive Modeling of Ovine Temporomandibular Joint Disc**

Kevin Labus, Colorado State University

### **Modeling Fatigue Failure in Fibrous Soft Tissue Using Continuum Damage Mechanics**

Bradley Henderson, Boise State University

## **Muscle Mechanics**

### **Use of Optogenetics for Light-Mediated Muscle Contraction and Tendon Loading**

Elahe Ganji, University of Delaware

### **Finite Element Modeling of the Rat Tibialis Anterior to Predict Functional Force Deficit from Volumetric Muscle Loss**

Matthew DiSalvo, University of Virginia

### **The Role of Biaxial Stretch in Elucidating Passive Muscle Mechanics**

Benjamin Wheatley, Bucknell University

### **Frontal Plane Pelvic Mechanics During High Velocity Running**

Cameron Nurse, Northeastern University

### **Muscle Morphometries with Head Supported Mass: Implications in Finite Element Models and Neck Pain**

Hoon Choi, Medical College of Wisconsin

### **Development and Implementation of Volumetric Compression Relaxation Testing of Skeletal Muscle**

Anurag Vaidya, Bucknell University

## **Musculoskeletal Design and Devices**

### **Effect of Seating Plane Inclination on Stress Concentration in Non-Linear Finite Element Model of Human Thigh**

Eli Broemer, Michigan State University

## **Musculoskeletal Tissue Engineering**

### **Hyperelastic Mechanical Properties Correlate to Biochemical Composition of Tissue-Engineered Menisci**

Gabriela Espinosa, University of California, Irvine

### **Acellular Tissue Scaffold that Promotes Cell Recruitment and Homing While Maintaining Tissue Specific Structure**

Jeanne Barthold, University of Colorado Boulder

**Acellular Osteochondral Plug as a Defect Repair in Sheep Decreased Localized Strain Concentration but is Unable to Integrate with Surrounding Tissue**

Jeanne Barthold, University of Colorado Boulder

**Emerging Solid Mechanics Topics in Biomechanics and Mechanobiology**

**The Biotribology of Touch & Perception: Numerically Modelling the Effects of Ageing**

Rikeen Jobanputra, Imperial College London

**Quantitative Investigation of the Folding Patterns of the Human Cerebral Cortex**

Nagehan Demirci, University of Notre Dame

**A Computational Model of Mouse Distal Colon and Rectum Capturing Through-Thickness and Longitudinal Heterogeneities in Biomechanics**

Yunmei Zhao, University of Connecticut

**A Novel Custom-Designed Volume-Pressure Apparatus to Measure Pulmonary Mechanics**

Samaneh Sattari, University of California at Riverside

**Shear Wave Speeds in Orthotropic Elastic Materials and Soft Materials with Two Fiber Families**

Zuoxian Hou, Washington University in St. Louis

**Transmural Differences in the Anisotropic Mechanical Behavior of Interventricular Septum in Adult Sheep**

Michael Nguyen-Truong, Colorado State University

**Novel Apparatus for Performing Simple Shear Deformations on Soft Membranes**

Raghuveer Lalitha Sridhar, Texas A&M University

**Alterations to Mechanical Behavior of the Rat Urinary Bladder Due to Type II Diabetes, with and Without Obesity**

Marissa Grobbel, Michigan State University

**Predicting the Mechanical Properties of Fibrin Gels Using Neural Networks Trained on Discrete Fiber Network Data**

Yue Leng, Purdue University

**Multiscale Analysis of Macromolecule Synthesis in a Regenerating Axolotl Limb**

Ester Comellas, Northeastern University

**An Active Free-Energy-Based Model to Predict Cancer Cell Streaming and Invasion**

Eoin McEvoy, University of Pennsylvania

**Measurements of Epithelial Monolayer Mechanics Using Nuclei as Sensors for Applications in Drug Delivery**

Kris Dahl, Carnegie Mellon University

**Neurological Dysfunction Induced by Brain Tumor-Generated Solid Stress is Reversed by Lithium Treatment**

Hadi Nia, Boston University

**Radiation Cystitis-Induced Remodeling of the Mouse Urinary Bladder: Effect on Mechanical Properties of the Extracellular Matrix**

Marissa Grobbel, Michigan State University

**Novel Quantification of Mechanical Load Induced Latent TGF-Beta Activation in Articular Cartilage**

Michael Albrow, Boston University

**Experimental Determination of Axial Vibration Characteristics of the Human Lower Leg**

Jacob Veta, Miami University

**Uncertainty Analysis of Skin Growth During Tissue Expansion Using Multi-Fidelity Gaussian Process Regression**

Taeksang Lee, Purdue University

**A Novel MRI Phantom Test Setup for Validation of Mechanical Imaging Techniques via Tissue Mimicking Phantoms**

Efe Ozkaya, Stevens Institute of Technology

**Computational Assessment of Stress Distribution in the Brain: Biomarkers of White Matter Lesion Formation**

Tyler C. Diorio, Purdue University

**Understanding the Effect of Material Behavior Uncertainty Including Anisotropy on the Biomechanics of Reconstructive Surgery Flaps Using Surrogate Models**

Casey Stowers, Purdue University

**Analyzing the Cortical Thickness of Mammalian Species Through the Segmentation of Magnetic Resonance Imaging Scans**

Mia Hoffman, University of Notre Dame

**Nano, Micro, and Multiscale Mechanics**

**Ultrashort Laser Fragmentation of Plasmonic Gold Nanoparticles: Coulomb Explosion Versus Photothermal Evaporation**

Peiyuan Kang, the University of Texas at Dallas

**A Multiscale Mechanical Analysis of Mouse Skin: Comparison Between Experiments and Models**

Nathan Witt, University of Iowa

**Multiscale Quantification of Microstructural Changes in Dermal Collagen in Young and Aged Mice**

Alan Woessner, University of Arkansas

**A Correction for Uniaxial Ring Pull Tests in the Determination of Mechanical Properties and Failure**

Ryan Mahutga, University of Minnesota

**Can an Affine Model Capture the Macroscopic Response of a Non-Affine Model by Appropriate Choice of Parameters?**

Maryam Nikpasand, University of Minnesota

**Effect of Inter-Douplet Coupling on Ciliary Beating**

Louis Woodhams, Washington University in St. Louis

**Characterizing the Pressure-Induced Alterations in Actin, Gfap and Nuclear Morphology of Mouse Optic Nerve**

Yik Tung Tracy Ling, Johns Hopkins University

**Non-Contact Microfluidic Mechanical Property Measurements of Single Apoptotic Bodies**

Joanna Dahl, University of Massachusetts Boston

**Micromechanics of Collagen Gel Characterized by Micro-Indentation Experiment and Single Network Computational Modeling**

Jay Hou, University of Minnesota

**A Microanatomical Biomechanical Model of Myocardium in the Hypertensive Heart**

Emilio A. Mendiola, the University of Texas at Austin

**Patterned Extracellular Matrix (ECM) Stiffness Influence on Neuronal Cell Mechanical Behavior**

Mohan Yasodharababu, University of Arkansas

**Mechanics of Collagenous Bio-Composites**

Marco Fielder, University of Arkansas

**Ocular Mechanics**

**Investigating the Biomechanical Properties of Human Lamina Cribrosa in Racioethnic Groups Using a Subdomain Based Inverse Finite Element Optimization**

Hirut Kollech, University of Pittsburgh

**Altered Tensile Stiffness and Permeability of Myopic Mouse Sclera as Determined by Compression Testing**

Dillon Brown, Georgia Institute of Technology

**A Parametric Sensitivity Analysis of Rat Optic Nerve Head Biomechanics**

C. Ross Ethier, Georgia Tech/Emory

**Study of Pressure Control by Employing Annular Flow in Tubing of a Non-Valved Glaucoma Drainage Device**

Sara Wilson, University of Kansas

**Alterations in Iris Stromal Cell Nuclei During Pupillary Responses**

Vineet Thomas, the University of Akron

**Regional Variation in Mechanical Strain in Mouse Optic Nerve Head with Acute and Chronic Pressure Elevation**

Arina Korneva, Johns Hopkins University

**Direct Visualization and Measurement of Stretch-Induced Uncrimping of the Collagen Fibers of the Optic Nerve Head**

Ian a Sigal, University of Pittsburgh



**Tissue Collagen Fibers Are Often Interwoven. So What? in Support of Considering Fiber Interweaving**

Ian a Sigal, University of Pittsburgh

**Solid Mechanics: Other**

**Buckling Under Pressure: Does the Cerebrospinal Fluid Affect the Wrinkling Instabilities in the Brain?**

Mohsen Darayi, University of Notre Dame

**Spla2 Inhibition Prevents the Cutaneous Peripheral Nerve Fiber Loss that Parallels Behavioral Sensitivity After Painful Transient Nerve Root Compression**

Julia Quindlen-Hotek, University of Pennsylvania

**Dynamic Mechanical Properties of Airfoil-Shaped Brain Surrogate Under Shock Wave Loading**

Sarah Bentil, Iowa State University

**Effects of Porosity and Topology on the Mechanical Performance of 3D Printed Nature-Inspired Meta-Biomaterials**

Maryam Tilton, Pennsylvania State University

**Shear Wave Elastography: A Non-Invasive Alternative for Multi-Axial Mechanical Testing? Proof of Concept in a Nonlinear Tissue-Mimicking Phantom**

Annette Caenen, Ghent University

**A Novel Approach to Characterize the Nonhomogeneous Elastic Property Distribution of Soft Tissues Based on the Regularized Virtual Fields Method**

Yue Mei, Dalian University of Technology

**Developing a Customized Device for Inflated Stretch of Native Porcine Dura Membrane**

Lakiesha Williams, University of Florida

**Modeling of Artificial Turf with the Discrete Element Method**

Justin Rittenhouse, Western Michigan University

**Machine Learning Based Discriminant Analysis of Asian Abdominal Aortic Aneurysms Based on Geometric Measures**

Sourav Patnaik, University of Texas at San Antonio

**Growth Plate Cartilage Exhibits Orientation and Depth Dependent Strain Fields Under Loading**

Kevin Eckstein, University of Colorado Boulder

**A Novel 3D Constitutive Model for Human Breast Tissue**

David Li, the University of Texas at Austin

**An Unsupervised Learning Analysis of Biomarkers in Abdominal Aortic Aneurysms Using K-Means Clustering**

Ender Finol, the University of Texas at San Antonio

**Direct Solution of the 3D Mechanical Behavior of Soft Tissues Using a Neural Network Based PDE Solver**

Wenbo Zhang, the University of Texas at Austin

**Mechanical Characterization of Soft Anisotropic Biomembranes from Inflation Tests and Optical Profilometry**

Amir Ostadi Moghaddam, University of Illinois at Urbana-Champaign

**Biaxial Tensile Mechanics of Aponeurosis Tissue**

Keith Grega, Bucknell University

**Reproductive Mechanics**

**3D Ultrasound Imaging of the Murine Cervix During Pregnancy**

Jennifer Anderson, Purdue University

**Convolutional Neural Network-Based Pelvic Floor Structure Segmentation Using Magnetic Resonance Imaging in Pelvic Organ Prolapse**

Fei Feng, Shanghai Jiao Tong University

**A Computational Study of Effects of Commonly Used Obstetrical Maneuvers on Fetal Brachial Plexus Stretch During a Shoulder Dystocia Events**

Sheng Chen, Michigan State University

**Impact of Polypropylene Mesh Tension and Pore Geometry on the Biomechanical Properties of the Vagina Following Implantation**

Katrina Knight, University of Pittsburgh

**Novel Quantification of Pelvic Floor Muscle Fascicle Orientations Using Photogrammetry of Cadaveric Specimens**

Megan Routzong, University of Pittsburgh

**Role of Decorin and Biglycan in Mouse Cervix Mechanical Properties During Pregnancy**

Nicole Lee, Columbia University

**Patient-Specific Parametric Models of the Gravid Uterus and Cervix from 2D Ultrasound**

Erin Louwagie, Columbia University

**Micromechanical and Microstructural Properties of the Uterine Cervix**

Amy Wagoner Johnson, University of Illinois at Urbana-Champaign

<b>Friday, June 19</b>	<b>Undergraduate Design Competition Lightning Talks</b>
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**Senior Design: A Synthetic Model for Calcified Arterial Access**

Shannon Mowbray, William Winchester, Valerie Lallo, Vanessa Limbert, Kristen Vogle, Finbar Byrne  
Widener University

**Assistive Device for Performing Exercises in Paraplegic Patients**

Carmen Reyes, Samantha Hamadyk, Dafna Karikari, Celeste Rice, Ria Mazumder  
Widener University

**Dynamic Ankle Brace with Adjustable Stiffness for Rehabilitation of Ankle Sprains**

Sophie Brundin, Izah Deang, Quinn Guzman  
Embry-Riddle Aeronautical University

**Semi-Autonomous Pullable Object Transporter (spot)**

Caroline Brooks, Christopher Davis, Mitchell Krentz, Paul Millan, Nicole Mitchell, Jordan Olson  
The University of Alabama

**A Lightweight Wearable American Sign Language Alphabet Translation Device**

Thao Nguyen, Prisssha Krishna Moorthy, Jennifer Tran, Karmina Calderon  
University of Texas at Arlington

**Design of a Facility-Owned Adjustable Interim Prosthetic**

Matthew Honaker, Masashi Nishiguchi, Hanna Wharton, Logan Palochak  
University of Mount Union

**Stoma Submersion Security: A Precautionary Device for Accidental Water Submersion**

Daphne Freeman, Megan DeRidder, Megan McCann, Jenna Russ, Molly Stewart  
Clarkson University

**Hemocompatible Tunable Blood Shunt for Norwood Recipients with Single Ventricle Physiology**

Kristen Shema, Drexel University

<b>Friday, June 19</b>	<b>Accepted Abstracts Not Presented</b>
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**Nf-kb Mediated Effects on Sensitivity and Cartilage Pathology in a Non-Invasive Loading Model of Post-Traumatic Osteoarthritis**

Ian Berke, Washington University in St. Louis

**Biomechanical Assessment of Tricuspid Regurgitation Using Patient-Specific Experimental and Computational Approaches**

Fatiesa Sulejmani, Georgia Institute of Technology

**Aortic Aneurysm Progression Is Sex-Dependent in Marfan Syndrome**

Nazli Gharraee, University of South Carolina

**Mechanical Properties of the Extracellular Matrix of the Bladder Wall in a Nlrc4 Ko Rat Model**

Tyler Tuttle, Michigan State University

**Sulfide Signaling Promotes Regeneration on Vascular Implants**

Ansha Zhao, University of Colorado at Boulder

**Dynamic Vertex Model of Epithelial Mechanics Built Upon Active-Viscoelastic Rheology of Actomyosin Cortex**

Sohan Kale, Virginia Tech

**Lymphatic Valves Yield a Heterogeneous Flow Field and Pro-Inflammatory Peri-Valvular Milieu**

Akshay Pujari, University of Massachusetts

**Protonix Motorized Walker**

Scott Christensen, the University of Alabama

**Determining and Mimicking the Role of Mesenchymal Stem Cells Within an Elastomeric Vascular Scaffold**

Katherine Lorentz, University of Pittsburgh

**Fast Computation of Fractional Flow Reserve for Coronary Artery Disease Management**

Mehran Mirramezani, University of California, Berkeley

**Regional Mechanical Analysis of the Porcine Thoracic Aorta Using Constitutive Models and Experimental Data**

Dongman Ryu, Michigan State University

**In Vitro Investigation of the Effect of Flow Diverting Stents on the Hemodynamics in Cerebral Aneurysms**

Fanette Chassagne, University of Washington

**Upper and Lower Lumbar Spine Loads from Vertical Impact Using Human Body Finite Element Modeling**

Prashant Khandelwal, Medical College of Wisconsin

**In-Vitro Investigation of the Effect of Oscillatory Intraventricular Pressure and Left Ventricular Assist Device Pulsatility and Speed on the Intraventricular Hemodynamics**

Marissa Miramontes, University of Washington

**Effect of Averaging the Extracellular Matrix Structural Parameters on the Mechanical Response of the Tricuspid Valve Leaflets**

Vineet Thomas, the University of Akron

**Detecting Inadvertent Muscle Damage During a Piriformis "Sparing" Approach to the Hip**

Hunter Storaci, Stanford University

**Lagrangian Tracking of Platelet Activation in Lvad Therapy: Computational Simulation in a Compliant Left Ventricle**

Tingting Yang, University of Washington, Seattle

**Adaptations of a Hockey Glove to Enhance Prismatic Prehensile Grasp for a User with Congenital Hand Impairments**

Haley Korth, Clarkson University

**Modeling Nickel Biotransport from Cardiovascular Stents**

Konstantinos Kapnisis, Cyprus University of Technology

**High Throughput Cryopreservation Using Printing and Laser Warming**

Li Zhan, University of Minnesota

**Applicability of Neck Injury Criteria Critical Intercepts for Full Body Finite Element Models: A Pilot Study**

Bharath Koya, Wake Forest School of Medicine

**Size-Shrinkable Nanoparticles for Drug Delivery to Breast Cancer Brain Metastases**

Shenqi Zhang, Yale University

**Helical Geometry of Actin Stress Fibers May Account for Their Adaptive Response to Mechanical Stimuli**

Shinji Deguchi, Osaka University

**Role of the Lung Tumor Extracellular Environment in Promoting Cell Invasion**

Rebecca Goldstein, University of Utah

**Label-Free Microscopic Assessment of Adult Stem Cell Differentiation Incubated with Nanoparticles**

Nishir Mehta, Louisiana State University

**Hemodynamics Based Personalized Assessment of Stroke Risk in Atrial Fibrillation Patients Undergoing Left Atrial Appendage Closure**

Nikhil Paliwal, Johns Hopkins University

**Predictions by a Cartilage Damage Model with Collagen Fiber Damage and Collagen Network Destructuring Are Consistent with Clinical and Experimental Data**

Corrinus van Donkelaar, Eindhoven University of Technology

**External and Internal Responses of the Cervical Spine with Artificial Disc and Conventional Fusion Surgeries**

Yuvaraj Purushothaman, Medical College of Wisconsin

**Functionalization of Pcl/thiol-Pegnb Vascular Grafts for Biomimetic Remodeling**

Monica Iglesias, University of Colorado at Boulder

**Comparison of Stenting Performances in Calcified and Non-Calcified Coronary Artery**

Pengfei Dong, University of Nebraska-Lincoln

**Roles of the Whole Rho-Gap Family in the Regulation of Cell Morphology and Emt-Related Functions**

Na Kang, Osaka University

**Fluid-Structure Interaction Modeling of Transcatheter Aortic Valve Replacement in Patient-Specific Bicuspid Aortic Valves**

Andres Caballero, Georgia Tech

**Ultrasound as a Stimulus for Transdermal, Hydrogel-Based Bone Repair**

Fayekah Assanah, University of Connecticut

**Characterization of Pulsed Electric Field Induced Cell Death in Annulus Fibrosus Tissue**

Prince Atsu, Rowan University

**Transcatheter Heart Valve Leaflet Design Affects Local Flow Characteristics: A n In-Vitro Study**

Beatrice Ncho, Georgia Institute of Technology

**Centrimag as a Right-Sided Fontan Assist Device: Effectiveness Across Patient Anatomies and Cannulations**

Phillip Trusty, Georgia Institute of Technology

**Simulating the Release Profile of a Nitric Oxide Releasing Catheter in Physiological Conditions**  
Xianglong Wang, University of Michigan, Tulane University

**Effect of Cyclic Stretch on Yes Associated Protein 1 (yap1) and Sry-Box Transcription Factor 9 (sox9) Expression in Aortic Valve**  
Md Tausif Salim, Georgia Institute of Technology

**Region-Based Characterization of Stress Relaxation Behavior in Porcine Pulmonary Arteries**  
Narasimha Rao Pillalamarri, University of Texas at San Antonio

**Comparison of Cinching Force in Mitral Annulus for Clip and Edge to Edge Repair Technique**  
Shamik Bhattacharya, Southeast Missouri State University

**Cnn-Based Cellular Contractile Force Evaluation Algorithm**  
Honghan Li, Osaka University

**Effect of Porosity on the Signal Strength of a Polyvinylidene Fluoride (pvdf) Biosensor**  
Matthew Danley, University of Minnesota Duluth

**Patient-Specific Computational Modeling of Prostate Artery Embolization: Targeted Delivery of Emboli**  
Mostafa Mahmoudi, Northern Arizona University

**Patient-Specific Pre-Operative Evaluation of Surgical Techniques for Planification – Application to Women Pelvic Organ Prolapse**  
Guillaume Dufaye, SATT-LaMcube

**Hydrogel-Based Phantoms for Magnetic Resonance Imaging**  
David Rutkowski, University of Wisconsin-Madison

**Towards Optimal Patient-Specific Shear Targeted Drug Delivery in Coronary Artery Disease**  
Sara S. Meschi, Northern Arizona University

**Trabecular Bone Permeability in Relation to Ct Attenuation Coefficient: Experimental Measures on Tibial Bone**  
Giovanni Solitro, Louisiana State University Health Science Center-Shreveport

**Effects of Macroscale Stresses on the Tricuspid Valve Interstitial Cellular Deformation: A Computational Analysis**  
Vineet Thomas, the University of Akron

**The Effect of Resection Size in the Treatment of Cam Type Femoroacetabular Impingement in the Typical Hip Arthroscopy Patient: A Biomechanical Analysis**  
John Bonano, Stanford University

**Optimization of Saline Flushing for Visualization of Chronic Total Occlusions**  
Syed Faisal, University of Washington

**Calculating Platelet Dynamics in Hemodynamic Simulations of Cerebral Aneurysms Treated with Coil Embolization Devices**  
Laurel Marsh, University of Washington

**The Euler Spiral of Animal Whiskers**

Eugene L. Starostin, London South Bank University

**3d Printing of Hydrogels with Spatially Controlled Intra-Drop Particulates**

Cih Cheng, Purdue University

**Validation of a Collagen Fiber Recruitment Model for Uniaxial Loading of the Spinal Cord Injured Rat Urinary Bladder**

Tyler Tuttle, Michigan State University

**Intraoperative Radio Frequency Heating Device to Treat Infected Metal Internal Fixation Devices**

Anil Attaluri, Pennsylvania State University - Harrisburg

**Experimental Validation of Micrnas Identified by Small RNA Sequencing of Ascs Undergoing Endothelial-Genesis**

Shahensha Shaik, Louisiana State University

**The Effect of Interposed Bone Marrow-Derived Mesenchymal Stem Cell Sheets on Early Healing of the Achilles Tendon in a Rat Model**

Masahiro Maruyama, Stanford University

**Effect of Porosity of the Functional Graded Scaffold for Treatment of Steroid-Associated Osteonecrosis of the Femoral Head in Rabbits**

Masahiro Maruyama, Stanford University

**Re-Evaluating Arterial Constrained Mixture Model Approach**

Haritha Mullagura, Michigan State University

**Non-Elastic Mechanical Remodeling of the Extracellular Matrix and the Role of Heterogeneous Crosslinking**

Michael Mak, Yale University

**Point Set Registration Algorithm for Characterizing Mitral Valve Morphology**

Keshav Kohli, Georgia Institute of Technology

**Characterization of Porosity Distribution of the Coil Mass Deployed Inside Cerebral Aneurysms and Its Influence on Porous Model Approximation**

Julia Romero Bhathal, University of Grenoble Alpes

**A Force Exertion Device for Walking Impairment Rehabilitation Targeting Balance Recovery**

Alexandra Hurley, the University of Alabama

**Using a Computational Human Body Model to Explore the Risk of Pelvis Injury in the Underbody Blast Environment**

Zachary Hostetler, Wake Forest School of Medicine

**On the Use of Computational Hemodynamics for Predicting Disease Severity in Adult Pulmonary Hypertension**

Narasimha Rao Pillalamarri, University of Texas at San Antonio

**In Vitro Real-Time Magnetic Resonance Imaging of Thrombus Growth**

Ling Yang, the Pennsylvania State University

**Glycosaminoglycan Influence on the Tensile Response of the Porcine Scleral Extracellular Matrix**

Mohamad Pachenari, University of Illinois at Chicago

**Exploring Annuloplasty Ring Holding Strength and Annular Microstructure in Diseased Animal Models**

Sanchita Bhat, Georgia Institute of Technology

**Visualising In-Contact Lubricant Replenishment with Application to Ac and Hydrogel Lubrication**

Elze Porte, Imperial College London

**Device for Visualizing Mechanotransduction in Cartilage During Limb Loading in an Axolotl**

Sarah Nano, Northeastern University

**Bioprosthetic Leaflet Durability: at the Heart (valve) of the Matter**

Alix Whelan, Trinity College Dublin

**Local Deformation Measurement in Dissecting Arterial Tissue Using Optical Coherence Tomography and Digital Volume Correlation**

Brooks Lane, Mines Saint-Etienne

**The Tensile Properties of Porcine Sclera as a Function of Hydration**

Hamed Hatami-Marbini, University of Illinois at Chicago

**Closing the Loop: A Comparison of the Sensitivities of Closed Loop and Open Loop Cardiovascular Models**

Jacob Sturdy, Norges Teknisk-Naturvitenskapelige Universitet

**The Role of Inertia and Hemodynamics in Thrombus Transport to the Circle of Willis in Left Ventricular Assist Device Therapy: Patient-Specific Computational Modeling**

Angela Straccia, University of Washington

**Effects of Animal Age, Heparin Release and Stem Cell on Long-Term Vascular Graft Remodeling**

Richard Johnson, University of Colorado at Boulder



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