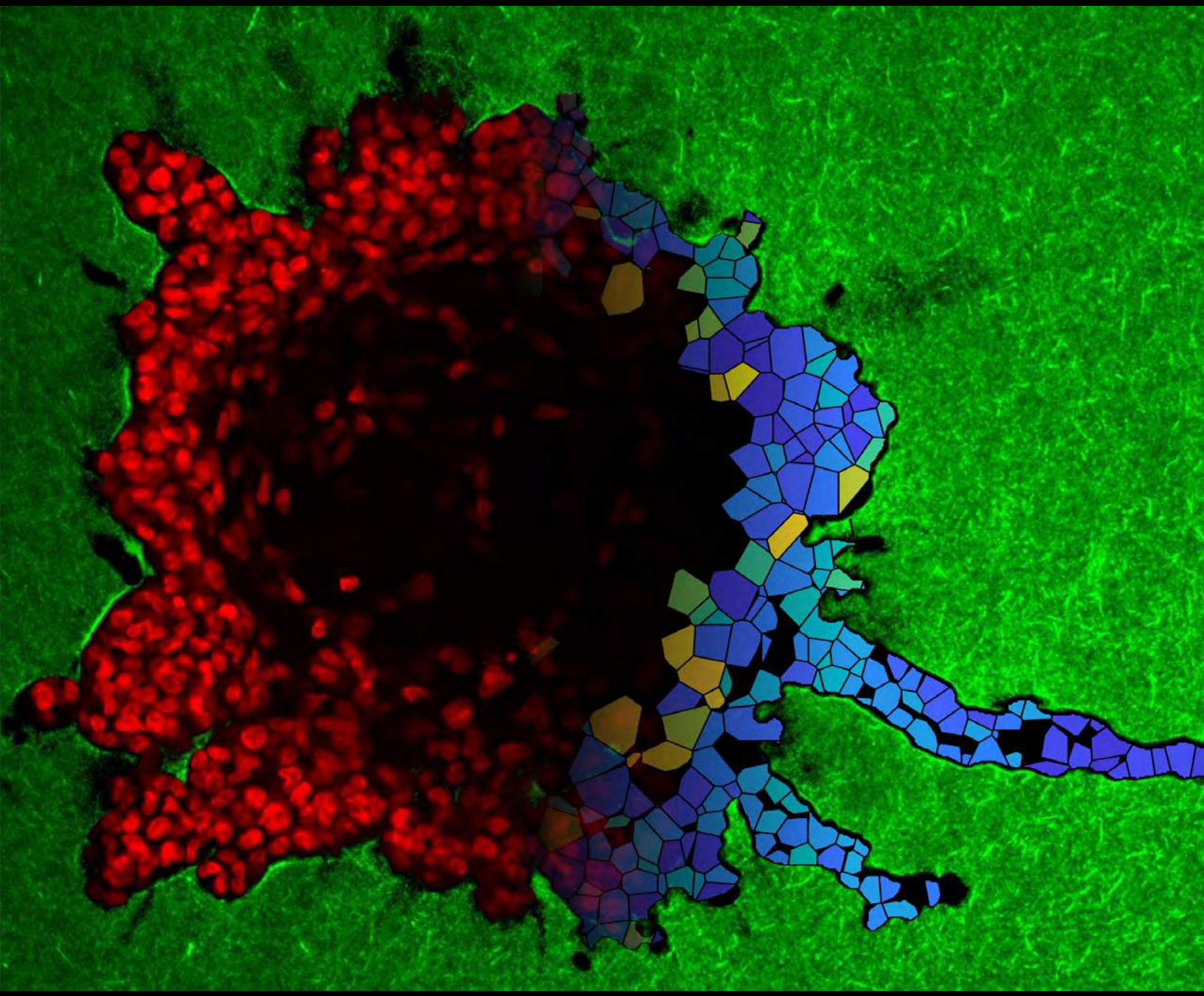
SB3C

biomechanics.
bioengineering.
biotransport.

2021 Summer Biomechanics, Bioengineering, and Biotransport Conference



Virtual Meeting

June 14-18, 2021

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. Funding for this conference was also made possible (in part) by 1R13EB028126-01 from the National Institute of Biomedical Imaging and Bioengineering. Prizes and other support for the Student Paper Competition were provided by the Bioengineering Division of the American Society of Mechanical Engineers. The views expressed in written conference materials or publications and by speakers and moderators do not necessarily reflect the official policies of the Department of Health and Human Services; nor does mention of trade names, commercial practices, or organizations imply endorsement by the U.S. Government. The conference organizers gratefully acknowledge Aletea vanVeldhuisen from Purdue University for her help with the Program Book and Proceedings.

The 2021 Summer Biomechanics, Bioengineering, and Biotransport Conference (SB^{3}C) organizers gratefully acknowledge the support of the National Science Foundation, the National Institutes of Health, and American Society of Mechanical Engineers.

Congratulations to the 2021 Cover Art Contest Winner:

Jacopo Ferruzzi, University of Texas at Dallas/Boston University
Title: Jamming and Unjamming Transitions Govern the Invasion of Tumor Spheroids within 3D Extracellular Matrices
Description: Metastatic MDA-MB-231 breast cancer spheroids undergo a jamming transition during collective migration in high density collagen. The image displays the equatorial cross-section of an MDA-MB-231 spheroid (initially comprising $\sim$ 1000 cells) invading in a 4 mg/ml collagen matrix for 48 hours. The entire spheroid volume is captured in the image stack by combining optical clearing and multiphoton imaging. DAPI-stained cell nuclei are shown in red and collagen fibers from second harmonic generation signal (SHG) are shown in green. Cell shapes are estimated using a bounded Voronoi tessellation of the cell nuclei and subsequent calculation of the shape index (SI) as the normalized surface area: $SI = \frac{S}{V^{2/3}}$ where S and V represent, respectively, the surface area and the volume of the Voronoi tile approximating each cell within the spheroid. The 2D cross-section of the 3D cell shapes are color coded according to their respective SI value and show a decreasing radial gradient, consistent with the presence of an unjammed fluid-like phase in the spheroid bulk and a jammed solid-like phase while cells invade collectively under confinement from the dense collagen matrix. The field of view has a size of 824.57 x 824.57 μm^2. Fading between Voronoi tiles and cell nuclei was included for artistic effect.

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1 Forward and Acknowledgement

Dear SB^{3}C Community,

Opening Remarks: It is our pleasure to welcome you to the 2021 Virtual Summer Biomechanics, Bioengineering, and Biotransport Conference (SB^{3}C). It has once again been a very challenging year given concerns over the global coronavirus pandemic. While our entire conference planning committee stayed on duty for the 2021 conference hoping to meet you all in person in Vail, Colorado – we had to make the very difficult decision to host this year's meeting virtually once again. Drawing from our experience leading the first virtual SB^{3}C meeting last year, we were able to make substantial adjustments to the format this year. We hope that the virtual SB^{3}C we have produced will provide all of you an improved conference experience, especially as it relates to your ability to connect with one another throughout the meeting.

Conference Structure: This year we will be offering a synchronous delivery of our Opening Plenary talk by Celeste Nelson (Princeton) as well as our medal awardee presentations. New this year we will also be enjoying our podium and poster sessions synchronously using the interactive platforms Whova and GatherTown. These choices were made with the hope that attendee interaction can be significantly improved over SB^{3}C 2020. We are excited about offering our Diversity Mentor/Mentee Event this year, which will be prefaced by a moderated panel discussion of experts in STEM diversity and inclusion. We would also like to congratulate the winners of this year's ASME Medals: Dr. Kristin Miller (Y. C. Fung Early Career Medal), Rafael Davalos (Van C. Mow Medal), Dr. Maury Hull (Robert Nerem Education and Mentorship Medal), Dr. Danny Bluestein (Savio L-Y Woo Translational Biomechanics Medal), and Dr. Ross Ethier (Herbert R. Lissner Medal). Congratulations to all! Please take some time to review their significant accomplishments as provided in this Program Book – and be sure to give them a personal congratulations if you run across them in our GatherTown virtual platform. This year also marks the inaugural offering of our SB^{3}C Pre-Conference Computational Workshop – focused on providing trainees with a smaller group setting to work directly with biomechanical simulation software developers to address issues arising with use of their platforms. In addition, we are offering: a Career Connections Event, a Women's Networking Event, an LGBTQ Networking Event, and a Student Networking Social. We hope you enjoy the 2021 SB^{3}C program we have put together and that you take advantage of our online platforms to connect more directly with your colleagues.

Student Paper Competition: Continuing our long tradition of elevating the work of our trainees, the ASME BED 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 live via a poster 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: The SB^{3}C Conference Organizing Committee would like to thank Pat Cinfici, Debbie Pasquale, Laurie Cruz, and everyone at Boscov's Travel for their continued support of SB^{3}C. The decision to go virtual again this year was a difficult one and we look forward to having an in-person meeting in 2022. This conference would not be possible without the generous support of the ASME, NSF, and the NIH. Their commitments have allowed the SPC to continue offering discounted and/or complimentary registrations for numerous trainees and young faculty! THANK YOU! A very important "thank you" is also necessary to all our sponsors and exhibitors, who have been patient as we worked to offer them the best visibility through our virtual platform this year. A final thanks to our ASME BED Technical Committees and the SB^{3}C Foundation Board for their programmatic and financial contributions to our 2021 meeting. We hope that you will enjoy our virtual conference this year and we look forward to seeing you in person in 2022!

Jonathan Vande Geest, Conference Chair
University of Pittsburgh

Jeff Ruberti, Program Chair
Northeastern University

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1.1 Virtual Conference Code of Conduct

SB^{3}C2021 is a professional conference of scientifically inclined adult individuals, and is hosted within the United States and thus under the umbrella of its laws and expectations regarding civil rights. Moreover, SB^{3}C2021 is committed to being an inclusive, welcoming, and harassment-free environment regardless of sex, race, ethnicity, age, gender identity, sexual orientation, nationality or physical ability. As such, all attendees are expected to behave with civility and respect to one another, and to recognize their personal responsibility in exercising good judgement regarding behavior during their attendance at this conference. If you are being harassed, notice that someone else is being harassed, or have any other concerns, please send an email to info@sb3c.org immediately. You may also message any of the organizing committee members via the Whova mobile app. If a participant engages in harassing or non-respectful behavior, the conference organizers may take any action they deem appropriate, including a warning or expulsion from the conference with no refund. Participants asked to stop any harassing behavior are expected to comply immediately. Any questions regarding this policy can be sent to info@sb3c.org.

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1.2 Program-at-a-Glance

SB3C 2021 - Virtual Meeting Program At A Glance

	Time	Session
MONDAY June 14, 2021	10:30am - 11:00am EDT	Opening Presentation
	11:00am - 12:30pm EDT	Solid Mechanics, Education, Industry Committee Meetings
	12:30pm - 2:00pm EDT	Parallel Sessions/Ph.D. SPC
	2:00pm - 2:30pm EDT	Break
	2:30pm - 4:00pm EDT	Parallel Sessions
	4:00pm - 4:30pm EDT	Break
	4:30pm - 5:30pm EDT	Plenary: Professor Celeste Nelson
	5:30pm - 6:30pm EDT	Faculty, Industry, and Post-Doc Women's Networking Event
	5:30pm - 6:30pm EDT	Student Neworking Social

	Time	Session
TUESDAY June 15, 2021	9:30am - 11:00am EDT	Fluid Mechanics and Design, Dynamics and Rehabilitation Committee Meetings
	11:00am - 12:30pm EDT	Parallel Sessions/Ph.D. SPC
	12:30pm - 1:00pm EDT	Break
	1:00pm - 2:30pm EDT	Parallel Sessions/Ph.D. SPC
	2:30pm - 4:00pm EDT	Poster Lunch
	4:00pm - 5:00pm EDT	Fung/Mow Award Lectures
	5:00pm - 6:00pm EDT	Diversity Panel
	6:00pm - 7:00pm EDT	Diversity Mentor/Mentee Event
	7:00pm - 7:30pm EDT	BEDRock Concert

	Time	Session
WEDNESDAY June 16, 2021	9:30am - 11:00 am EDT	Biotransport and Tissure and Cellular Engineering Committee Meetings
	11:00am - 12:30pm EDT	Parallel Sessions/Ph.D. SPC
	12:30pm - 1:00pm EDT	Break
	1:00pm - 2:30pm EDT	Parallel Sessions
	2:30pm - 4:00pm EDT	Poster Lunch
	4:00pm - 5:00pm EDT	Woo/Nerem Award Lectures
	5:00pm - 6:30pm EDT	Parallel Sessions
	6:30pm - 8:00pm EDT	BS/MS Poster Session

	Time	Session
THURSDAY June 17, 2021	10:00am - 11:00am EDT	Student Leadership Committee Meeting
	11:00am - 12:30pm EDT	Parallel Sessions/Ph.D. SPC
	12:30pm - 1:00pm EDT	Break
	1:00pm - 2:30pm EDT	Parallel Sessions/Ph.D. SPC
	2:30pm - 4:00pm EDT	Poster Lunch
	4:00pm - 5:30pm EDT	Parallel Sessions
	5:30pm -7:00pm EDT	Workshops
	6:30pm - 8:30pm EDT	Career Connections Event

	Time	Session
FRIDAY June 18, 2021	10:00am - 11:00am EDT	ASME BED Open Meeting
	11:00am - 12:30pm EDT	Parallel Sessions
	12:30 pm-1:00pm EDT	Break
	1:00pm - 2:30pm EDT	Parallel Sessions
	2:30pm - 3:30pm EDT	LGBTQ Networking Event
	3:30pm - 4:30pm EDT	Lissner Award Lecture
	4:30pm - 6:30pm EDT	Workshops
	6:30pm EDT	Closing Presentation

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2 General Information

All times below are in EDT.

2.1 Networking Events

Monday June 14		
Opening Presentation	High Mountain Meadow	10:30 - 11:00 AM
Faculty, Industry, and Post-Doc Women's Networking Event	Saddle Ridge	5:30 - 6:30 PM
Student Networking Social Event	Mogul Madness	5:30 - 6:30 PM
Tuesday June 15		
Justice, Equity, Diversity, Inclusion (JEDI) Mentoring Panel	Grand Traverse	5:00 - 6:00 PM
Diversity Mentor/Mentee Breakout Discussion Groups with Panelists	Grand Traverse	6:00 - 7:00 PM
BEDRock	Concert Hall	7:00 - 8:00 PM
Thursday June 17		
Career Connections Event	Grand Traverse	6:30 - 8:30 PM
Friday June 18		
LGBTQ Networking Event	Grand Traverse	2:30 - 3:30 PM

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2.2 Committee Meetings

The committee meetings listed below are open to all. Attending these meetings is a terrific way to get more involved with the Bioengineering Division of the ASME! Please consider joining one or more of the meetings listed below.

Monday, June 14

Education Committee Meeting	Mud Springs	11:00 AM - 12:30 PM
Industry Committee Meeting	Alpine Drift	11:00 AM - 12:30 PM
Solid Mechanics Committee Meeting	Grand Traverse	11:00 AM - 12:30 PM

Tuesday, June 15

Biofluid Mechanics Committee Meeting	Saddle Ridge	9:30 - 11:00 AM
Design, Dynamics and Rehabilitation Committee Meeting	Mud Springs	9:30 - 11:00 AM

Wednesday, June 16

Biotransport Committee Meeting	Mud Springs	9:30 - 11:00 AM
Tissue and Cellular Engineering Committee Meeting	Saddle Ridge	9:30 - 11:00 AM

Thursday, June 17

Student Leadership Committee Meeting	Saddle Ridge	10:00 - 11:00 AM

Friday, June 18

ASME BED Open Meeting	Saddle Ridge	10:00 - 11:00 AM

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3 Conference Organizing Committees

3.1 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
Ian A. Sigal, Student Paper Competition Chair, University of Pittsburgh
Joel Boerckel, Media Chair, University of Pennsylvania
Justin Scott, Student Leadership Chair, Michigan State University

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3.2 Program Committee

Jeffrey Ruberti, Chair, Program Committee, Northeastern University
Xiaoming (Shawn) He, Chair, Biotransport Technical Committee, University of Maryland
Bumsoo Han, Co-Chair, Biotransport Technical Committee, Purdue 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
Thao (Vicky) Nguyen, Chair, Solid Mechanics Committee, Johns Hopkins University
Kristin Myers, Co-Chair, Solid Mechanics Committee, Columbia University
Grace O'Connell, Chair, Cell & Tissue Engineering Technical Committee, UC Berkeley
David Corr, Co-Chair, Cell & Tissue Engineering Technical Committee, Rensselaer Polytechnic Institute
Justin Scott, Chair, Student Leadership Chair, Michigan State University

3.3 Student Paper Competition Committee

Ian A. Sigal, Ph.D. Level, University of Pittsburgh
Joao Soares, Ph.D. Level, Virginia Commonwealth University
Kristin Miller, M.S. Level, Tulane University
Megan Killian, B.S. Level, University of Michigan
Michael Moreno, Undergraduate Student Design Competition Chair, Texas A&M University

Thank you to all committee members!

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4 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
2021 C. Ross Ethier

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.

2021 C. Ross Ethier, Ph.D.

Dr. C. Ross Ethier, Ph.D., holds the Lawrence L. Gellerstedt, Jr. Chair in Bioengineering and is a Georgia Research Alliance Eminent Scholar in the Wallace H. Coulter Department of Biomedical Engineering at Georgia Institute of Technology and Emory University School of Medicine. Prior to joining Georgia Tech he was Head of the Department of Bioengineering at Imperial College, London for 5 years, and Director of the Institute of Biomaterials and Biomedical Engineering at U. of Toronto for 2 years before that. He received his Ph.D. from MIT in 1986, his S.M. from MIT in 1983, his M. Math from Waterloo in 1982 and his B.Sc. from Queen's University in 1980. His research is in the biomechanics of cells and whole organs, with specific emphasis on ocular biomechanics. He works on developing treatments for glaucoma, the second most common cause of blindness, and for SANS, a syndrome affecting astronauts which is a major NASA human health concern. He has developed a new paradigm of how pressure within the eye is regulated and how the sclera plays a major and unexpected role in influencing vision loss in glaucoma. He has published approximately 200 refereed journal articles and two books, and received both Steacie and Humboldt Fellowships. His work has attracted approximately 14,000 citations and has an h-index of 70 (Google Scholar May 2021).

He is recognized for his outstanding contributions to ocular biomechanics, specifically the biomechanics of intraocular pressure regulation and optic nerve head biomechanics in glaucoma; for mentoring and training the next generation of biomechanical engineers; and for internationally-recognized leadership within the biomechanics community.

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Savio L-Y. Woo Medal

2016 Baruch Barry Lieber
2017 Arthur Erdman
2018 Kyriacos A. Athanasiou
2019 Rita M. Patterson
2020 Mehmet Toner
2021 Daniel Bluestein

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.

2021 Daniel Bluestein, Ph.D.

Dr. Danny Bluestein, Ph.D., is a Professor of Biomedical Engineering at Stony Brook University. Prof. Bluestein's research interests include the elucidation of physical forces that regulate cellular function in flowing blood, and translation of this knowledge to numerical and experimental strategies aimed at optimizing the thromboresistance of Mechanical Circulatory Support (MCS) devices, multiscale modeling of thrombosis, and enhancing clinical diagnostics of cardiovascular diseases processes and progression for developing strategies to achieve better clinical outcomes of procedures and devices for patients who suffer from these diseases. He is the author of 146 peer reviewed scientific articles. He serves as an associate editor and a member of the editorial board of several bioengineering journals, and is an active member of Biomedical Engineering Society, Bioengineering Division of the ASME, and served as the chair of the BED Biofluids technical committee and the Steering Committee of the NIH Multiscale Modeling (MSM) Consortium.

Dr. Bluestein is an internationally recognized leader in the study of cardiovascular biomechanics, thrombosis, and the thrombogenicity of medical devices. His research focuses on the biomechanics and mechanotransduction process controlling thrombus formation and progression of pathologies in the cardiovascular system as well as in blood recirculating devices. His experimental and companion modeling studies have illuminated the subtle processes at play when blood and platelets are subjected to turbulent or highly disturbed flow fields that arise within and distal to cardiovascular support devices and cardiovascular pathologies such as stenosis, vulnerable plaques, and aneurysms. Translation of this knowledge to optimization of blood recirculating devices for improved thromboresistance was achieved by interfacing cutting edge numerical simulation methodologies that he has developed with experimental strategies and hematological assays to create the Device Thrombogenicity Emulation (DTE) approach- a universal methodology for optimizing the thromboresistance of mechanical circulatory support (MCS) devices. This innovative approach was developed during Phase I and Phase II of his special NIBIB Quantum project where he led a large group of bioengineers, clinicians and cardiovascular devices companies that collaborated in the project. The DTE approach was successfully implemented in the design optimization process of ventricular assist devices (VAD) - reducing the use of anticoagulants and antithrombotic drugs for the patients and further helping to extend their use from bridge to transplant (BTT) to destination therapy. A unique implementation of the DTE was in the design of a scaled down version of the only FDA approved Syncardia total artificial heart (TAH) that was too big to be implanted in most female and pediatric patients- to a device that could fit in smaller patients. Since then it was successfully implanted in numerous patients.

Dr. Bluestein received a Bachelor of Science degree in aerospace engineering from the Technion – Israel Institute of Technology, Israel, and a Master of Science degree in fluid mechanics and Ph.D. in biomedical engineering from Tel Aviv University, Israel.

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2018 Roger D. Kamm
2019 Kenneth R. Diller
2020 Dawn M. Elliott
2021 Maury L. Hull

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.

2021 Maury L. Hull, Ph.D.

Dr. Maury L. Hull, Ph.D., is Distinguished Professor Emeritus at the University of California Davis where he holds appointments in the Department of Biomedical Engineering, the Department of Mechanical Engineering, and the Department of Orthopaedic Surgery. He received his BS degree in mechanical engineering from Carnegie-Mellon University in 1969 and M.S. and Ph.D. degrees also in mechanical engineering from the University of California Berkeley in 1970 and 1975. He became a faculty member in the Department of Mechanical Engineering at the University of California Davis in 1976. During his distinguished career, he introduced 7 new undergraduate and graduate courses and developed unique experiments for existing laboratory courses. As a result of teaching these courses and others, he received the UC Davis Engineering Alumni Distinguished Teaching Award in 2002. He has mentored 90 graduate advisees and research orthopaedic residents who are lead authors on most of his 240 papers published in scientific journals. From 1993 until 2000 he served as Chair of the Biomedical Engineering Graduate Program and played a leadership role in creating a new Department of Biomedical Engineering launched in 2001. This department now has 35 full-time faculty members, 400 undergraduate students, 100 graduate students, and annual research expenditures in excess of $ 17 million. Also while serving as Graduate Program Chair, he spearheaded the creation of the annual University of California Systemwide Biomedical Engineering Symposium. This symposium typically attracts upwards of 200 attendees from the 10 UC campuses with a large participation by students. Dr. Hull was active in the Bioengineering Division of the American Society of Mechanical Engineers in various leadership positions for 15 years including Chair of the Division in 2003. As Division Chair, he led the formation of the annual Summer Bioengineering Conference (now the SB^{3}C conference) typically attended by 800 participants including a large proportion of students.

Dr. Hull's research activities encompass orthopedic biomechanics with emphasis on the human knee, musculoskeletal system modeling and simulation of movement, and sports biomechanics and equipment design. Working with colleague Stephen Howell MD, a recent highlight of Dr. Hull's research is pioneering a new surgical technique for total knee replacement, which improves patient outcomes. In recognition of his research achievements, he has received various awards including the Giovanni Borelli Award from the American Society of Biomechanics in 1989, the H. R. Lissner Medal from the Bioengineering Division of the American Society of Mechanical Engineers in 2007, and honorary membership in the Personalized Arthroplasty Society in 2020. He serves on the editorial board of the Journal of Biomechanics and has served multiple terms as Associate Editor of the Journal of Biomechanical Engineering. He currently directs the Orthopaedic Biomechanics Laboratory in the Department of Orthopaedic Surgery at the UC Davis Medical Center in Sacramento.

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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 Ph.D. 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.

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 Huangm
2020 Stavros Thomopoulos
2021 Rafael V. Davalos

2021 Rafael V. Davaolos, Ph.D.

Dr. Rafael V. Davalos, Ph.D., is the L. Preston Wade Professor in the Virginia Tech – Wake Forest University School of Biomedical Engineering and Sciences and the Department of Biomedical Engineering and Mechanics. He is Director of Virginia Tech's Center for Engineered Health, and Co-Leader of the Signaling and Biotechnology Program for the Wake Forest Comprehensive Cancer Center. Dr. Davalos serves on the executive committee as treasurer of the ASME Bioengineering Division and as treasurer on the council for the International Society for Electroporation Based Technologies and Treatments. He currently serves on the editorial board of IEEE Transactions on Biomedical Engineering, Bioelectricity, Cancers and Electrophoresis. Previously, he has served on the editorial board for the ASME Journal of Medical Devices, as the information chair for the Summer Biomechanics, Bioengineering, and Biotransport Conference, and as vice chair of the biotransport group within the Bioengineering Division.

Dr. Davalos' research interests are in microfluidics for personalized medicine and developing technologies for cancer therapy. He is most recognized for co-inventing Irreversible Electroporation (IRE), a non-thermal minimally invasive surgical technique for soft tissue ablation which preserves major blood vessels, nerves, and the extracellular matrix. This form of cancer therapy received the Expedited Pathway Designation in 2018 and has been used to help thousands of patients worldwide. He is further developing an advanced form of the technology with potential for immunotherapy, and also as a new method to treat brain cancer. Dr. Davalos has authored more than 125 peer-reviewed articles, 16 book chapters, 10 journal/book covers with an h-index of 59 (>12,000 citations) and has 36 issued patents. He will serve as a plenary speaker for the 4th World Congress on Electroporation in Copenhagen, Denmark, in 2022; and has served as a plenary speaker for the Bioelectrochemistry Society in Lyon, France, in 2017; the 1st World Congress on Electroporation in Portoroz, Slovenia, in 2015; at the Society of Cryobiology Annual Meeting in 2008; and the keynote speaker for the International Symposium on Electro- and Liquid Phase-Separation Techniques in Baltimore, United States, in 2012. Dr. Davalos is an ASME and AIMBE Fellow.

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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
2021 Kristin S. Miller

2021 Kristin S. Miller, Ph.D.

Dr. Kristin S. Miller, Ph.D., is an Associate Professor in the Department of Biomedical Engineering at Tulane University. After receiving a BS in Biomedical Engineering from Texas A&M University, she completed her Ph.D. in Bioengineering under the mentorship of Dr. Louis J. Soslowsky at the University of Pennsylvania. Her dissertation research focused on quantifying how collagen fiber alignment changes during mechanical testing in developing tendons. She then moved to Yale University as a post-doctoral fellow under the mentorship of Dr. Jay D. Humphrey. At Yale, her work focused on mathematical modeling frameworks that predict the salient features of tissue engineered vascular graft evolution following implantation in murine vasculature, with particular consideration to loss of the polymeric scaffold and subsequent production of neotissue.

Since 2014, Dr. Miller has directed the Biomechanics of Growth and Remodeling Laboratory. Dr. Miller and colleagues have 1) assessed the biaxial mechanical function, extracellular matrix composition, and residual strain in the murine female reproductive system, 2) evaluated the role and interaction of elastic fibers and smooth muscle contractility in the murine vagina, and 3) advanced understanding of structural and mechanical processes during pelvic organ prolapse progression. Dr. Miller has published more than 30 peer-reviewed journal articles and more than 60 conference abstracts. Her team's research is supported by the NIH, NSF, and foundations. Dr. Miller is immensely grateful to her mentors, colleagues/collaborators, and trainees, including the ASME Summer Bioengineering Conference and the SB^{3}C community. She has been active in the Bioengineering Division since 2009 and currently serves as the co-chair of the Other Solids Theme and on the Student Paper Competition committees. Dr. Miller received the National Science Foundation Faculty Early Career Development Award in 2018.

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Plenary and Award Lecture Abstracts

Monday, June 14, 2021, 4:30 - 5:30 PM EDT

Celeste M. Nelson, *Plenary Presentation*

Biography:

Dr. Nelson is the Wilke Family Professor of Bioengineering and a Professor in the Departments of Chemical Biological Engineering and Molecular Biology at Princeton University. She earned S.B. degrees in Chemical Engineering and Biology at MIT in 1998, a Ph.D. in Biomedical Engineering from the Johns Hopkins University School of Medicine in 2003, followed by postdoctoral training in Life Sciences at Lawrence Berkeley National Laboratory until 2007. Dr. Nelson's laboratory specializes in using engineered tissues and computational models to understand how mechanical forces direct developmental patterning events during tissue morphogenesis and during disease progression. She has authored more than 130 peer-reviewed publications. Dr. Nelson's contributions to the fields of tissue mechanics and morphogenesis have been recognized by a number of awards, including a Burroughs Wellcome Fund Career Award at the Scientific Interface (2007), a Packard Fellowship (2008), a Sloan Fellowship (2010), the MIT TR35 (2010), the Allan P. Colburn Award (2011), a Dreyfus Teacher-Scholar Award (2012), and a Faculty Scholar Award from the Howard Hughes Medical Institute (2016), and a Mid-Career Award from the Biomedical Engineering Society (2019).

Title: Mechanical Forces and Epithelial Folding

The morphogenetic patterning that generates three-dimensional (3D) tissues requires dynamic concerted rearrangements of individual cells with respect to each other. We have developed microfluidic approaches to investigate the mechanical forces and downstream signaling responsible for generating the airways of the lung. I will discuss how we combine these experimental techniques with computational models to uncover the physical forces that drive development of complex epithelial geometries. I will also describe efforts to uncover and actuate the different physical mechanisms used to build the airways in lungs from birds, mammals, and reptiles.

Tuesday, June 15, 2021, 4:00 - 5:00 PM EDT

Kristin S. Miller, *Y. C. Fung Early Career Award*

Title: Biomechanics of the Female Reproductive System

The vagina is central to female pelvic support and adapts to dynamic intra-abdominal pressures throughout a woman's lifespan. Structural instability in the vagina and surrounding pelvic organs may lead to significant health problems, such as pelvic organ prolapse. While the etiologies of these conditions remain unknown, altered elastic fiber content is implicated. Elastic fibers are present in most soft biological tissues and are critical to tissue function. Loss of elastic fibers may alter tissue adaptation by both mechanical and biochemical pathways, including varied structural integrity and smooth muscle cell phenotype; however, the relationship between elastic fibers and vaginal mechanical properties is not fully elucidated. In this talk, I will present our efforts to delineate the mechanical role of elastic fibers and smooth muscle cells in the vagina.

Rafael V. Davaolos, *Van C. Mow Medal*

Title: High-Frequency Irreversible Electroporation to Treat Glioblastoma (GBM)

Irreversible Electroporation (IRE) is a minimally invasive surgical therapy to treat unresectable tumors using low-energy microsecond pulses. IRE is unique among tissue ablation techniques in affecting only the cell membrane while tissue molecules, everything encompassing collagen structures to proteins; remain intact, thereby making treatment near critical structures such as major blood vessels and nerves possible. We are currently developing high-frequency IRE

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(HFIRE) for the treatment of glioblastoma (GBM), which has a patient median survival of only 15 months. The therapy preferentially targets cancer cells over healthy cells, transiently disrupts the blood-brain barrier for delivery of therapeutics, and induces a positive immune response. Our preclinical work focuses on helping canine patients with naturally occurring GBM, which are excellent translational models of human GBM. Results of our ongoing trials have been extremely positive, supporting that HFIRE is effective for the treatment of GBM, including tumors refractory to surgery, radio- and chemotherapies.

Wednesday, June 16, 2021, 4:00 - 5:00 PM EDT

Daniel Bluestein, *Savio L-Y. Woo Medal*

Title: Optimization of Prosthetic Devices and Procedures for Treating CV Diseases

Mechanical circulatory support (MCS) devices for heart failure patients remain plagued by thrombosis – mandating lifelong anticoagulation. A universal predictive methodology: Device Thrombogenicity Emulation (DTE) was developed for optimizing their thromboresistance – combining numerical simulations with in vitro measurements of coagulation markers before and after iterative design optimization. DTE was applied to Ventricular Assist Devices, prosthetic heart valves, and the Total Artificial Heart for attaining pre-clinical thrombo-optimization, indicating its potential for reducing device thrombogenicity – ideally to a level that may obviate the need for anticoagulation. DTE was additionally utilized for developing and optimizing a novel polymeric valve for Transcatheter Aortic Valve Replacement (TAVR) – for patients with advanced calcific aortic valve disease. TAVR is rapidly expanding to lower risk younger patients. However, the current tissue-based valves TAVR technology is burdened with durability and thrombosis issues. Demonstrating superio¬r hemodynamic and durability as compared to the former, polymer TAVR valves may serve as a viable long-term alternative to the current TAVR technology.

Maury L. Hull, *Robert M. Nerem Education and Mentorship Medal*

Title: The Biomedical Engineering Story at the University of California Davis

The Robert M. Nerem Medal presentation is divided into three segments. The first is a tribute to Bob Nerem who sadly passed away in Spring of 2020. The second is the story of the 20-year old Department of Biomedical Engineering at the University of California Davis which I played a leadership role in creating. Aided initially by a Special Opportunity Award and subsequently by a Leadership Award from the Whitaker Foundation, the department was founded in 2001 and a new building costing $110 million was built to house the department. The department has grown rapidly and now has 35 full-time faculty members, 400 undergraduate students, 100 graduate students, and annual research expenditures in excess of $17 million. The final segment is a shout out to my former graduate students who initiated the nomination for this medal and provided supporting materials. They include Rick Neptune (PhD 1996), Steve Kautz (PhD 1992), Tammy Haut-Donahue (PhD 2000), Deva Chan (MS 2008), Scott Maxwell (MS 1985), and Corey Neu (PhD 2004).

Friday, June 18, 2021, 3:30 - 4:30 PM EDT

C. Ross Ethier, *H. R. Lissner Medal*

Title: A Short Walk Through the Amazing World of Ocular Biomechanics

Our eyes are amazing organs, allowing us to experience a dense flow of information that enriches our lives. To the uninitiated, it may seem that biomechanics has little to do with ocular function, but nothing could be further from the truth. Our eyes are pressurized connective tissue structures with complex architecture, a rich blood supply, and three fluid circulation/drainage systems. Here I will touch on our work that attempts to understand these systems in health and disease, especially in glaucoma – the world's most common cause of irreversible blindness. A theme woven throughout the technical aspects of the talk is how fortunate I have been to have been able to interact with wonderful mentors, colleagues and trainees.

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7 Students

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8 Justice, Equity, Diversity, Inclusion (JEDI) Mentoring Panel

Tuesday, June 15, 2021, 5:00 - 6:00 PM EDT

Panelists:

Daniel Ababayhu, Ph.D.	Postdoctoral Fellow	University of Virginia
Johnna Frierson, Ph.D.	Assistant Dean for Graduate and Postdoctoral Diversity and Inclusion, Assistant Professor of Medical Education	Duke University
Alex Hyler, Ph.D.	Chief Scientific Officer	CytoRecovery
Sharon Milgram, Ph.D.	Director, Office of Intramural Training and Education (OITE)	National Institutes of Health
Ana Maria Poras, Ph.D.	AAAS IF/THEN Ambassador, Presidential Post-Doctoral Fellow	Cornell University

Dr. Daniel Abebayehu completed his B.S. in Biomedical Engineering at the University of Virginia and his undergraduate research training with Dr. Edward Botchwey in Tissue Engineering/Regenerative Medicine. He then completed his Ph.D. in Biomedical Engineering at Virginia Commonwealth University under the mentorship of Dr. John Ryan, where his research focused on investigating how scaffold morphology and scaffold degradative byproducts can alter the response from innate immune cells. He is now completing his postdoctoral work with Dr. Thomas Barker at the University of Virginia to continue exploring the intersection of immunology and regenerative medicine, specifically focusing on fibrosis and fibroblast heterogeneity. His long-term research goals entail exploring the intersection of immunology/inflammation and fibroblast biology in the context of fibrosis and tissue regeneration.

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Dr. Johnna Frierson is the Assistant Dean for Graduate and Postdoctoral Diversity and Inclusion and Assistant Professor of Medical Education at Duke University School of Medicine. A native of Rock Hill, SC, she received her bachelor's degree in Biology at Furman University, and Ph.D. in Microbiology and Immunology at Vanderbilt University. Her professional interests and expertise lie in examining and identifying solutions to challenges at the intersection of STEM, education, and equity. Dr. Frierson translates this expertise into developing innovative initiatives to enhance recruitment and retention of scientists from underrepresented backgrounds, support student development, cultivate an inclusive academic and professional environment, and expand community outreach to inspire the next generation of STEM scholars. She has obtained funding from a variety of sources to support her programmatic efforts including donor-funded gifts, the Burroughs Wellcome Fund and the National Science Foundation. Her passion and impactful work have drawn notice nationally as Dr. Frierson has been quoted by The New York Times, featured in Science magazine and identified as one of "1000 Inspiring Black Scientists in America" by Cell Mentor.

Dr. Alex Hyler is from Lawrence, Kansas where she earned her bachelors with honors in chemical engineering from the University of Kansas in 2013. Afterwards, she earned her Ph.D. in biomedical engineering from the Virginia Tech-Wake Forest School of Biomedical Engineering and Sciences in 2018. During her time at VT, Dr. Hyler earned a Fulbright to conduct some of her Ph.D. research in Denmark, and she was named the Outstanding Graduate Student of the Year upon graduation for her work in scholarship and community outreach. She has expertise in ovarian cancer biology, microfluidics, and device engineering. Dr. Hyler is currently the Chief Scientific Officer for CytoRecovery, a dynamic startup working to commercialize new cell sorting and recovery technologies. Here she manages CytoRecovery's research and technology commercialization portfolios, manages the scientific research projects, explores innovate applications, and transitions products to production for market launch. When she's not working, Dr. Hyler enjoys traveling, watching sports, and spoiling her two dogs.

Dr. Sharon Milgram received a BS degree in Physical Therapy from Temple University and a Ph.D. in Cell Biology from Emory University. She completed postdoctoral training at The Johns Hopkins University before joining the faculty at The University of North Carolina at Chapel Hill. There, she rose to the rank of Full Professor in the Department of Cell & Developmental Biology. Dr. Milgram served as the Associate Director of the Medical Scientist Training Program, Director of the Interdisciplinary Biomedical Sciences Graduate Program, and the Director of the Summer Undergraduate Research Experience. In 2007 she joined the NIH Office of the Director as the Director of the Office of Intramural Training and Education (OITE) where she directs a trans-NIH Office dedicated to the career advancement of over 5000 trainees. Dr. Milgram lectures widely on science careers, mentorship, leadership, and management in research environments. She lives in Takoma Park, Maryland with her wife and son.

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Dr. Ana Maria Porras will join the Dept. of Biomedical Engineering at the University of Florida as an Assistant Professor in the fall, where her lab will design in vitro models to understand human-microbe interactions in global health contexts. Originally from Colombia, Dr. Porras arrived in the U.S. 15 years ago to pursue a BS in Biomedical Engineering at the University of Texas at Austin. Immediately after, she completed a Masters and Ph.D. at the University of Wisconsin-Madison, where she also obtained a Certificate in Teaching and Learning with an emphasis on inclusive pedagogy. That passion for diversity and inclusion drives most of her work; most recently, she co-founded the Latinx in BME community and was selected as one of 125 AAAS IF/THEN Ambassadors for girls and women in STEM. Dr. Porras is also a science artist and bilingual communicator. Every week she teaches microbiology in English and Spanish on social media using crocheted microbes designed by herself. Outside of all that, Dr. Porras loves to travel, bake, swim, dance, read, and above all, eat ice cream.

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9 Industry and Academic Panels

Industry Career Panel

Thursday, June 17, 2021, 6:30 - 7:00 PM EDT

Panelists:

Alex Hyler	Cytorecovery
Ian Campbell	Exponent, Inc.
Dorn Carranza	FDA
Lin Li	Eli Lily

Dr. Alexandra Hyler is the Head Research Scientist with CytoRecovery developing a cell separation platform. She received her B.S. in chemical engineering from KU in 2013 and her PhD in 2018 in biomedical engineering from VT, where she researched ovarian cancer progression during which she was a Fulbright Fellow to Denmark.

Dr. Ian Campbell is a biomechanical engineering consultant specializing in injury biomechanics, with a particular affinity for ocular injuries and traumatic brain injuries. His Ph.D. is from the joint department of biomedical engineering from Georgia Tech and Emory, and he has a P.E. in mechanical engineering.

Dr. Dorn Carranza is Associate Director for Strategic Partnerships and Innovation and the Associate Director for Regulatory and Translational Sciences at the Office of Science and Engineering Laboratories (OSEL), Center for Devices and Radiological Health in the U.S. Food and Drug Administration. He is an emerging technology, innovation and entrepreneurial leader working on a shared vision to strengthen U.S. leadership in medical device innovation.

Dr. Lin Li is a Senior Consultant Engineer currently working at the Delivery Devices and Connected Solutions team in Eli Lilly and Company. He received his B.S from McMaster University (Canada) and his Ph.D. from University of Tennessee in the field of Materials Science and Engineering. He joined Lilly in 2015 and has been part of Lilly Research working to develop innovative pharmaceutical packaging and devices ever since.

Academic Career Panel

Thursday, June 17, 2021, 7:00 - 7:30 PM EDT

Panelists:

Gerard Atesian	Columbia U
Maria Holland	U Notre Dame
Don Anderson	U Iowa
Stephanie George	East Carolina U and NSF

Dr. Gerard Ateshian is the Andrew Walz Professor of Mechanical Engineering and Professor of Biomedical Engineering at Columbia in New York City. His primary research is in the field of soft tissue mechanics, with an emphasis on cartilage mechanics, lubrication, and tissue engineering, the formulation of growth

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theories for biological tissues, and the implementation of computational frameworks to solve challenging problems in these fields. His primary clinical interest focuses on the treatment of osteoarthritis.

Dr. Maria Holland is the Clare Boothe Luce Assistant Professor of Aerospace and Mechanical Engineering at the University of Notre Dame in Notre Dame, IN. She earned her M.S. and Ph.D. from Stanford University in the Department of Mechanical Engineering with Prof. Ellen Kuhl, and her bachelor's degree in mechanical engineering from the University of Tulsa, graduating Phi Beta Kappa. Her research is in computational biomechanics, using solid mechanics and computational tools to address important questions about complex soft materials, including the brain. Through collaborations with clinicians and experimentalists, she aims to understand the development of the human brain and how it relates to the brain's form and function. Additionally, she works to extend the functionality of traditional engineering methods to encompass soft, growing materials. She is passionate about sharing the underappreciated breadth and diversity of biomechanics via fascinating stories on her student blog, Biomechanics in the Wild (https://sites.nd.edu/biomechanics-in-the-wild/).

Dr. Don Anderson is the Richard and Jan Johnson Chair in Orthopedic Biomechanics, Professor, and Vice-Chair of Research in the Department of Orthopedics Rehabilitation at the University of Iowa. He holds a BSE in Biomedical Engineering, as well as an MS and Ph.D. in Mechanical Engineering, all earned at the University of Iowa. Reflecting on his engineering roots, Dr. Anderson holds complimentary appointments as a Professor in Biomedical Engineering and Industrial Engineering. He has 30+ years of experience with image analysis, computer modeling, and computational stress analysis in musculoskeletal applications. His primary research focus throughout his career has been on articular joint biomechanics, specifically studying the mechanical relationship between joint injury and the subsequent development of post-traumatic osteoarthritis.

Dr. Stephanie George is currently the Program Director for the Engineering of Biomedical Systems (EBMS) program within the Chemical, Bioengineering, Environmental and Transport Systems Division (CBET) at the National Science Foundation (NSF). Dr. George is on "loan" to the NSF from East Carolina University (ECU) where she is an Associate Professor in the Department of Engineering. She joined the faculty of ECU in 2010 after completing a Post-Doctoral Fellowship at and Ph.D. in Biomedical Engineering from Georgia Tech and Emory University. Dr. George's research applies engineering frameworks to address cardiovascular problems with particular emphasis on computational modeling and image processing. Prior to her role at NSF, Dr. George served as PI for three NSF Research Experiences for Undergraduates (REU) Site awards and Co-PI for an NSF ADVANCE Adaptation award. Dr. George has been recognized for her achievements in integrating research, education, and equity. She received ECU's 2017 Scholar-Teacher Award and was selected to participate in the Diversity and Equity Leadership Program (ECU), BRIDGES Academic Leadership for Women (UNC System), and the BBT Active Learning and Leadership Fellowship program (ECU). Dr. George resides in a small town in eastern North Carolina with her husband and four children (ages 6 - 15). Although the pandemic has created additional challenges for juggling work and family life, this past year has taught her to savor the tiny moments and bravely pursue unexpected opportunities.

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SCIENTIFIC SESSIONS

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SB³C 2021 Virtual Meeting Scientific Sessions

Monday, June 14	12:30PM – 2:00PM EDT

Advances in Biomedical Engineering Education

Alpine Drift

Session Chair: Debanjan Mukherjee, University of Colorado Boulder
Session Chair: Zhongping Huang, West Chester University

12:30PM **Efficacy of Teaching Biomedical Engineering Laboratories Using Virtual Reality**
Anita Singh[1], Arun Ramakrishnan[2], Sriram Balasubramanian[2]
[1]Widener University, [2]Drexel University

12:43PM **"Hands-On, Minds-On, and Science-Up": A Concept-Based Learning Laboratory With a Taste of Research Experience for an Undergraduate Biomedical Engineering Course**
Cyrus Fiori[1], Taisiya Sigaeva[1], Maria Jose Pino Alban[2], Youssef Beauferris[2], Donovan Stagg[2], Elena Di Martino[2]
[1]University of Waterloo, [2]University of Calgary

12:56PM **Developing Community to Support First Generation Freshman in an Engineering Programming Course**
Sara Wilson[1], Molly McVey[1], Nolan Norton[1]
[1]University of Kansas

1:09PM **Development and Implementation of an Engineering Research Course for a College-In-Prison Program**
Julie Speer[1], Zain Clapacs[1]
[1]Washington University in St. Louis

1:22PM **Incorporating Engineering Standards into a Biomechanics Laboratory Course**
Kristen Billiar[1]
[1]Worcester Polytechnic Institute

1:35PM **Virtual Research Mentoring Between Graduate and Undergraduate Students During the Covid-19 Pandemic**
Julie Speer[1], Max Lyon[1], Julia Johnson[1]
[1]Washington University in St. Louis

Monday, June 14	12:30PM – 2:00PM EDT

Bone Mechanics

Saddle Ridge

Session Chair: Arun Nair, University of Arkansas
Session Chair: Lindsey Westover, University of Alberta

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12:30PM **Multi-Scale Cortical Bone Morphology Varies Across Mice of Different Genetic Backgrounds**
Nicole Migotsky[1], Matthew Silva[1]
[1]Washington University in St. Louis

12:43PM **Investigation of Elastic Moduli of Mineralized Collagen Fibril and Extrafibrillar Matrix in Bovine Cortical Bone Using Peakforce Tapping Atomic Force Microscopy**
Yuxiao Zhou[1], Jing Du[1]
[1]Penn State University

12:56PM **Understanding Mechanisms of Load Transfer in the Tendon-To-Bone Attachment**
Mikhail Golman[1], Jonathan Almer[2], Stavros Thomopoulos[1], Alix Deymier[3]
[1]Columbia University, [2]Argonne National Laboratory, [3]University of Connecticut Health Center

1:09PM **Determining Tibial Stress and Strain During the Stance Phase with 3D Finite Element Modeling in a Healthy Running Population**
Patricia Butler[1], Ali Vahdati[1], Stacey Meardon[1], Stephanie George[1]
[1]East Carolina University

1:22PM **Digital Volume Correlation Using Deep Learning-Denoised Synchrotron Micro-CT Images to Study Bone Mechanical Behavior**
Yoshihiro Obata[1], Michael Sieverts[1], Daniel Pelt[2], Claire Acevedo[1]
[1]University of Utah, [2]Centrum Wiskunde & Informatica, Amsterdam, Netherlands

1:35PM **Tendon Enthesis Toughness Relies on Position-Dependent Fiber Recruitment and Bony Attachment Geometry**
Mikhail Golman[1], Victor Birman[2], Stavros Thomopoulos[1], Guy Genin[3]
[1]Columbia University, [2]Missouri University of Science and Technology, [3]Washington University in St. Louis

Monday, June 14	**12:30PM – 2:00PM EDT**

Emerging *In Vitro*, Experimental, Computational and Visualization Methods in Biofluid Mechanics

Mud Springs

Session Chair: Jimmy Azarnoosh, Marquette University
Session Chair: John LaDisa, Marquette University

12:30PM **Rapid Automatic Reconstruction of Heart Valves and Cardiac Structures from CT Images for Pre-TAVR Evaluations Using a Parametric Leaflet Model**
Huang Chen[1], Beom Jun Lee[1], Sri Krishna Sivakumar[1], Breandan Yeats[1], Vinod Thourani[2], Venkateshwar Polsani[2], Lakshmi Dasi[1]
[1]Georgia Institute of Technology, [2]Marcus Valve Center, Piedmont Heart

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12:43PM **A Computational Fluid Dynamics Formulation with Solute Transport Derived from Mixture Theory and its Finite Element Implementation in FEBio**
Jay Shim[1], Steve Maas[2], Vijay Vedula[1], Clark Hung[1], Jeffrey Weiss[2], Gerard Ateshian[1]
[1]Columbia University, [2]University of Utah

12:56PM **Comparison of Nonlinear Membrane, Shell, and 3D Formulations for Vascular Biomechanics**
Nitesh Nama[1], Miquel Aguirre[2], Rogelio Ortigosa[3], Antonio Gil[4], Jay Humphrey[5], C. Alberto Figueroa[1]
[1]University of Michigan, [2]Mines Saint-Etienne, [3]Technical University of Cartagena, [4]Swansea University, [5]Yale University

1:09PM **The Effect of Hematocrit on the Thickness and Asymmetry of the Cell-Free Layer in Arterial Bifurcations**
Sayan Roychowdhury[1], Peter Balogh[1], Amanda Randles[1]
[1]Duke University

1:22PM **Potential Biofluidic and Geometrical Biomarkers of Thoracic Aortic Aneurysm Outcome in the Fbln4SMKO Mouse**
Marisa S. Bazzi[1], Ramin Balouchzadeh[2], Shawn N. Pavey[2], Jessica E. Wagenseil[2], Victor H. Barocas[1]
[1]University of Minnesota, [2]Washington University

1:35PM **A Platform for Studying the Effects of Nanotopography and Reactive Chemical Species on Integrin Selection**
Ryan Fasse[1], Novella Bates[2], Alex Guerra[3], Joe Baio[1], Monica Hinds[2], Patrick Jurney[3]
[1]Oregon State University, [2]Oregon Health & Science University, [3]San Jose State University

Monday, June 14	**12:30PM – 2:00PM EDT**

PhD Student Paper Competition 1: Biotransport, Biosensors and Biomaterials

Mogul Madness

Session Chair: Sara Roccabianca, Michigan State University
Session Chair: Guy Genin, Washington University in St. Louis

12:30PM **Sophorolipids Demonstrate Promising Anti-Cancer Efficacy in 2D, 2.5D, and 3D Breast Cancer Models**
Cassandra Roberge[1], David Kingsley[1], Lillian Murphy[1], Filbert Totsingan[1], Rebecca Miceli[1], Richard Gross[1], David Corr[1]
[1] Rensselaer Polytechnic Institute

12:45PM **Fibrous Microenvironments Regulate Nuclear Shape in a Diameter-Dependent Manner**
Aniket Jana[1], Amrinder Nain[1]
[1]Virginia Tech

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1:00PM **Conductive Polypyrrole-Encapsulated Silk Fibroin Fibers for Myocardial Regeneration**
Yeshi Liang[1], James Goh[1]
[1]National University of Singapore

1:15PM **Diamond: Digital Plasmonic-Nanobubble Detection for Homogeneous Assay with Enhanced Sensitivity**
Yaning Liu[1], Haihang Ye[1], Zhenpeng Qin[1]
[1]University of Texas at Dallas

1:30PM **Successful Cryopreservation of Rabbit Jugular Vein Using Magnetic Nanoparticles Enhanced Single-Mode Electromagnetic Resonance Rewarming System**
Shen Ren[1], Zhiquan Shu[2], Ziyuan Wang[1], Ye Jin[1], Ruidong Ma[1], Shaohang Hao[1], Dayong Gao[1]
[1]University of Washington, [2]University of Washington Tacoma

1:45PM **Modulating the Blood-Brain Barrier by Picosecond Laser Stimulation of Molecular-Targeted Nanoparticles**
Xiaoqing Li[1], Vamsidhara Vemireddy[2], Qi Cai[1], Hejian Xiong[1], Peiyuan Kang[1], Xiuying Li[3], Monica Giannotta[3], Heather Hayenga[1], Edward Pan[2], Shashank Sirsi[1], Celine Mateo[4], David Kleinfeld[4], Chris Greene[5], Matthew Campbell[5], Elisabetta Dejana[3], Robert Bachoo[2], Zhenpeng Qin[1]
[1]University of Texas at Dallas, [2]University of Texas Southwestern Medical Center, [3]FIRC Institute of Molecular Oncology Foundation, [4]University of California San Diego, [5]Trinity College Dublin

Monday, June 14	**2:30PM – 4:00PM EDT**

Biofluids Mechanobiology and Pathology I

Mud Springs

Session Chair: Claudio Chiastra, Politecnico di Torino
Session Chair: Mette Olufsen, North Carolina State University

2:30PM **T Cells from Cadherin-11-Deficient Mice Promote Neointima Formation Following Vascular Injury**
Matthew Bersi[1,2], Matthew Madden[1], Tessa Huffstater[1], Lance Riley[1], Ethan Joll[1], Michael Raddatz[1], Victoria Le[3], Aaron Baker[3], Jeffrey Rathmell[1], David Merryman[1]
[1]Vanderbilt University, [2]Washington University in St Louis, [3]University of Texas at Austin

2:43PM **Linking Gene Expression, Hemodynamics and Cellular Dynamics in a Patient-Specific Multiscale Model of In-Stent Restenosis**
Anna Corti[1], Monika Colombo[1], Stefano Casarin[2], Jared M Rozowsky[3], Yong He[3], Sara Bridio[1], Francesco Migliavacca[1], Jose F Rodriguez Matas[1], Scott A Berceli[3], Claudio Chiastra[1]
[1]Politecnico di Milano, [2]Houston Methodist Hospital, [3]University of Florida

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2:56PM **Multiscale Computational Model Predictions of Shear Stress and Cyclic Stretch in the Pulmonary Vasculature**
Michelle Bartolo[1], Nicholas Hill[2], Naomi Chesler[3], Mette Olufsen[1]
[1]North Carolina State University, [2]University of Glasgow, [3]University of California Irvine

3:09PM **Multiscale Hemodynamic Predictions in Chronic Thromboembolic Pulmonary Hypertension**
Mitchel Colebank[1], Mette Olufsen[1]
[1]North Carolina State University

3:22PM **Elucidating the Role of Wall Shear Stress in Aortic Wall Remodeling in Ascending Thoracic Aortic Aneurysms**
Selene Pirola[1], M Yousuf Salmasi[1], Serena M Fisichella[1], Sumesh Sasidharan[1], Omar A. Jarral[1], Declan P O'Regan[1], James E. Moore Jr[1], Thanos Athanasiou[1], Xiao Yun Xu[1]
[1]Imperial College London

3:35PM **Effects of Prolonged, Altered Hemodynamics on Zebrafish Embryonic Heart Development**
Yoke Yin Foo[1], Efthymios Motakis[2], Zenia Tiang[3], Shuhao Shen[1], Peiyuan Kang[1], Jason Kuan Han Lai[1], Wei Xuan Chan[1], Hadi Wiputra[1], Nanguang Chen[1], Ching Kit Chen[1], Christoph Winkler[1], Roger Foo[3], Choon Hwai Yap[4]
[1]National University of Singapore, [2]Jackson Laboratory, [3]Agency for Science Technology and Research, [4]Imperial College London

Monday, June 14	**2:30PM – 4:00PM EDT**

Biomechanics of Joints and Tissues

Saddle Ridge

Session Chair: Corinne Henak, University of Wisconsin-Madison
Session Chair: Andrew Kemper, Virginia Tech

2:30PM **Effect of Total Ankle Arthroplasty Implantation and Adaptive Gait on Ankle and Adjacent Joint Kinematics During Simulated Gait**
Jeffrey Hoffman[1], Jaeyoung Kim[1], Brett Steineman[1], Rogerio Bitar[1], Daniel Sturnick[1], Jonathan Deland[1]
[1]Hospital for Special Surgery

2:43PM **Additional Distal Femoral Resection Increases Mid-Flexion Laxity of Posterior Stabilized TKA with Flexion Contracture: A Computational Model**
Shady Elmasry[1], Brian Chalmers[1], Cynthia Kahlenberg[1], Peter Sculco[1], Timothy Wright[1], David Mayman[1], Geoffrey Westrich[1], Michael Cross[1], Carl Imhauser[1]
[1]Hospital for Special Surgery

2:56PM **Influence of Chondrolabral Damage and Labral Repair on Hip Joint Mechanics With Cam Fai Morphology**
Jocelyn Todd[1], Travis Maak[1], Gerard Ateshian[2], Andrew Anderson[1], Jeffrey Weiss[1]
[1]University of Utah, [2]Columbia University

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3:09PM **Physiological Loading Conditions to Simulate Standing**
Stephanie Rossman[1,2], Eric Meyer[1], Jorge Isaza[3], Steven Rundell[2]
[1]Lawrence Technological University, [2]Explico Engineering, [3]Spine Specialist of Louisiana

3:22PM **Role of Muscle Activation on Lumbar Spine Force in Frontal Impact Loading**
Sagar Umale[1], John Humm[1], Narayan Yoganandan[1]
[1]Medical College of Wisconsin

3:35PM **PID Controlled, Finite-Element Simulation of Bipolar Radiofrequency Ablation of Porcine Spinal Muscle**
Hanife Tugba Kumru[1], Anilchandra Attaluri[1], Daniel H Cortes[1]
[1]The Pennsylvania State University

Monday, June 14	**2:30PM – 4:00PM EDT**

Image-based Characterization of Soft Tissues

Mogul Madness

Session Chair: Jacopo Ferruzzi, University of Texas - Dallas
Session Chair: Colleen Witzenburg, University of Wisconsin-Madison

2:30PM **Lamina Cribrosa Deformations Induced *In Vivo* by Acutely and Chronically Elevated Intraocular Pressure**
Fuqiang Zhong[1], Yi Hua[1], Junchao Wei[1], Manik Bansal[1], Juan Reynaud[2], Brad Fortune[2], Ziyi Zhu[1], Ian Sigal[1]
[1]University of Pittsburgh, [2]Devers Eye Institute, Legacy Health Research Institute

2:43PM ***Ex-Vivo* Local Plaque Rupture Analysis of Atherosclerotic Human Carotid Arteries Through Nano-Indentation, Tensile Testing and Digital Image Correlation**
Su Guvenir[1], Pablo de Miguel[2], Ali C. Akyildiz[1]
[1]Erasmus Medical Center, [2]Delft University of Technology

2:56PM **On the Relative Sensitivity of AAA Rupture Potential Index to Sex, Intraluminal Pressure, and Familial History**
Balaji Rengarajan[1], Satish Muluk[2], Mark Eskandari[3], Ender Finol[1]
[1]University of Texas at San Antonio, [2]Allegheny Health Network, [3]Northwestern University School of Medicine

3:09PM **Damage Modeling of the Human Meniscus: Validating Finite Element Models with Digital Image Correlation**
Derek Nesbitt[1], Trevor Lujan[1]
[1]Boise State University

3:22PM **The Effect of Age-Related Advanced Glycation End-Products on Tissue Mechanics Depends on Underlying Collagen Organization**
Austin Gouldin[1], Jennifer Puetzer[1]
[1]Virginia Commonwealth University

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3:35PM **Polarized Spatial Domain Imaging for Simultaneous Tissue Strain and Fiber Orientation Measurements**
Coinneach Mackenzie Dover[1], Will Goth[2], James Tunnell[1], Michael Sacks[1]
[1]University of Texas at Austin, [2]SpectraWAVE, Inc.

Monday, June 14	2:30PM – 4:00PM EDT

Multi-Scale Modeling and Characterization of Soft Tissues

Alpine Drift

Session Chair: Pim Oomen, University of Virginia
Session Chair: Sara Roccabianca, Michigan State University

2:30PM **A Novel Three-Layered Model of Mouse Distal Colon and Rectum Capturing Through-Thickness Biomechanics**
Yunmei Zhao[1], Bin Feng[1], David M. Pierce[1]
[1]University of Connecticut

2:43PM **Protein Spreading Patterns in Alzheimer's Disease: Exploring the Difference Between a Connectivity-Based and Proximity-Based Connectome Model**
Shima Jalalian[1], Johannes Weickenmeier[1]
[1]Stevens Institute of Technology

2:56PM **Fiber Network-Based Multiscale Models Predict Experimentally Measured Volume Reduction of Stretched Mouse Skin**
Nathan Witt[1], Alan Woessner[2], Kyle Quinn[2], Edward Sander[1]
[1]University of Iowa, [2]University of Arkansas

3:09PM **The Mechanical Similitude of Positive- Versus Negative-Pressure Ventilation in Mouse Lungs**
Kathrine Anduaga[1], Talyah Nelson[1], Samaneh Sattari[1], Crystal Mariano[1], Arzu Ulu[1], Tara Nordgren[1], Mona Eskandari[1]
[1]University of California Riverside

3:22PM **Cortical Thickness Distribution of the Human Cerebral Cortex Identified by Curvature at Local Scales**
Nagehan Demirci[1], Maria Holland[1]
[1]University of Notre Dame

3:35PM **Interaction Mechanisms of Peptoid and Neuronal Cell Receptors and its Dependence on Peptoid Sphere Size and Chain Length**
Mohan Yasodharababu[1], Shannon Servoss[1], Arun Nair[1]
[1]University of Arkansas

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Tuesday, June 15	11:00AM – 12:30PM EDT

Biofluids Mechanobiology and Pathology II

Mud Springs

Session Chair: Ryan Pedrigi, University of Nebraska-Lincoln
Session Chair: Atefeh Razavi, Georgia Institute of Technology

11:00AM **Leveraging Endothelial Glycocalyx Integrity in Atherosclerotic-Relevant Flow Conditions for Targeted Intravenous Nanoparticle Delivery**
Ronodeep Mitra[1], Ming Cheng[1], Gerard O'Neil[1], Praveen Kulkarni[1], Rajiv Kumar[1], Srinivas Sridhar[1], Craig Ferris[1], James Hamilton[2], Hanjoong Jo[3], Eno Ebong[1]
[1]Northeastern University, [2]Boston University School of Medicine, [3]Emory University

11:13AM **Regulation of TXNIP and the Role of ER Stress in the Anti-Inflammatory Effect of Empagliflozin to Glycocalyx Degradation**
Marc-Antoine Campeau[1], Richard Leask[1]
[1]McGill University

11:26AM **Computational Models to Evaluate the Impact of Coronary Collateral Artery Flow in Adult and Postnatal Mice**
Suhaas Anbazhakan[1], Kristy Red-Horse[1], Alison Marsden[1]
[1]Stanford University

11:39AM **Mean and Transverse Wall Shear Stress Correlate with Enos Expression in Endothelial Cells Under Orbital Flow**
Jaideep Sahni[1], Glenn Richardson[1], Ryan Pedrigi[1]
[1]University of Nebraska-Lincoln

11:52AM **Wall Shear Stress Topological Skeleton Variability Predicts Myocardial Infarction**
Maurizio Lodi Rizzini[1], Alessandro Candreva[2], Claudio Chiastra[1], Takuya Mizukami[2], Diego Gallo[1], Jean-Paul Aben[3], Olivier Muller[4], Bernard De Bruyne[2], Carlos Collet[2], Umberto Morbiducci[1]
[1]Politecnico di Torino, [2]OLV-Clinic, [3]Pie Medical Imaging BV, [4]Lausanne University Hospital

12:05PM **Designing a High-Throughput Water Channel to Assess Bone Tissue Development *In Vivo* Under Different Mechanical Environments**
Gina Georgadarellis[1], Craig Albertson[1], Juan Jiménez[1]
[1]University of Massachusetts Amherst

Tuesday, June 15	11:00AM – 12:30PM EDT

Brain and Injury Mechanics I: Kinematics

Saddle Ridge

Session Chair: Amanda Esquivel, University of Michigan-Dearborn
Session Chair: Songbai Ji, Worcester Polytechnic Institute

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11:00AM **The Effect of Head Impact Exposure in NCAA Division I Football on Concussion Symptom Severity**
Jack Seifert[1,2], Alok Shah[2], Jared Muench[2], Jaroslaw Harezlak[3], Steve Rowson[4], Jason P. Mihalik[5], Stefan Duma[4], Paul Pasquina[6], Steve P. Broglio[7], Thomas M. McAllister[3], Michael McCrea[2], Brian D. Stemper[1,2]
[1]Marquettte University, [2]Medical College of Wisconsin, [3]Indiana University, [4]Virginia Tech, [5]University of North Carolina, [6]University of Health Sciences, [7]University of Michigan

11:13AM **Investigating the Effect of Sports Helmets on the Frequency Response of the Human Brain**
Fargol Rezayaraghi (R. Araghi) [1], Javid Abderezaei[1], Efe Ozkaya[1], Colleen E. Shea[1], Mehmet Kurt[1]
[1]Stevens Institute of Technology

11:26AM **Statistical Interpretation of Predictive Factors of Kinematics in Traumatic Brain Injury from Head Impacts**
Ylheng Li [1], Xianghao Zhan[1], Yuzhe Liu[1], David Camarillo[1]
[1]Stanford University

11:39AM **Biomechanics of Headers in Youth and Collegiate Female Soccer**
Tanner Filben[1], Nicholas Pritchard[1], Logan Miller[1], Christopher Miles[1], Jillian Urban[1], Joel Stitzel[1]
[1]Wake Forest School of Medicine

11:52AM **A Strategy for Validating the Kinematics of a Vehicle-Specific MADYMO Model of A Low-Speed Rear-End Collison**
Dominic Demma[1], Keith Button[1], Elizabeth Kappler[1], Stephanie Rossman[1], Steven Rundell[1]
[1]Explico Engineering Company

12:05PM **Effects of Aggressiveness, Confidence, and Perceived Coach Support on Head Impact Exposure Metrics in Youth Football**
Madison Marks[1], William Flood[2], Joel Stitzel[1,2], Jillian Urban[1,2]
[1]Virginia Tech, [2]Wake Forest School of Medicine

Tuesday, June 15	**11:00AM – 12:30PM EDT**

Device, Design and Rehabilitation I

Alpine Drift

Session Chair: Michael Moreno, Texas A&M University
Session Chair: Anita Singh, Widener University

11:00AM **Biomechanical Effects of Cycling Crank Length on Resultant Hip and Knee Joint Forces and Range of Motion**
Avery Newman[1], Abigail Fisk[1], Christiane O'Hara[1], Reymil Fernandez[1], Robert Clark[1]
[1]California Polytechnic State University

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11:13AM **Measuring Prosthetic Foot Use by Activity Level with Step Activity Monitoring**
John Chomack[1], Alexis Sidiropoulos[1], Michael Poppo[1], Jason Maikos[1]
[1]Veteran Affairs New York Harbor Healthcare System

11:26AM **Three Different Office Postures: Determining Pelvic Tilt, Torso Openness, Ground Reaction Forces and Blood Perfusion**
Archana Lamsal[1], Garrett Weidig[1], Teresa Bellingar[2], Tamara Reid Bush[1]
[1]Michigan State University, [2]Haworth Inc.

11:39AM **Wearable Sensor Validation for Tasks Requiring High Acceleration**
Sarah Moudy[1], Yein Lee[1], Shelby Alfred[1], Rita Patterson[1]
[1]University of North Texas Health Science Center

11:52AM **Evidence of Sex Bias in Finite Element Modeling of Hip Arthroplasty**
Syeda Lamia[1], Chien-Yu Lin[2], Richard Hughes[1], Elizabeth Dailey[1], Megan Killian[1]
[1]University of Michigan, [2]University of Texas

12:05PM **Development and Validation of an Ultra-High Field Compatible MR Elastography Actuator**
Emily Triolo[1], Aymeric Pionteck[1], Akbar Alipour[2], Oleksandr Khegai[2], Paul Kennedy[2], Priti Balchandani[2], Mehmet Kurt[1]
[1]Stevens Institute of Technology, [2]Icahn School of Medicine at Mount Sinai

Tuesday, June 15	**11:00AM – 12:30PM EDT**

PhD Student Paper Competition 2: Bladder, Lung, and Ocular Biomechanics

Mogul Madness

Session Chair: Rebecca Heise, Virginia Commonwealth University
Session Chair: Joseph Sherwood, Imperial College of London

11:00AM **Lung Mechanics of Positive- and Negative- Pressure Ventilation Under Varied Inflation Volumes**
Samaneh Sattari[1], Crystal Mariano[1], Mona Eskandari[1]
[1]University of California, Riverside

11:15AM **Deformation of Peripapillary Sclera and Retina in Response to Elevated Intraocular Pressure**
Sunny Kwok[1], Manqi Pan[1], Yanhui Ma[1], Xueliang Pan[1], Jun Liu[1]
[1]The Ohio State University

11:30AM **Assessing the Comparative Strains Between Positive and Negative Pressure Ventilation Using Digital Image Correlation**
Crystal Mariano[1], Samaneh Sattar[1], Mona Eskandari[1]
[1]University of California, Riverside

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11:45AM **Integrating Capillary Flow Modeling and Geometric Quantification Into Reconstructed 3D Capillary Networks of the Optic Nerve Head**
Po-Yi Lee[1], Jason Walker[1], Yi Hua[1], Bryn Brazile[1], Ian A. Sigal[1]
[1]University of Pittsburgh

12:00PM **Investigating the Effect of Varied Breathing Rates and Volumes on the Mechanics of Murine Lungs**
Talyah Nelson[1], Kathrine Anduaga[1], Samaneh Sattari[1], Crystal Mariano[1], Arzu Ulu[1], Tara Nordgen[1], Mona Eskandari[1]
[1]University of California, Riverside

12:15PM **Inflammasome Nlrc4 Gene Knockout Increases Stiffness of Bladder Wall in Rat Model**
Eli Broemer[1], Christina Chan[1], Sara Roccabianca[1]
[1]Michigan State University

Tuesday, June 15	**1:00PM – 2:30PM EDT**

Cartilage Mechanics: Measurement and Injury Biomechanics

Saddle Ridge

Session Chair: Deva Chan, Purdue University
Session Chair: Chris Price, University of Delaware

1:00PM **Vibrometry as a Nondestructive Alternative to Dynamic Mechanical Testing in Cartilage**
Gabriela Espinosa[1], Gaston Otarola-Pezzani[1], Jerry Hu[1], Kyriacos Athanasiou[1]
[1]University of California, Irvine

1:13PM **Crosslinking of Cartilage Collagen Via Nonlinear Femtosecond Laser Activation of Riboflavin**
Jiashuai Fan[1], C.V. Sise[1], Kimberly R. Kroupa[1], Clark T. Hung[1], Gerard A. Ateshian[1], Sinisa Vukelic[1]
[1]Columbia University

1:26PM **Manipulating the Initiation and Propagation of Microcracks in Collagen Networks of Cartilage**
Stephany Santos[1], Corey P. Neu[2], Bryanna Samolyk[1], David M. Pierce[1]
[1]University of Connecticut, [2]University of Colorado Boulder

1:39PM **Crosslinking of Collagen Across Cartilage Tears for Improved Interface Strength**
Kimberly Kroupa[1], C.V. Sise[1], Clark Hung[1], Sinisa Vukelic[1], Gerard Ateshian[1]
[1]Columbia University

1:52PM **Transition from Stress-Governed Fracture to Pressure-Induced Fragmentation in Cartilage Failure**
Dipul Chawla[1], Guebum Han[2], Melih Eriten[1], Corinne Henak[1]
[1]University of Wisconsin-Madison, [2]University of Minnesota

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2:05PM **Articular Cartilage Geometry and Material Properties Predict Functional Tribomechanics Across Species**
Meghan E. Kupratis[1], Ahmed E. Gure[2], Jamie M. Benson[1], Kyla F. Ortved[3], David L. Burris[1]
[1]University of Delaware, [2]University of Texas Arlington, [3]University of Pennsylvania New Bolton Center

Tuesday, June 15	**1:00PM – 2:30PM EDT**

Device, Design and Rehabilitation II

Alpine Drift

Session Chair: Michael Moreno, Texas A&M University
Session Chair: Anita Singh, Widener University

1:00PM **Motor Evoked Potential Recruitment Curves Indicate Neuroplasticity of the Biceps Brachii in Cervical Spinal Cord Injury**
Thibault Roumengous[1], Yasmina Zeineddine[1], Carrie Peterson[1]
[1]Virginia Commonwealth University

1:13PM **Balloon Forming Machine for Customizing Treatment of Coronary Artery Disease**
Kaitlyn Elmer[1], Maxwell Bean[1], Barry Uretsky[1], Morten Jensen[1]
[1]University of Arkansas

1:26PM **An Evaluation of Interface Pressure and Shear Force Patterns in Injury Prone Regions While Seated in an Articulating Chair**
Justin Scott[1], Tamara Reid Bush[1]
[1]Michigan State University

1:39PM **Identifying Key Parameters for Multiobjective Shape Optimization of a Double-Walled Aortic Stent-Graft**
Shannen B. Kizilski[1], Rumi Faizer[1], Victor H. Barocas[1]
[1]University of Minnesota

1:52PM **Change in Knee Joint Mechanics After ACL Transection During Simulated Gait: a Human Cadaveric Model**
Amanda Wach[1], Joseph Ruzbarsky[1], Ashley Pekmezian[1], Tony Chen[1], Russell Warren[1], Peter Torzilli[1], Suzanne Maher[1]
[1]Hospital for Special Surgery

2:05PM **Flow Visualization and Aerosols in Performance**
Abhishek Kumar[1], Tehya Stockman[1], Jean Hertzberg[1], Shelly Miller[1], Donald Milton[2], Jelena Srebric[2], Shengwei Zhu[2], Lingzhe Wang[2], Marina Vance[1], Darin Toohey[1], Sameer Patel[1]
[1]University of Colorado Boulder, [2]University of Maryland

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Tuesday, June 15	1:00PM – 2:30PM EDT

Patient Specific Flow and Physiology I

Mud Springs

Session Chair: Zahra K. Motamed, McMaster University
Session Chair: Alejandro Roldan-Alzate, University of Wisconsin-Madison

1:00PM **Assessment of Sex Differences in Ventricular Vascular Coupling of Left Ventricular and Aortic Flow Derived from 4D Flow MRI in Healthy, Young Adults**
Cody Johnson[1], Ryan Pewowaruk[1], David Rutkowski[1], Amanda Wolfinger[1], Alejandro Roldan-Alzate[1]
[1]University of Wisconsin-Madison

1:13PM **Comparing Tissue-Engineered Vascular Grafts in Fontan Patients to the Standard of Care Using Computational Fluid Dynamics**
Erica Schwarz[1], John Kelly[2], Stephanie Lindsey[1], Kan Hor[2], Aekaansh Verma[1], Ethan Kung[3], Jay Humphrey[4], Christopher Breuer[2], Alison Marsden[1]
[1]Stanford University, [2]Nationwide Children's Hospital, [3]Clemson University, [4]Yale University

1:26PM **Computational Assessment of Renal Hemodynamic Disturbances in a Canine Model of an Abdominal Aortic Coarctation**
Christopher Tossas-Betancourt[1], Yunus Ahmed[1], Petrus van Bakel[1], Drew Braet[1], William Sherk[1], Luis Hernandez-Garcia[1], David Williams[1], Daniel Myers[1], Thomas Wakefield[1], Dawn Coleman[1], Jonathan Eliason[1], James Stanley[1], C. Alberto Figueroa[1]
[1]University of Michigan

1:39PM **Effect of Surgery on Coronary Flow Hemodynamics in Children with Anomalous Aortic Origin of a Coronary Artery (AAOCA): A Patient-Specific Computational Study**
Atefeh Razavi[1], Jayanthi Parthasarathy[2], Yasaman Farsiani[2], Silvana Molossi[3], Carlos Mery[4], Rajesh Krishnamurthy[2], Lakshmi Prasad Dasi[1]
[1]Georgia Institute of Technology, [2]Nationwide Children's Hospital, [3]Baylor College of Medicine, [4]University of Texas at Austin

1:52PM **Virtual Treatment Planning in Williams and Alagille Patients with Peripheral Pulmonary Artery Stenosis**
Ingrid Lan[1], Weiguang Yang[1], Jeffrey Feinstein[1], Thomas Collins[1], Alison Marsden[1]
[1]Stanford University

2:05PM **Tracheomalacia Affects Neonatal Respiratory Airflow in the Upper Airway**
Chamindu Gunatilaka[1], Erik Hysinger[1], Andreas Schuh[2], Deep Gandhi[1], Nara Higano[1], Qiwei Xiao[1], Daniel Ignatiuk[1], Andrew Hahn[3], Sean Fain[3], Robert Fleck[1], Jason Woods[1], Alister Bates[1]
[1]Cincinnati Children's Hospital Medical Center, [2]Imperial College London, University of Wisconsin-Madison

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Tuesday, June 15	1:00PM – 2:30PM EDT

PhD Student Paper Competition 3: Bone and Head Injury Biomechanics

Mogul Madness

Session Chair: Mariana Kersh, University of Illinois at Urbana-Champaign
Session Chair: Richard Debski, University of Pittsburgh

1:00PM **Comparison of Head Impact Exposure Across Common Training Activities in Youth Soccer**
Nicholas Pritchard[1], Tanner Filben[1], Sebastian Haja[1], Logan Miller[1], Mark Espeland[1], Joel Stitzel[1], Jillian Urban[1]
[1]Wake Forest School of Medicine

1:15PM **Investigation of the Hindbrain Motion in Chiari Malformation I Patients Through 3D Amplified MRI**
Javid Abderezaei[1], Aymeric Pionteck[1], Ya-Chen Chuang[1], Itamar Terem[2], Leo Dang[3], Miriam Scadeng[3], Peter Morgenstern[4], Raj Shrivastava[4], Samantha Holdsworth[3], Yang Yang, Mehmet Kurt[1]
[1]Stevens Institute of Technology, [2]Stanford University, [3]University of Auckland, [4] Icahn School of Medicine at Mount Sinai

1:30PM **The Structure-Function Relationships of the Human Vertebral Endplate**
Yuanqiao Wu[1], Elise Morgan[1]
[1]Boston University

1:45PM **Maternal Bone Adaptation to Mechanical Loading During Pregnancy, Lactation, and Post-Weaning Recovery**
Yhan Li[1], Chantal de Bakker[1], Hongbo Zhao[1], Ashutosh Parajuli[2], Wei-Ju Tseng[1], Shaopeng Pei[1,2], Tan Meng[1], Rebecca Chung[1], Liyun Wang[2], X. Sherry Liu[1]
[1]University of Pennsylvania, [2]University of Delaware

2:00PM **Solution Composition Affects Dissolution-Recrystallization Mechanisms of Biomimetic Apatite**
Stephanie Wong[1], Mikayla Moynahan[1], Alix Deymier[1]
[1]University of Connecticut

2:15PM **The Skeletal Response to Varied Models of Metabolic Acidosis**
Mikayla Moody[1], Anna Peterson[1], Brian Wingender[1], Katya Morozov[1], Iris Nakashima[1], Tannin Schmidt[1], Alix Deymier[1]
[1]University of Connecticut Health Center

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Poster Session

Poster Session I	Tuesday, June 15, 2:30PM – 4:00PM EDT

Posters: Cardiovascular Biomechanics

Aspen Glade

Session Chair: Thao (Vicky) Nguyen, Johns Hopkins University
Session Chair: Kristin Myers, Columbia University

Theoretical Assessment of Focused Septal Hypertrophic Growth in Hypertrophic Cardiomyopathy
Sandra Hager[1], Will Zhang[2], Renee Miller[1], Jack Lee[1], David Nordsletten[1,2]
[1]King's College London, [2]University of Michigan

Right Ventricular Strain Estimation in Rodents from High-Frequency Ultrasound
Conner Earl[1], Frederick W. Damen[1], Melissa Yin[2], Kristiina Aasa[2], Sarah Burris[2], Craig J. Goergen[1]
[1]Purdue University, [2]FUJIFILM VisualSonics

Aortic Valve Dynamics Coupled with Growth and Remodeling Due to Aging and Calcification
Mohammadreza Soltany Sadrabadi[1], Mona Eskandari[2], Amirhossein Arzani1
[1]Northern Arizona University, [2]University of California, Riverside

A Multiscale Computational Model for Cell-Signaling Driven Growth and Remodeling of Arteries
Linda Irons[1], Marcos Latorre[1], Jay Humphrey[1]
[1]Yale University

Effect of Arterial Wall Inclusions on Failure Mechanics of Intracranial Aneurysm Tissue
Ronald Fortunato[1], Anne Robertson[1], Chao Sang[1], Spandan Maiti[1]
[1]University of Pittsburgh

Biomechanics of Human Fetal Hearts with Critical Aortic Stenosis and Evolving Hypoplastic Left Heart Syndrome
Chi Wei Ong[1], Meifeng Ren[2], Hadi Wiputra[2], Joy Mojumder[3], Wei Xuan Chan[2], Andreas Tulzer[4], Gerald Tulzer[4], Martin Buist[2], Citra Nurfarah Zaini Mattar[2], Lik Chuan Lee[3], Choon Hwai Yap[5]
[1]Agency for Science Technology and Research, [2]National University of Singapore, [3]Michigan State University, [4]Kepler University Hospital, [5]Imperial College London

Effects of Cardiac Geometric Remodeling During Heart Failure on Cardiac Function
Yu Zheng[1], Wei Xuan Chan[1], Choon Hwai Yap[2]
[1]National University of Singapore, [2]Imperial College London

Determination of an Appropriate Strain Energy Density Function for the Tricuspid Heart Valve Leaflets Using Constant Invariant-Based Mechanical Testing
Devin Laurence[1], Chung-Hao Lee[1]
[1]The University of Oklahoma

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Design and Fabrication of a Novel Polymeric Transcatheter Aortic Valve
Hieu Bui[1], Susan James[2], Lakshmi Prasad Dasi[1]
[1]Georgia Institute of Technology, [2]Colorado State University

Embryonic Aortic Arch Material Properties by Optical Coherence Tomography Guided Micro-Pipette Aspiration
S.Samaneh Lashkarinia[1], Gursan Coban[2], Erhan Ermek[1], Merve Celik[1], Hummaira Siddiqui[1], Yap Choon Hwai[3], Kerem Pekkan[1]
[1]Koc University, [2]Istinye University, [3]Imperial College London

Measuring the Anisotropic Mechanical Properties of Single Neonatal Mouse Cardiac Myocytes
Taylor Rothermel[1], Patrick Alford[1]
[1]University of Minnesota - Twin Cities

Transcatheter Heart Valve Leaflet Design Affects Local Leaflet Strain: An *In-Vitro* Study
Beatrice Ncho[1], Katelynne Berland[1], Vahid Sadri[1], Jillian Ortner[1], Ajit Yoganathan[1]
[1]Georgia Institute of Technology

Stress Analysis of Intracranial Aneurysm Based on *In Vivo* 3D Model and Intraoperative Image: A Case Study
Yuanming Luo[1], Xiaodong Zhai[2], Peng Hu[2], Hongqi Zhang[2], Yadong Wang[2], Lan Cao[3], Jia Lu[1]
[1]University of Iowa, [2]Xuanwu Hospital Capital Medical, [3]Boea Wisdom (Hangzhou) Network Technology Co., Ltd.

Model-Directed Design of Kink-Resistant Vascular Grafts with High Compliance
David Jiang[1], Andrew Robinson[1], Elizabeth Cosgriff-Hernandez[1], Lucas Timmins[1]
[1]University of Utah

Myofibril Disarray Decreases Peak Stress & Efficiency in a Finite Element Model of Muscle Fiber
Charles Mann[1], Hossein Sharifi[1], Alexus Rockward[1], Joy Mojumder[2], Lik Chuan Lee[2], Kenneth Campbell[1], Jonathan Wenk[1]
[1]University of Kentucky, [2]Michigan State University

The Effect of Hematocrit on the Viscoelastic Behavior of Embolus Analogs
Bryan Good[1]
[1]University of Tennessee

Optimizing Transcatheter Heart Valve Use in Mitral Annular Calcification
Breandan Yeats[1], Huang Chen[1], Pradeep Yadav[2], Venkateshwar Polsani[2], Vinod Thourani[2], Lakshmi Dasi[1]
[1]Georgia Institute of Technology, [2]Piedmont Hospital

High-Speed Simulation of the 3D Behavior of Myocardium Using a Neural Network PDE Approach
Wenbo Zhang[1], David Li[1], Tan Bui-Thanh[1], Michael Sacks[1]
[1]The University of Texas at Austin

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The Effect of Endothelial Dysfunction on Aortic Mechanics and Extracellular Matrix Microstructure During Age-Related Vascular Remodeling
Liya Du[1], Jeffrey Rodgers[1], Tarek Shazly[1], John Eberth[1], Susan Lessner[1]
[1]University of South Carolina

Nanoparticle-Mediated Controlled Myocardial Delivery for Hypertrophic Cardiomyopathy
Jun Liao[1]
[1]University of Texas at Arlington

Development of a Fully Degradable Heart Valve for Implantation *In Utero*
Hieu T. Bui[1], Sanchita S. Bhat[1], Christopher K. Breuer[2], Aimee Armstrong[2], Martin Bocks[3], Ajit P. Yoganathan[1], Lakshmi Prasad Dasi[1]
[1]Georgia Institute of Technology, [2]Nationwide Children's Hospital, [3]Case Western Reserve University School of Medicine

A Comparative Biomechanical Study of Porcine Epicardial Layer and Endocardial Layer
Jun Liao[1]
[1]University of Texas at Arlington

Biomechanical Characterizations of Acellular Neonatal Porcine Ventricles
Jun Liao[1]
[1]University of Texas at Arlington

Optimization of Perivascular Region Geometry and Material Properties for Application in Patient-Specific Model of a Coronary Artery
Caleb Berggren[1], David Molony[2], Habib Samady[2], Lucas Timmins[1]
[1]University of Utah, [2]Emory University School of Medicine

Fiber-Gel Coupling in Coated Elastomeric Scaffolds for Replacement Heart Valves
Shruti Motiwale[1], Madeleine Russell[1], Megan Wancura[1], Andrew Robinson[1], Elizabeth Cosgriff-Hernandez[1], Michael Sacks[1]
[1]University of Texas at Austin

***In-Vivo* Estimation of Myocardial Elasticity in HFpEF Using Four-Dimensional Ultrasound Imaging**
Maziyar Keshavarzian[1], Sunder Neelakantan[1], Lilly McAllister[1], Carl Tong[1], Reza Avazmohammadi[1]
[1]Texas A&M University

Developing a Reduced Order Modelling Methodology for Simulating Transcatheter Aortic Valve Replacement Procedures
Imran Shah[1], Milad Samaee[1], Atefeh Razavi[1], Alessandro Veneziani[2], Lakshmi Dasi[1]
[1]Georgia Institute of Technology, [2]Emory University

Patient Specific Modeling and 3-Dimensional Printing for Planning of Redo Transcatheter Aortic Valve Replacement
Sri Krishna Sivakumar[1], Huang Chen[1], Breandan Yeats[1], Sarah Tucker[1], Scott Hollister[1], Pradeep Yadav[2], Venkat Polsani[2], Vinod Thourani[2], Lakshmi Dasi[1]
[1]Georgia Institute of Technology, [2]Piedmont Atlanta Hospital

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Modelling Collagen Fiber Recruitment in Aortic Tissue Using Kinetic Average
Xuehuan He[1], Jia Lu[1]
[1]University of Iowa

Patient Specific Computational Modeling Towards Planning of Valve in Valve Transcatheter Aortic Valve Replacement
Sri Krishna Sivakumar[1], Breandan Yeats[1], Venkateshwar Polsani[2], Pradeep Yadav[2], Vinod Thourani[2], Lakshmi Dasi[1]
[1]Georgia Institute of Technology, [2]Piedmont Atlanta Hospital

A Semi-Automatic Approach for Aortic Wall Segmentation to Improve Rapid and Repeatable Assessments of Regional Wall Strain Using Dense MRI
Patrick Jones[1], John Wilson[1]
[1]Virginia Commonwealth University

Stress-Driven Fiber Remodeling in a Finite Element Model of Cardiac Tissue
Alexus Rockward[1], Charles Mann[1], Hossein Sharifi[1], Joy Mojumder[2], Lik Chuan[2], Kenneth Campbell[1], Jonathan Wenk[1]
[1]University of Kentucky, [2]Michigan State University

Categorization Based on *In-Vivo* Imaging and Histological Data Improves Prediction Capability of a Structured-Based Constitutive Model for Aneurysmal Aortic Tissue Mechanics
Tuan Thinh Tong[1], Miriam Nightingale[1], Michael Scott[2], Alex Barker[3], Taisiya Sigaeva[4], Paul Fedak[1], Elena Di Martino[1]
[1]University of Calgary, [2]Northwestern University, [3]University of Colorado Anschutz Medical Campus, [4]University of Waterloo

Collagen Microstructural Organization Contributes to Neovessel Guidance During Angiogenesis
Jason Manning[1], Adam Rauff[1], Jeffrey Weiss[1]
[1]University of Utah

Posters: Computational Biofluid Mechanics I

Aspen Glade

Session Chair: John LaDisa, Marquette University
Session Chair: Alejandro Roldan-Alzate, University of Wisconsin-Madison

Enhanced Hemodynamic Predictions in a Calcified Aortic Valve Geometry Using the Quemada Model
Asad Mirza[1], Amanda Barreto[1], Tisha Boodooram[1], Sharan Ramaswamy[1]
[1]Florida International University

Dynamics of Morphological Remodeling and Impact of Hemodynamics on Restenosis in Human Stented Superficial Femoral Arteries
Monika Colombo[1], Yong He[2], Anna Corti[1], Diego Gallo[3], Federica Ninno[4], Stefano Casarin[5], Jared M Rozowsky[2], Francesco Migliavacca[1], Scott Berceli[2,5,6], Claudio Chiastra[1,2]
[1]Politecnico di Milano, [2]Politecnico di Torino, [3]University of Florida, [4]University College of London, [5]Houston Methodist Hospital, [6]Malcolm Randall VAMC

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Investigating Structural Covariance Networks by Using Graph Measures to Analyze Brain Connectivity for Schizophrenia
Madison Lewis[1], Nicholas Theis[1], Brendan Muldoon[1], Konasale Prasad[1]
[1]University of Pittsburgh

A General Protocol for Simulating Resting Cardiovascular Physiology Using a Closed-Loop Lumped Parameter Model
Akash Gupta[1], Aseem Pradhan[1], Surya Prakash Sharma[1], Tyler Schmidt[1], Ethan Kung[1]
[1]Clemson University

Developing a New Surrogate Model for Computational Fluid Dynamic Simulation of Aorta Using Statistical Shape Modeling and Deep Neural Networks
Pan Du[1], Xiaozhi Zhu[1], Jianxun Wang[1]
[1]University of Notre Dame

Numerical Investigation of Hemodynamics at Initiation of Pulmonary Arterial Hypertension Associated with Congenital Heart Disease
Melody Dong[1], Ingrid Lan[1], Weiguang Yang[1], Marlene Rabinovitch[1], Jeffrey Feinstein[1], Alison Marsden[1]
[1]Stanford University

Development of a Computational Platform to Evaluate a Positive End-Expiratory Pressure in Patients with Tracheostomy
Shiori Kageyama[1], Naoki Takeishi[1], Hiroki Taenaka[1], Takeshi Yoshida[1], Shigeo Wada[1]
[1]Osaka University

Development on a Computational Framework to Express Patient-Specific Intracranial Cerebrospinal Fluid Flow Based on Phase-Contrast Magnetic Resonance Images
Syusaku Maeda[1], Tomohiro Otani[1], Shigeki Yamada[2], Yoshiyuki Watanabe[2], Selin Ilik[1], Naoki Takaishi[1], Shigeo Wada[1]
[1]Osaka University, [2]Shiga University of Medical Science

Modelling Mechanical Feedback Mechanisms in Multiscale Sliding Filament Model of Lymphatic Muscle Pumping
Peter Xie[1], Christopher Morris[1], James Moore[1]
[1]Imperial College London

Junction Modeling in Patient-Specific Blood Flow Simulations
Elena Martinez[1], Martin Pfaller[2], Jonathan Pham[2], Alison Marsden[2]
[1]Loyola Marymount University, [2]Stanford University

Posters: Design Dynamics and Rehabilitation and Education

Aspen Glade

Session Chair: Michael Moreno, Texas A&M University
Session Chair: Anita Singh, Widener University

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Using Dragonfly Imaging Software for Transmission Electron Microscopy Analysis
Connor Leek[1], Megan Killian[1]
[1]University of Delaware, [2]University of Michigan

Carbon Nanotube Infiltration Effects in Thermal Properties of Shape Memory Polymer Foams – Design of a Triggering Mechanism for Endovascular Devices
Sergio Andres Pineda-Castillo[1], Bradley N. Bohnstedt[2], Yingtao Liu[1], Chung-Hao Lee[1]
[1]University of Oklahoma, [2]Indiana University School of Medicine

Design of a MRI-Compatible Pipette Simulator to Study How Pipette Design Affects Joint Forces and Contact Pressures
Nolan Norton[1], Kenneth Fischer[1]
[1]University of Kansas

Comparative Ankle-Foot Rollover Shape Analysis of Powered and Unpowered Prosthetic Feet in Individuals with Transfemoral Amputation
Michael Poppo[1], Andrew Hansen[1,2], John Chomack[1], Jason Maikos[1]
[1]Veterans Affairs New York Harbor Healthcare System, [2]University of Minnesota

Thumb and Index Finger Motions Coupled with Pilot Work on an Octopus Toward the Development of Smart Prosthetics
Garrett Weidig[1], Chris Sadler[1], Tamara Reid Bush[1]
[1]Michigan State University

A Preliminary Framework for Computational Flow Diverter Design Optimization at Scale
Matthew Gunther[1], Brian Chong[2], David Frakes[1]
[1]Georgia Institute of Technology, [2]Mayo Clinic

A Low-Cost, Open-Source Robot Hand-Wrist System for Tactile-ASL Based Communication for the Deaf Blind
Samantha Johnson[1], Gaogeng Gao[2], Minas Liarokapis[2], Chiara Bellini[1]
[1]Northeastern University, [2]The University of Auckland

Connexone: A Medical Application for Protection Against Opioid Overdose
Hirschel Nambiar[1]
[1]Food and Drug Administration

Non-Invasive System to Synchronize Aerosol Delivery with Inhalation in Neonates
Franklin Briones[1], Athena Chien[1], Hope Fa-Kaji[1], Samantha McClendon[1], Pujita Munnangi[1], Rithika Proddutoor[1], Sabia Abidi[1]
[1]Rice University

Wireless Intracranial Pressure Sensing and Mobile Application Transmission for Ventriculoperitoneal Shunts
Madison Belyea[1], Erik Jaklitsch[1], Levon Rodriguez[1], Alexandra Silverman[1], Halyn Valley[1], Michael Jaeggli[1], Yasmeen Elsawaf[2]
[1]Northeastern University, [2]University of Central Florida

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Ultrasonics - Tracking Full-Thickness Skin Deformations for a Biophysics-Based Evaluation of Skin Health
Kyra Bednarski[1], James Brown[1], Edward LaGrassa[1], Mary McNeil[1], Kyle Shepitka[1], Ahsanul Torza[1], Johannes Weickenmeier[1]
[1]Stevens Institute of Technology

LEAR ISP: Automotive Seat Comfort Analysis System
Brittany Wieland[1], Bethany Balint[1], Juan Jaramillo[1], Drake Barry[1], Eric G. Meyer[1], Wu Pan Zagorski[2]
[1]Lawrence Technological University, [2]Lear Corporation

Phantom Limb Pain Strap
Camara L. Casson[1], Angel E. Collins[1], Dina Dragoljic[1], Alexis R. Hopkins[1], Marissa A. Jordan, Camara Casson[1], Ted Conway[1]
[1]Florida Institute of Technology

Posters: Morphology, Development and Emerging Topics in Tissue and Cellular Engineering

Aspen Glade

Session Chair: Chung-Hao Lee, University of Oklahoma

Extracellular Matrix Regulation of Breast Cancer Cell Invasion in a 3D Tumor Model
Jacob Heiss[1], Hossein Tavana[1]
[1]The University of Akron

Acoustic Radiation Force on Eukaryotic Cell Due to Standing Surface Acoustic Wave
Xiangjun Peng[1], Guy Genin[1]
[1]Washington University

Continuum-Based Interpretations of Mechano-Adaptation in Epithelial Micro-Tissues
Bernard Cook[1], Patrick Alford[1]
[1]University of Minnesota

Fgf-10-Mediated Buckling Morphogenesis of the Embryonic Airway Epithelium
Kara Peak[1], Victor Varner[1]
[1]The University of Texas at Dallas

Identification of Adipocyte Secreted Factors Responsible for Myofibroblast Conversion
Mariam El-Hattab[1], Francoise Gourronc[1], Jesse Liszewski[1], Brandon Davies[1], Aloysius Klingelhutz[1], James A. Ankrum[1], Edward A. Sander[1]
[1]University of Iowa

CFD Analysis of Fluid Flow Shear Stress on the Osteocyte Lacuno-Canalicular Network
Mohammadmehdi Niroobakhsh[1], Loretta Laughrey[1], Mark Johnson[1], Sarah Dallas[1], Ganesh Thiagarajan[1]
[1]University of Missouri-Kansas City

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Contractile Perpendicular Lateral Protrusions Facilitate Myofibroblastic Expansion

Abinash Padhi[1], Edna Cukierman[2], Klaus Hahn[3], Rakesh Kapania[1], Amrinder Nain[1]
[1]Virginia Tech, [2]Fox Chase Cancer Center, [3]University of North Carolina Chapel Hill

Mechano-Transcriptomic Analysis of Migratory Phenotypes of Glioblastoma Patient Cells

Jay Hou[1], Mariah McMahon[1], David Odde[1]
[1]University of Minnesota

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Wednesday, June 16	11:00AM – 12:30PM EDT

Brain and Injury Mechanics II: Soft Tissue Mechanics

Saddle Ridge

Session Chair: Jillian Urban, Wake Forest School of Medicine
Session Chair: Haojie Mao, Western University

11:00AM **Studying the Variation of Biomechanics During Myelination Using an *In Vitro* Neuron-Oligodendrocyte Co-Culture Model**
Ya-Chen Chuang[1], Mehmet Kurt[1], Carmen V. Melendez-Vasquez[2], Ace Alcantara[2]
[1]Stevens Institute of Technology, [2]Hunter College

11:13AM **Effects of Pia-Arachnoid Complex Constitutive Formulations on Predictions of Concussion**
Nikolaus Benko[1], Brittany Coats[1]
[1]University of Utah

11:26AM **Head Impact Simplification Using Effective Kinematic Triplets to Preserve Brain Strain**
Kianoosh Ghazi[1], Shaoju Wu[1], Wei Zhao[1], Songbai Ji[1]
[1]Worcester Polytechnic Institute

11:39AM **Time Course of the Cumulative Strain Damage Measure for Frontal and Lateral Impacts**
Tyler F Rooks[1], John Humm[1], Jamie Baisden[1], Narayan Yoganandan[1]
[1]Medical College of Wisconsin

11:52AM **Development and Multi-Level Validation of a Human Aorta Model for Traumatic Injury**
Wei Zeng[1], Adrian Caudillo[1], Sayak Mukherjee[1], Matthew Panzer[1]
[1]University of Virginia

12:05PM ***In Vivo* Injury Thresholds of Neonatal Brachial Plexus Nerves When Subjected to Stretch**
Virginia Orozco[1], Rachel Magee[1], Mitali Sahni[1], Sriram Balasubramanian[1], Anita Singh[2]
[1]Drexel University, [2]Widener University

Wednesday, June 16	11:00AM – 12:30PM EDT

Development and Morphogenesis

Alpine Drift

Session Chair: Yubing Sun, University of Massachusetts, Amherst
Session Chair: Victor Varner, University of Texas, Dallas

11:00AM **Modulating Epithelial Fluid Secretion and Transmural Fluid Pressure to Regulate Proliferation and Branching Morphogenesis in the Embryonic Lung**
Shelby Mohr-Allen[1], Victor Varner[1]
[1]University of Texas at Dallas

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11:13AM **Heterogenous Expression of Long Non-Coding RNA Regulates Vascular Smooth Muscle Cell Adhesion Strength and Phenotype**
Jaimie Mayner[1], Aditya Kumar[1], Pranjali Beri[1], Valentina Lo Sardo[2], Ali Torkamani[1], Kristen Baldwin[2], Adam Engler[1]
[1]University of California San Diego, [2]Scripps Research Institute

11:26AM **Cell-Cell Adhesion Modulates Tissue Fluidity During Epithelial Morphogenesis**
Xun Wang[1], Christian Cupo[1], Karen Kasza[1]
[1]Columbia University

11:39AM **Myosin Network Architecture During Convergent Extension Tissue Morphogenesis**
Christian Cupo[1], Cole Allan[1], Annie Lin[1], Marisol Herrera-Perez[1], Karen Kasza[1]
[1]Columbia University

11:52AM **Quantification of Neuron Morphological Development Using the Change Point Test**
Ashlee Liao[1], Victoria Webster-Wood[1], Yongjie Zhang[1]
[1]Carnegie Mellon University

12:05PM **Assessing Umbilical Vessel Structural Effects on Contraction-Induced Buckling Using Computational Modeling**
Jason Szafron[1], Sae-Il Murtada[1], Sumeda Nandadasa[2], Suneel Apte[2], Jay Humphrey[1]
[1]Yale University, [2]Cleveland Clinic Lerner Research Institute

Wednesday, June 16	**11:00AM – 12:30PM EDT**

Patient Specific Flow and Physiology II

Mud Springs

Session Chair: Amir Arzani, Northern Arizona University
Session Chair: Hoda Hatoum, Michigan Technological University

11:00AM **Exploring the Link Between Wall Shear Stress Topological Skeleton and Near-Wall Mass Transport in Cardiovascular Flows Using a Eulerian-Based Method**
Giuseppe De Nisco[1], Valentina Mazzi[1], Karol Calò[1], Maurizio Lodi Rizzini[1], Claudio Chiastra[1], Jolanda J. Wentzel[2], David A. Steinman[3], Diego Gallo[1], Umberto Morbiducci[1]
[1]Politecnico di Torino, [2]Erasmus MC, [3]University of Toronto

11:13AM **Simulation of Cryoballoon Ablation for Pulmonary Vein Isolation**
Tejas Patel[1], Tong Gao[1], Lik Chuan Lee[1]
[1]Michigan State University

11:26AM **Examination of Prospective and Retrospective Gated 4D Flow MRI Acquisitions to Evaluation Fluid Velocities in the Carotid Bifurcation**
Elliott Hurd[1], Jason Mendes[1], Edward DiBella[1], John Oshinski[2], Lucas Timmins[1]
[1]University of Utah, [2]Emory University School of Medicine

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11:39AM **Computational Modeling of Borderline Left Ventricular Circulation for Clinical Decision-Making**
Yurui Chen[1], Isao Anzai[1], David Kalfa[1], Vijay Vedula[1]
[1]Columbia University

11:52AM **Tracking of the Left Atrial Appendage Motion in Time Resolved CT**
Sophia Bäck[1], Lilian Henrikson[1], Carl-Johan Carlhäll[1], Anders Persson[1], Matts Karlsson[1], Tino Ebbers[1]
[1]Linköping University

12:05PM **Focal Enhancement in Intracranial Aneurysms – Effects of Local Hemodynamics On VW-MRI Signals**
Franziska Gaidzik[1], Mariya Pravdivtseva[2], Jana Korte[1], Naomi Larsen[2], Sylvia Saalfeld[1], Gábor Janiga[1], Philipp Berg[1]
[1]University of Magdeburg, Germany, [2]University Hospital Schleswig-Holstein Kiel, Germany

Wednesday, June 16	**11:00AM – 12:30PM EDT**

PhD Student Paper Competition 4: Soft Tissue Biomechanics

Mogul Madness

Session Chair: Liyun Wang, University of Delaware
Session Chair: Joel Boerckel, University of Pennsylvania

11:00AM **A High-Fidelity 3D Micromechanical Model of Ventricular Myocardium**
David Li[1], Emilio Mendiola[1], Reza Avaz[2], Frank Sachse[3], Michael Sacks[1]
[1]The University of Texas at Austin, [2]Texas A&M University, [3]The University of Utah

11:15AM **Novel Multiscale Structure-Based Model of the Bovine Caudal Disc Motion Segment**
Minhao Zhou[1], Grace O'Connell[1]
[1]University of California, Berkeley

11:30AM **Measuring *In Situ* Lumbar Facet Capsular Ligament Strains Due to Joint Pressure and Residual Stress**
Elizabeth Gacek[1], Arin Ellingson[1], Victor Barocas[1]
[1]University of Minnesota - Twin Cities

11:45AM **From Microstructure to Micromechanical Properties of Soft Tissues**
Amir Ostadi Moghaddam[1], Woowon Lee[2], Zixi Lin[3], Heidi Phillips[1], Mayandi Sivaguru[1], Barbara McFarlin[4], Kimani Toussaint[3], Amy Wagoner Johnson[1]
[1]University of Illinois at Urbana Champaign, [2]University of Colorado Boulder, [3]Brown University, [4]University of Illinois at Chicago

12:00PM **Actomyosin Contractility Regulates Multi-Scale Mechanobiology of Nucleus Pulposus Cells in Inflammation**
Timothy Jacobsen[1], Paula Hernandez[2], Nadeen Chahine[1]
[1]Columbia University, [2]University of Texas Southwestern Medical Center

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12:15PM **Mechanical Response of Mouse Cervices Lacking Decorin and Biglycan During Pregnancy**
Nicole Lee[1], Lei Shi[1], Mariano Caraballo[2], Shanmugasundaram Nallasamy[2], Charles Jayyosi[1], Mala Mahendroo[2], Kristin Myers[1]
[1]Columbia University, [2]University of Texas Southwestern Medical Center

Wednesday, June 16	**1:00PM – 2:30PM EDT**

Biotransport in Tumor Microenvironment and Immunotherapy

Mud Springs

Session Chair: Kunal Mitra, Florida Tech
Session Chair: Fateme Esmailie, Georgia Institute of Technology

1:00PM **Re-Engineering the Mechanical Tumor Microenvironment with Dexamethasone Enhances Efficacy of Cisplatin-Loaded Nanocarrier in Metastatic Breast Cancer**
Fotios Mpekris[1], John D. Martin[2], Myrofora Panagi[1], Thahomina T. Khan[2], Margaret R. Martin[2], Chrysovalantis Voutouri[1], Jumpei Norimatsu[2], Triantafyllos Stylianopoulos[1], Kazunori Kataoka[3], Horacio Cabral[2]
[1]University of Cyprus, [2]University of Tokyo, [3]Kawasaki Institute of Industrial Promotion

1:13PM **Spatiotemporal Progression and Modulation of the Blood-Brain-Tumor Barrier**
Qi Cai[1], Xiaoqing Li[1], Hejian Xiong[1], Xiaofei Gao[2], Robert Bachoo[2], Zhenpeng Qin[1]
[1]The University of Texas at Dallas, [2]University of Texas Southwestern Medical Center

1:26PM **Targeted Heating of Mitochondria Greatly Augments Nanoparticle-Mediated Cancer Chemotherapy**
Jiangsheng Xu[1], Xiaoming He[1]
[1]University of Maryland, College Park

1:39PM **A Novel Local Tumor Progression Prediction Method for Multi-Mode Thermal Ablation**
Xinyi Wang[1], Jianlong Yang[1], Aili Zhang[1], Lisa X. Xu[1]
[1]Shanghai Jiao Tong University

1:52PM **Mechanotherapeutics Combined with Cytotoxic Nanomedicine Overcomes Vessel Compression and Resistance to Immunotherapy in Triple Negative Breast Cancer**
Myrofora Panagi[1], Fotios Mpekris[1], Chrysovalantis Voutouri[1], John D. Martin[2], Kazunori Kataoka[3], Horacio Cabral[2], Triantafyllos Stylianopoulos[1]
[1]University of Cyprus, [2]The University of Tokyo, [3]Kawasaki Institute of Industrial Promotion

2:05PM **Quantitative Assessment of the Effects of Interstitial Flows, Macrophage Polarization and Immunotherapy on Tumor Immune Cell Infiltration**
Huu Tuan Nguyen[1], Nadia Gurvich[2], Christie Zhang[2], Giovanni Offeddu[1], Mark Gillrie[1], Sharon Lee[1], Seng-Lai Tan[2], Roger Kamm[1]
[1]Massachusetts Institute of Technology, [2]Elstar Therapeutics

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Wednesday, June 16	1:00PM – 2:30PM EDT

Growth and Remodeling Mechanics I: Growth and Remodeling

Mogul Madness

Session Chair: Kyoko Yoshida, University of Virginia
Session Chair: Adrian Buganza Tepole, Purdue University

1:00PM **3D Growth and Remodeling in Ascending Thoracic Aortic Aneurysms**
Joan Laubrie[1,2,3], Jamaleddin Mousavi[1,2,3], Stéphane Avril[1,2,3]
[1]Mines Saint-Etienne, [2]University of Lyon, [3]University of Jean Monnet

1:13PM **Remodeling of the Thoracic Aorta Due to Ageing in Mice**
Yasmeen Farra[1], Jacqueline Matz[1], Chiara Bellini[1]
[1]Northeastern University

1:26PM **Computational Modeling of Stress-Mediated Vascular Remodeling in Pulmonary Arterial Hypertension**
Reza Pourmodheji[1], Zhenxiang Jiang[1], Christopher Tossas-Betancourt[2], C. Alberto Figueroa[2], Seungik Baek[1], Lik Chuan Lee[1]
[1]Michigan State University, [2]University of Michigan

1:39PM **Alterations to the Maternal Bony Pelvis and Pelvic Floor Muscle Complex During Pregnancy: a Statistical Shape Analysis**
Megan Routzong[1], Liam Martin[1], Ghazaleh Rostaminia[2], Pamela Moalli[1], Steven Abramowitch[1]
[1]University of Pittsburgh, [2]University of Chicago

1:52PM **Effect of Elastase Digestion and Maternal Age on Murine Vagina Wall Biaxial Mechanics**
Shelby White[1], Laurephile Desrosiers[2], Leise Knoepp[2], Kristin Miller[1]
[1]Tulane University, [2]Ochsner Clinical School

2:05PM **A Hybrid Discrete-Continuum Multiscale Kinematic Growth Model**
Elizabeth Gacek[1], Ryan Mahutga[1], Victor Barocas[1]
[1]University of Minnesota - Twin Cities

Wednesday, June 16	1:00PM – 2:30PM EDT

Ligament and Tendon Mechanics: Modeling and Measurement

Saddle Ridge

Session Chair: Megan Killian, University of Michigan
Session Chair: Babak Safa, Georgia Institute of Technology

1:00PM **An Inverse Mechanics Approach to Determine Changes in the Mechanical Heterogeneity of the Lumbar Facet Capsular Ligament**
Jill Middendorf[1], Victor Barocas[1]
[1]University of Minnesota

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1:13PM **Tuning Shear Wave Tensiometry to Improve Subject Specificity in Achilles Tendon Loading Measurements During Walking**
Stephanie Cone[1], Dylan Schmitz[1], Darryl Thelen[1]
[1]University of Wisconsin

1:26PM **Sensitivity of the Shear Wave Speed-Stress Relationship to Ligament Fiber Alignment – A Probabilistic Finite Element Study**
Jonathon Blank[1], Darryl Thelen[1], Joshua Roth[1]
[1]University of Wisconsin-Madison

1:39PM **Fatigue Loading of Mouse Achilles Tendon Explants Does Not Induce Collagen Denaturation**
Krishna Pedaprolu[1], Spencer Szczesny[1]
[1]Pennsylvania State University

1:52PM **Signal to Noise Ratio of Polarization Imaging Parameters Is Dependent on Light Intensity and Microstructural Anisotropy of Soft Tissues**
Leanne Iannucci[1], Yingkai Chen[2], Viktor Gruev[2], Spencer Lake[1]
[1]Washington University in St. Louis, [2]University of Illinois at Urbana-Champaign

2:05PM **Label-Free Quantification of Soft Tissue Alignment by Polarized Raman Spectroscopy**
Hui Zhou[1], Janny Pineiro[1], Malisa Sarntinoranont[1], Ghatu Subhash[1], Chelsey Simmons[1]
[1]University of Florida

Wednesday, June 16	**1:00PM – 2:30PM EDT**

Tissue Engineering and Regeneration

Alpine Drift

Session Chair: Brendon Baker, University of Michigan
Session Chair: Alix Deymier, University of Connecticut Health Center

1:00PM **Sustained Il-10 Delivery Enhances Recovery from Volumetric Muscle Loss Injury Through Immunoregulatory Factors**
Tai Huynh[1], Cassandra Reed[1], Zain Blackwell[1], David Zaharoff[2], Jeffrey Wolchok[1]
[1]University of Arkansas – Fayetteville, [2]University of North Carolina - Chapel Hill

1:13PM **Mechanosensing as a Therapeutic Target in Synovial Fibrosis**
Edward Bonnevie[1], Carla Scanzello[1], Robert Mauck[1]
[1]University of Pennsylvania

1:26PM **Mechanosensitive Notch Signaling Regulates Phenotypic Changes in Vascular Smooth Muscle Cells**
Cansu Karakaya[1], Valery Visser[1], Tommaso Ristori[1], Carlijn Bouten[1], Cecilia Sahlgren[1,2], Sandra Loerakker[1]
[1]Eindhoven University of Technology, [2]Åbo Akademi University

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1:39PM **Reversible Inhibition of Myofibroblast Activity to Improve Elbow Range of Motion After Capsulectomy**
Jordan A Jensen[1], Venkat Ganesh[1], Mariam Y El-Hattab[1], Jaidev Chakka[1], Juliana C Quarterman[1], Timothy P Fowler[1], Emily Petersen[1], Douglas Fredricks[1], James A Martin[1], Aliasger K Salem[1], Edward A Sander[1]
[1]University of Iowa

1:52PM **Stiffness and Anisotropy Dependent Proangiogenic Potential of Mesenchymal Stromal Cells**
Michael Nguyen-Truong[1], Seungil Kim[2], Courtney Doherty[1], Megan Frederes[1], Samantha Kaonis[1], Soham Ghosh[1], Peiman Hematti[3], William Wagner[2], Zhijie Wang[1]
[1]Colorado State University, [2]University of Pittsburgh, [3]University of Wisconsin, Madison

2:05PM **Fibril Strain Promotes Addition of Type I Collagen Molecules to Single, Native Collagen Fibrils *In Vitro***
Seyed Mohammad Siadat[1], Jeffrey Ruberti[1]
[1]Northeastern University

Poster Sessions

Poster Session II	Wednesday, June 16, 2:30PM – 4:00PM EDT

Posters: Biotransport

Aspen Glade

Session Chair: Joanna Dahl, University of Massachusetts, Boston
Session Chair: Zhenpeng Qin, University of Texas, Dallas

Peristaltic Pumping in Sub-Wavelength Perivascular Models
Jessica Shang[1], John Brennen Carr[1], Caroline Cardinale[1], Delin Zeng[1]
[1]University of Rochester

A Continuum Mechanics Approach to Model Stiffness Sensing by Smooth Muscle Cells
Ali Akbar Karkhaneh Yousefi[1,2], Claudie Petit[1,2], Stephane Avril[1,2]
[1]Mines Saint-Etienne, [2]University of Lyon

Excess collagen deposition in diabetic kidney disease enhances cellular communication: A mathematical model
Haryana Thomas[1,2], Ashlee Ford Versypt[1,2]
[1]Oklahoma State University, [2]University at Buffalo

Pulsatile Perfusion Optimization within a Multi-Organ Preservation Device
Daniel Portillo[1], Stephen Rivas[1], Gabriela Pineda[1], Sukhwinder Kaur[1], Lauren Bayliss[2], Leon Bunegin[3], R. Lyle Hood[1]
[1]The University of Texas at San Antonio, [2]The University of Texas - Rio Grande Valley, [3]Vascular Perfusion Solutions

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Differentiating Nanoscale Confined and Collective Heating by Plasmonic Nanoparticle Arrays
Chen Xie[1], Peiyuan Kang[1], Zhenpeng Qin[1]
[1]University of Texas at Dallas

Effect of Convection on Cellular Sensing Precision for Directed Cell Migration
Hye-ran Moon[1], Soutick Saha[1], Andrew Mugler[2], Bumsoo Han[1]
[1]Purdue University, [2]University of Pittsburgh

The Role of Eye Movements in the Process of Silicone Oil Emulsification After Vitrectomy
Irene Nepita[1], Alessandro Stocchio[1], Libero Liggieri[3], Francesca Ravera[3], Eva Santini[3], Mario R. Romano[4], Rodolfo Repetto[1]
[1]University of Genoa, [2]Hong Kong Polytechnic, [3]Institute for Condensed Matter Chemistry and Technologies for Energy, CNR, Genoa, [4]Humanitias University, Milan

Study on Heating Capability of New Radiofrequency Angioplasty Balloon
Hongying Wang[1], Shiqing Zhao[1], Jincheng Zou[1], Aili Zhang[1]
[1]Shanghai Jiao Tong University, Shanghai, China

Estimation of Clinical Size of Breast Tumour Lesions Using Contrast Enhanced Magnetic Resonance Imaging: Delineation of Tumour Boundaries
Manpreet Singh[1], Manjesh Dalal[2], Gurasis Singh Sodhi[2]
[1]University of Maryland, [2]Government Medical college and Hospital, Sector 32B, Chandigarh

Biofluid Mechanics of Surfactant Delivery in Bioengineered Three-Dimensional Lung Airway Model
Hannah Combs[1], Hossein Tavana[1]
[1]The University of Akron

A High Performance, Low-Cost Approach to Ventilation to Increase Global Capacity for Covid-19
Daniel J. Watson[1], Jennifer Frattolin[1], Michael Madekurozwa[1], Willy V. Bonneuil[1], Axel C. Moore[1], James E. Moore Jr.[1], Jakob Mathiszig-Lee[1,2], Joseph van Batenburg-Sherwood[1]
[1]Imperial College London, [2]Royal Marsden Hospital

Effect of Curvature on the Thermal Interface Conductance Between Nanoscale Gold and Water
Blake Wilson[1], Jaona Randrianalisoa[2], Steven Nielsen[1], Zhenpeng Qin[1]
[1]The University of Texas at Dallas, [2]University of Reims Champagne-Ardenne

Bioinspired 3D Culture in Nanoliter Core-Shell Hydrogel Microcapsules Isolates Highly Pluripotent Human IPSCS
Jiangsheng Xu[1], James Shamul[1], Xiaoming He[1]
[1]University of Maryland, College Park

Stroma Affects the Intratumoral Transport of Bacteria-Based Drug Delivery Agents
Ying Zhan[1], Richey Davis[1], Bahareh Behkam[1],
[1]Virginia Tech

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Enhancing Transscleral Delivery of a Drug Surrogate Using Ultrasound in Porcine Eyes
Grayson Bockman[1], Jr. Jiun Liou[1], Jonathan Vande Geest[1]
[1]University of Pittsburgh

Interactive Program Development for Analysis of Hemodynamic Data in Patients with Pulmonary Hypertension
Jordan Elliott[1], Franz Rischard[1], Rebecca Vanderpool[1]
[1]University of Arizona

Posters: Experimental Biofluid Mechanics I

Aspen Glade

Session Chair: John LaDisa, Marquette University
Session Chair: Alejandro Roldan-Alzate, University of Wisconsin-Madison

Prevalence and Risk Factors for Blebs in Intracranial Aneurysms
Seyedeh Fatemeh Salimi Ashkezari[1], Fernando Mut[1], Juan Cebral[1]
[1]George Mason University

Association Between Aneurysm Local Hemodynamics and Wall Enhancement on 7T-MRI
Sara Hadad[1], Fernando Mut[1], Bong J Chung[2], Jorge A Roa[3], Anne M Robertson[4], David M Hassan[3], Edgar A Samaniego[3], Juan R Cebral[1]
[1]George Mason University, [2]Mount Saintclair University, [3]University of Iowa, [4]University of Pittsburg

Evolution of the Hemodynamic Properties and Arterial Wall Remodeling in Pulmonary Arterial Hypertension
Hao Mu[1], Daniela Valdez-Jasso[1]
[1]University of California, San Diego

Frequency Characteristics of Elastic Patient-Specific Aneurysm Model
Ryuhei Yamaguchi[1], Naoki Ikeya[2], Nadia Shafii[3], Kahar Osman[3], Atsushi Saito[4], Gaku Tanaka[2], Makoto Ohta[1]
[1]Institute of Fluid Science, Tohoku University, [2]Chiba University, [3]Universiti Teknologi Malaysia, [4]Sendai Medical Center

A Combined Microfluidic Device and Numerical Simulation Technique for the Evaluation of Red Blood Cell Shear Induced Damage
Ratul Paul[1], Mehdi Nikfar[1], Yuyuan Zhou[1], Meghdad Razizadeh[1], Yaling Liu[1]
[1]Lehigh University

Analysis of Hemodynamics in Aneurysm Blebs with Thin and Atherosclerotic Walls
Seyedeh Fatemeh Salimi Ashkezari[1], Fernando Mut[1], Juan Cebral[1]
[1]George Mason University

Wall Shear Stress (WSS) Values in a Pig Model of Carotid Stenosis Based on Free-Running 5D MRI and CFD
Yinghan Xu[1], John N. Oshinski[1], Murali Padala[1], Keshav Kohli[2], Zhenglun Alan Wei[2], Alison Marsden[3]
[1]Emory University, Georgia Institute of Technology, University of Massachusetts Lowell

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Differential Nanoparticle Accumulation in a Mouse Model of Atherosclerosis May be Driven by Smooth Muscle Cells
Morgan Schake[1], Ian McCue[1], Hunter Miller[1], Badrul Alam Bony[1], Evan Curtis[1], Connor Gee[1], Forrest Kievit[1], Ryan Pedrigi[1]
[1]University of Nebraska-Lincoln

Blood Flow in a Retina Capillary Vascular Network with Explicit Blood Cells
Kacper Ostalowski[1], Jifu Tan[1]
[1]Northern Illinois University

***In Vitro* Validation of a Real-time 3D MRI Urodynamics Protocol**
Colin Kim[1], Cody Johnson[1], James Rice[1], Alejandro Roldan-Alzate[1]
[1]University of Wisconsin-Madison

The Effect of Shear Stress on Human Lung Microvascular Endothelial Cell Glycocalyx
Camden Holm[1], Natasha Cruz-Calderon[1], Solomon Mensah[1]
[1]Worcester Polytechnic institute

Posters: Injury, Bone, Joint and Musculoskeletal Biomechanics

Aspen Glade

Session Chair: Thao (Vicky) Nguyen, Johns Hopkins University
Session Chair: Kristin Myers, Columbia University

Brain Strain at Skull Frame of Reference
Yuzhe Liu[1], Xianghao Zhan[1], August G. Domel[1], Michael Zeineh[1], Gerald Grant[1], David Camarillo[1]
[1]Stanford University

Prediction of Brain Strain Across Head Impact Subtypes Using 18 Brain Injury Criteria
Xianghao Zhan[1], Yiheng Li[1], Yuzhe Liu[1], David Camarillo[1]
[1]Stanford University

Larger Muscle Fibers and Fiber Bundles Manifest Smaller Elastic Modulus in Paraspinal Muscles of Rats and Humans
Masoud Malakoutian[1], Marine Theret[1], Shun Yamamoto[1], Iraj Dehghan-Hamani[1], Michael Lee[1], John Street[1], Fabio Rossi[1], Stephen Brown[2], Thomas Oxland[1]
[1]University of British Columbia, [1]University of Guelph

Finite Element Analysis for Carpal Arch Under Varying Thenar Muscle Force Magnitudes and Directions
Hui Zhang[1], Zong-Ming Li[1]
[1]University of Arizona

Studying the Mechanical Effect of Human Talus Bone Implants on the Surrounding Articular Cartilage
Maha Ead[1], Tao Liu[1], Kajsa Duke[1], Nadr Jomha[1], Marwan El-Rich[2], Lindsey Westover[1]
[1]University of Alberta, [2]Khalifa University

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Modeling the Effect of Bighorn Sheep Horn Shape on Post-Impact Accelerations
Benjamin Wheatley[1], Aaron Drake[2], Luca Fuller[2], Seth Donahue[2]
[1]Bucknell University, [2]University of Massachusetts Amherst

The Differential Impact of Heterogeneity on Trabecular Plates and Rods in Finite Element Models of Human Vertebral Bone
Jason Cox[1], Jacqueline Cole[1]
[1]University of North Carolina at Chapel Hill / North Carolina State University

The Evolution of Heterogeneous Parameters for Modeling Cartilage During the Progression of Osteoarthritis
Xiaogang Wang[1], David Pierce[1]
[1]University of Connecticut

An Electromagnetic Actuator for Brain Magnetic Resonance Elastography
Suhao Qiu[1], Zhao He[1], Runke Wang[1], Ruokun Li[2], Fuhua Yan[2], Yuan Feng[1]
[1]Shanghai Jiao Tong University, [2]Ruijin Hospital

Fatigue-Induced Damage Accretion of the Elbow AMCL Due to Repetitive Valgus Cycling
David Jordan[1], Alexander Kharlamov[2], Patrick Schimoler[1], Mark Miller[1]
[1]University of Pittsburgh, [2]Allegheny General Hospital

Estimation and Assessment of Sagittal Spinal Curvature and Thoracic Muscle Morphometry in Different Postures
Anoosha Pai S[1], Thomas R. Oxland[1], David R. Wilson[1], Stephen H.M. Brown[2], John Street[1], Honglin Zhang[1], Sidney Fels[1]
[1]The University of British Columbia, [2]University of Guelph

Mechanical Function of Fan-Like Extension and Midsubstance Fibers of Porcine Anterior Cruciate Ligament
Satoshi Yamakawa[1], Konsei Shino[2], Tatsuo Mae[1], Ken Nakata[1], Hiromichi Fujie[3]
[1]Osaka University, [2]Yukioka Hospital, [3]Tokyo Metropolitan University

On the Clinical Diagnosis of Acromioclavicular Joint Arthritis
Bethany Arn[1], Mohamed Samir Hefzy[1], Brian Trease[1], Abdulazim Mustapha[1]
[1]The University of Toledo

Clinical Evaluation of a Novel Fastening Device for a Scoliosis Brace
Denis DiAngelo[1], Chloe Chung[1], Daniel Hoyer[1], Derek Kelly[2], Jeffery Sawyer[2]
[1]The University of Tennessee Health Science Center, [2]Campbell Clinic Orthopaedics

Multi-Directional Flexibility Endurance Testing of Four Different Cervical Total Disc Replacement Prostheses
Denis DiAngelo[1], Chloe Chung[1], Daniel Hoyer[1], Tyler Carson[2], Kevin Foley[2]
[1]The University of Tennessee Health Science Center, [2]Semmes Murphey Clinic

Shear Expulsion Testing of Four Different Cervical Total Disc Replacement Prostheses
Denis DiAngelo[1], Chloe Chung[1], Daniel Hoyer[1], Tyler Carson[2], Kevin Foley[2]
[1]The University of Tennessee Health Science Center, [2]Semmes Murphey Clinic

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Influence of Physiologically Informative Average Contact Stresses on Cartilages' Tribological Rehydration
Shamimur Akanda[1], Meghan Kupratis[1], David Burris[1], Christopher Price[1]
[1]University of Delaware

Effect of Seat Orientation on the Lumbar Response to FAA-Longitudinal Crash Pulse: A Parametric Modeling Study
Karthik Somasundaram[1], John Humm[1], Prashant Kandelwal[1], Narayan Yoganandan[1], Frank Pintar[1]
[1]Medical College of Wisconsin

Implementing an Artificial Neural Network to Study Brain Strain and Mild Traumatic Brain Injury Metrics
Luke Patterson[1], Yanir Levy[1], Haojie Mao[1]
[1]University of Western Ontario

Bone Biomechanics Advances Animal Welfare in Egg-Laying Hens
Glynn Gallaway[1], Brittney Emmert[1], Thomas Siegmund[1], Darrin Karcher[1]
[1]Purdue University

Development of an Anatomically Accurate Non-Human Primate Finite Element Head Model
Tyler Rooks[1], John Humm[1], Jamie Baisden[1], Narayan Yoganandan[1]
[1]Medical College of Wisconsin

A Computational Digital Twin Methodology for Understanding Biomechanics of Vertebroplasty
Hossein Ahmadian[1], Prasath Mageswaran[1], Dukagjin Blakaj[1], Ehud Mendel[1], Soheil Soghrati[1], Wiiliam Marras[1]
[1]The Ohio State University

Presence of Greater Tuberosity Facets Significantly Altered in Subjects with Symptomatic Isolated Supraspinatus Tendon Tears
Luke Mattar[1], Rachel Martello[1], Adam Popchak[1], Volker Musahl[1], James Irrgang[1], Richard Debski[1]
[1]University of Pittsburgh

Accelerated Acquisition of Displacements and Strain in Tibiofemoral Joint Cartilage by Spiral DENSE MRI and Compressed Sensing
Woowon Lee[1], Emily Miller[1], Corey Neu[1]
[1]University of Colorado Boulder

Alteration of Intrinsic Brain Motion After Endoscopic Third Ventriculostomy Treatment in Neonatal Hydrocephalus
Aymeric Pionteck[1], Manasa Rao[2], Peter Morgenstern[2], Mehmet Kurt[1]
[1]Stevens Institute of Technology, [2]Icahn School of Medicine at Mount Sinai

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Toward the Translation of 3D-Printed Flexible-PLA Intervertebral Discs in Small Animal Rodent Models
Samantha Marshall[1], Jennifer Pilamunga[1], Joseph Lombardi[1], Nadeen Chahine[1]
[1]Columbia University

***In Vivo* Quantification of Brain Morphologies Via Mechanics-Informed Deep Learning Approach**
Shuolun Wang[1], Nagehan Demirci[1], Vicente Castro Solar[2], Maria Holland[1], Francisco Sahli Costabal[2]
[1]University of Notre Dame, [1]Pontificia Universidad Catolica de Chile

Analyzing Suture Fixation Techniques for Tibial Eminence Avulsion Fractures
Yulia Yatsenko[1], Nyaluma Wagala[1], Calvin Chan[1], Volker Musahl[1], Richard Debski[1]
[1]University of Pittsburgh

Effect of Helmet on Gender-Based Cervical Spine Segmental Responses in Rear Impact
Yuvaraj Purushothaman[1], John Humm[1], Hoon Choi[1], Deepak Rajasekaran[1], Narayan Yoganandan[1]
[1]Medical College of Wisconsin

Altering Surface Curvature of Patellar Osteochondral Allografts Through Subject-Specific Modification of Subchondral Bone
Katherine Spack[1], Courtney Shaeffer[1], Peter Shyu[1], James Cook[2], Clark Hung[1], Melvin Rosenwasser[1], Gerard Ateshian[1]
[1]Columbia University, [2]University of Missouri

Wave Transmission and Bone Growth in Bioinspired Scaffolds
Marco Fielder[1], Arun Nair[1]
[1]University of Arkansas

Sitting MRI Study of Lumbar Spinal Musculature
Vicky Varghese[1], Hoon Choi[1], Jamie Baisden[1], Anjishnu Banerjee[1], Ulrich Kemmo[1], Sagar Umale[1], John Humm[1], Narayan Yoganandan[1]
[1]Medical College of Wisconsin

Head Impact Biomechanics of Ice Zone and Athlete Intent in Youth Ice Hockey
Abigail Swenson[1], N. Stewart Pritchard[1,2], Logan Miller[1,2], Jillian Urban[1,2], Joel Stitzel[1,2]
[1]Wake Forest University School of Medicine, [2]Virginia Tech

Mechanical Environment of Supraspinatus Tendon During Functional Reach: A Finite Element Study
S. Cyrus Rezvanifar[1], John Looft[2], Anna Spracklin[3], Mohab Eid[1], Justin Staker[1], Arin Ellingson[1], Paula Ludewig[1]
[1]University of Minnesota - Twin Cities, [2]Minneapolis VA Health Care System, [3]Northwestern University

Segmental Loads in Male and Female Necks Under Helmeted Condition in Frontal (G-X) Impacts
Yuvaraj Purushothaman[1], Sagar Umale[1], John Humm[1], Narayan Yoganandan[1]
[1]Medical College of Wisconsin

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Effects of Impact Position, Muscle Activation and Posture on Head Injury Risk
Jonathan Mortensen[1], Nikolaus Benko[1], Brittany Coats[1], Andrew Merryweather[1]
[1]University of Utah

Evaluating Flexor Digitorum Superficialis Tendon Fatigue Using High-Frequency Ultrasound Based Strain Algorithms
Andrew Darling[1], Conner Earl[1], Fredrick W. Damen[1], Nan Chen[1], Travis Mendoza[2], Denny Yu[1], Grace O'Connel[2], Carisa Harris Adamson[3], Craig J. Goergen[1]
[1]Purdue University, [2]University of California, Berkeley, [3]University of California, San Francisco

Machine Learning Segmentation for Densitometric Phantom CT Data
Ashley Pernsteiner[1], Carla Winsor[1], Heidi-Lynn Ploeg[2], Corinne Henak[1]
[1]University of Wisconsin – Madison, [2]Queen's University

Youth Pitching Kinematics: Associations with Body Overweight Parameters
Christina Fong[1], Ryan Sax[1], Rafael Escamilla[2], Arnel Aguinaldo[3], Scott Hazelwood[1], Stephen Klisch[1]
[1]California Polytechnic State University, [2]California State University, Sacramento, [3]Point Loma Nazarene University

A Methodology to Measure the True Flexural Strength of Brittle Cylinders
Michael MacIsaac[1], Ghatu Subhash[1], Salil Bavdekar[1]
[1]University of Florida

Measurement of Mechanical Properties of Iberian Ribbed Newt Tendon Toward Establishment of Complete Tendon Regeneration Model
Fumiya Sato[1], Daisuke Suzuki[2], Toshinori Hayashi[3], Takeo Matsumoto[1], Eijiro Maeda[1]
[1]Nagoya University, [2]Hokkaido Chitose College of Rehabilitation, [3]Hiroshima University

Micromechanical Comparison Between Hydrogel and Silicone Gel Used for Studying Stiffness Sensing by Adherent Cells
Kathleen Heusser[1], Nikhil Mittal[1], Mohanish Chandurkar[1], Zhongtian Zhang[1], Karrar Alofari[1], Jeffrey Allen[1], Bruce Lee[1], Fei Long[1], Sangyoon Han[1]
[1]Michigan Technological University

Posters: Mechanobiology in Tissue and Cellular Engineering

Aspen Glade

Session Chair: Solomon Mensah, Worcester Polytechnic Institute

Structural and Non-Structural Determinants of Speed and Timing of Conduction in Auditory Neuronal Axons
Jun Xu[1]
[1]Tarleton State University

Role of the Extracellular Environment in Achieving Stable Epithelial Morphogenesis *In Vitro*
Marjan Hagelaars[1], Carlijn Bouten[1], Sandra Loerakker[1]
[1]Eindhoven University of Technology

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Melanoma Tumour Formation in 3D Collagen *In Vitro* Matrices is Regulated by Intracellular Mechanics and Tbx3 Content
Ghodeejah Higgins[1], Faatiemah Higgins[1], Jade Peres[1], Tamer Abdalrahman[2], Muhammad Zaman[3], Sharon Prince[1], Thomas Franz[1]
[1]University of Cape Town, [2]Charité Medical University of Berlin, Germany, [3]Boston University

Myosin-Independent Mechanotransmission for Sensing Stiffness of Extracellular Matrix
Nikhil Mittal[1], Sangyoon Han[1]
[1]Michigan Technological University

Role of Substrate Stiffness on Pluripotency and Differentiation of Human Embryonic Stem Cells
Jasmeet Kaur Virdi[1], Prasad Pethe[2]
[1]SVKM's NMIMS Deemed-to-be University, [2]Symbiosis International University

Male and Female HUVEC Differ in Extracellular Matrix, Inflammation, and Vascular Function-Related Gene Expression
Callie Weber[1], Nicole Arnold[2], Douglas Dluzen[1], Alisa Clyne[1]
[1]University of Maryland, [2]Morgan State University

Acute Remodeling of a Tissue Engineered Vascular Graft Is Influenced by Compliance and Transforming Growth Factor Beta 2
Kenneth Furdella[1], Shinichi Higuchi[1], Kang Kim[1], Tom Doetschman[2], William Wagner[1], Jonathan Vande Geest[1]
[1]University of Pittsburgh, [2]University of Arizona

In Airway Epithelial Cells, Unjamming Transition Involves Basal Cell Elongation and Stress Fiber Accumulation
Thien-Khoi Phung[1], Jennifer Mitchel[1], Michael O'Sullivan[1], Jin-Ah Park[1]
[1]Harvard T.H. Chan School of Public Health

Notochord Eccentricity and its Relation to Cell Packing
Emma Sorrell[1], Sharon Lubkin[1]
[1]North Carolina State University

Intercellular Coupling Among Smooth Muscle Cells Changes While Undergoing Agonist-Induced Constriction
Suzanne Stasiak[1], Dhananjay Tambe[2], Harikrishnan Parameswaran[1]
[1]Northeastern University, [2]University of South Alabama

Directional Cell Migration Guided by a Strain Gradient
Feiyu Yang[1], Yubing Sun[1]
[1]University of Massachusetts, Amherst

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Wednesday, June 16	5:00PM – 6:30PM EDT

Engineered *In Vitro* Models

Alpine Drift

Session Chair: Arun Nair, University of Arkansas
Session Chair: Jingjie Hu, Mayo Clinic

5:00PM **Evaluation of the Seeding Efficiency of a Custom-Designed Seed-and-Culture Perfusion Bioreactor for Engineered Tissue Vascular Grafts**
Sarah Saunders[1], Joao Soares[1]
[1]Virginia Commonwealth University

5:13PM **A 3D Macromolecular Modeling Framework for Collagen Fibril Mechanics and Plasticity**
Lauren Bersie-Larson[1], Paolo Provenzano[1], Victor Barocas[1]
[1]University of Minnesota, Twin Cities

5:26PM **Changes in Fiber Level Strains & Calcium Activity after Exposure to Bacterial Collagenase in Neuron Collagen Constructs Mimicking Ligaments Suggests Possible Mechanisms for Pain Associated with Joint Degeneration**
Sagar Singh[1], Beth Winkelstein[1]
[1]University of Pennsylvania

5:39PM **Development of a Deformable Microfluidic Chip to Replicate Tissue Strains *In Situ***
Andre Montes[1], Jonathan McKinley[1], Grace O'Connell[1], Mohammad Mofrad[1]
[1]University of California, Berkeley

5:52PM **Substratum Stiffness Modulates the Morphology and Proliferation of Primary Corneal Keratocytes in Response to PDGF-BB**
Krithika S. Iyer[1], David W. Schmidtke[1], W. Matthew Petroll[2], Victor D. Varner[1]
[1]University of Texas at Dallas, [2]University of Texas at Southwestern

6:05PM **Towards Controlling Arterial Growth and Remodeling Via Cell-Cell Signaling: A Multiscale Computational Model**
Jordy van Asten[1], Marcos Latorre[2], Jason Szafron[2], Tommaso Ristori[1], Frank Baaijens[1], Jay Humphrey[2], Sandra Loerakker[1]
[1]Eindhoven University of Technology, [2]Yale University

Wednesday, June 16	5:00PM – 6:30PM EDT

Growth and Remodeling Mechanics II: Mechanobiology

Mogul Madness

Session Chair: Colleen Witzenburg, University of Wisconsin-Madison
Session Chair: Johannes Weickenmeier, Stevens Institute of Technology

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5:00PM **Modeling the Three-Way Chemo-Mechanical Feedback between Cellular Contractility, Actin Polymerization, and Adhesion Turnover in the Remodeling of Endothelial Junctions**
Eoin McEvoy[1], Tal Sneh[2], Emad Moeendarbary[3], Xingyu Chen[2], Tatyana Svitkina[2], Roger Kamm[4], Vivek Shenoy[2]
[1]National University of Ireland Galway, [2]University of Pennsylvania, [3]University College London, [4]Massachusetts Institute of Technology

5:13PM **Multiscale Model of Heart Growth During Pregnancy: Integrating Mechanical and Hormonal Signaling**
Kyoko Yoshida[1], Jeffrey Saucerman[1], Jeffrey Holmes[2]
[1]University of Virginia, [2]University of Alabama at Birmingham

5:26PM **Modeling Wound Healing Mechanobiology: Multi-scale Coupling of a Cell Adhesion Model to a Finite Element Model of Tissue**
Yifan Guo[1], Julian Jimenez[1], Sarah Calve[2], Adrian Buganza Tepole[1]
[1]Purdue University, [2]University of Colorado Boulder

5:39PM **Force Transmission within the Migrating Endothelium Regulates Shunt Formation during Angiogenic Remodelling**
Lowell T. Edgar[1], Miguel O. Bernabeu[1]
[1]University of Edinburgh

5:52PM **Local Tissue Heterogeneity Surrounding Neurons May Modulate Their Responses Via Altered Axonal Strain Fields**
Jill Middendorf[1], Meagan Ita[2], Beth Winkelstein[2], Victor Barocas[1]
[1]University of Minnesota, [2]University of Pennsylvania

6:05PM **Evolving structure-function relations in aortic maturation and aging**
Cristina Cavinato[1], Sae-Il Murtada[1], Alexia Rojas[1], Jay D. Humphrey[1]
[1]Yale University

Wednesday, June 16	**5:00PM – 6:30PM EDT**

Multiscale Biotransport in Drug Delivery

Mud Springs

Session Chair: Jifu Tan, Northern Illinois University
Session Chair: Zhiquan Shu, University of Washington

5:00PM **The Impact of Injection Timing and Location on Microparticle Delivery for Tumor Targeting in a Patient-Specific Liver**
Tim Bomberna[1], Charlotte Debbaut[1], Geert Maleux[2], Chris Verslype[2], Lawrence Bonne[2]
[1]UGent, [2]UZ Leuven

5:13PM **Constant Pressure CED Infusions with Controlled Catheter Movement in Agarose Gel Brain Tissue Phantoms**
Jason N. Mehta[1], Brianna E. Morales[1], Christopher G. Rylander[1]
[1]The University of Texas at Austin

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5:26PM **Mechanism of Enhanced Thermal Transport and Photoacoustic Effect for Silica-Coated Gold Nanoparticles**
Peiyuan Kang[1], Jonghae Youn[1], Zhenpeng Qin[1]
[1]University of Texas at Dallas

5:39PM **Design and Evaluation of Faciliflow: A Lymph Node Prosthetic for Prevention of Surgically Induced Lymphedema**
Jennifer Frattolin[1], Arushri Swarup[1], Alain Vella[1], Fatima Al-Khal[1], Anaös Schaschkow[2], Pierre Gianello[2], Guido Giacalone[2], James E. Moore Jr.[1]
[1]Imperial College London, [2]Université Catholique de Louvain

5:52PM **A Mechanistic Study of the Interstitial Transport of Collagenase-secreting Tumor-targeting Salmonella Typhimurium Toward Improving Tumor Colonization**
Eric Leaman[1], Bahareh Behkam[1]
[1]Virginia Tech

6:05PM **Enhancement of Drug Delivery to Pancreatic Cancer Targeting Fibrin Matrix**
Sae Rome Choi[1], Hye-ran Moon[1], Yi Yang[2], Matthew J. Flick[2], Bumsoo Han[1]
[1]Purdue University, [2]University of North Carolina

Wednesday, June 16	**5:00PM – 6:30PM EDT**

Ocular and Reproductive Mechanics I: Form and Function

Saddle Ridge

Session Chair: Katrina Knight, University of Pittsburgh
Session Chair: Hamed Hatami-Marbini, UIC

5:00PM **Changes in Vaginal Shape Throughout the Lifespan**
Liam Martin[1], Megan Routzong[1], Pamela Moalli[1], Ghazaleh Rostaminia[2], Victoria Martin[1], Katherine Lebrun[1], Steven Abramowitch[1]
[1]University of Pittsburgh, [2]Northshore HealthSystems

5:13PM **Effects of Maternal Geometry and Gestational Age on Loading of the Gravid Human Uterus and Cervix**
Erin Louwagie[1], Lindsey Carlson[2], Joy Vink[1], Timothy Hall[2], Helen Feltovich[1], Kristin Myers[1]
[1]Columbia University, [2]University of Wisconsin-Madison

5:26PM **The Effects of Fetal Head Size on Maternal Coccyx Rotation During a Vaginal Delivery**
Sheng Chen[1], Megan Routzong[2], Steven Abramowitch[2], Michele Grimm[1]
[1]Michigan State University, [2]University of Pittsburgh

5:39PM **Effect of Osmotic Loading on Vaginal Viscoelastic Mechanical Properties**
Gabrielle Clark-Patterson[1], Laurephile Desrosiers[2], Leise Knoepp[2], Raffaella De Vita[3], Kristin Miller[1]
[1]Tulane University, [2]Ochsner Clinical School, [3]Virginia Polytechnic Institute and State University

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5:52PM **The Impact of Tissue Property Variations on Optic Nerve Head Deformation Under Physiological and Supra-Physiological Loading**
Andrew Feola[1,2], C. Ross Ethier[2], Brian Samuels[3]
[1]Atlanta VA Medical Center, [2]Georgia Institute of Technology, [3]University of Alabama at Birmingham

6:05PM **Factors Influencing Minimum Lamina Cribrosa Oxygen Concentration**
Yi Hua[1], Jason Walker[1], Po-Yi Lee[1], Fengting Ji[1], Haiden McDonald[1], Pedro Pallares[1], Bryn Brazile[1], Ian Sigal[1]
[1]University of Pittsburgh

Poster Session

Poster Session III	Wednesday, June 16, 6:30PM – 7:30PM EDT

Posters: BS Finalists Poster Session

Aspen Glade

Session Chair: Megan Killian, University of Michigan

Proposed Injury Threshold for Drone Blade Lacerations
Lauren Duma[1], Mark Begonia[1], Barry Miller[1], Stefan Duma[1]
[1]Virginia Tech

3D Image Correlation of Porcine Adipose Tissue Under Compression
Dari Samson[1], Bryce Chapman[1], Brenda Burke[1], Dr. Lakiesha Williams[1]
[1]University of Florida

Engaging Biomedical Engineering Students with Gamification in Online Learning
Nina Dorfner[1], Rana Zakerzadeh[1]
[1]Duquesne University

Simulation of Oxygen Mass Transport in a Complaint Abdominal Aortic Aneurysm Model
Alexis Throop[1], Burton Carbino[1], Alexander Guy[1], Nina Dorfner[1], Rana Zakerzadeh[1]
[1]Duquesne University

The Effect of Stenosis Severity and Arterial Wall Mechanics on Functional Diagnostic Parameters
Angelica Alday[1], Talha Lone[1], Rana Zakerzadeh[1]
[1]Duquesne University

Whitewater Helmet STAR: Evaluating the Biomechanical Performance and Risk of Head Injury for Whitewater Helmets
Brock Duma[1], Mark Begonia[1], Stefan Duma[1]
[1]Virginia Tech

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Data Acquisition System to Quantify Bone Viscoelasticity in Hindfoot and Midfoot Arthrodesis
Melissa Requist[1], Amanda Rugg[1], Brooks Johnson[1], Michelle Son[1], Alicia Alvarez[1], Daniel Latt[1]
[1]University of Arizona

Location Dependent Mechanical Behavior of Aponeurosis Tissue Under Uniaxial Tensile Stretch
Emily Tully[1], Benjamin Wheatley[1]
[1]Bucknell University

Loss of Endothelin-1 May Offer Pulmonary Vascular Protection After Myocardial Infarction
Hailey Frye[1], Diana Tabima[1], David McCulley[2], Naomi Chesler[3]
[1]University of Wisconsin – Madison, [2]University of California, San Diego, [3]University of California, Irvine

The Synoviocyte Response to Physiologic Shear Under Culture Conditions Simulating Diabetic Insulin Resistance and Osteoarthritis Joint Inflammation
Neeraj Sakhrani[1], Lance Murphy[1], Andy Lee[1], Eric Semler[2], Roshan Shah[1], Gerard Ateshian[1], Clark Hung[1]
[1]Columbia University, [2]MTF Biologics

The Impact of Pregnancy and Childbirth on Vaginal Dimensions and Curvature
Victoria Martin[1], Megan Routzong[1], Steven Abramowitch[1]
[1]University of Pittsburgh

Pharmaceutical Intervention Helps but does not Prevent Proteoglycan Loss in the Meniscus Following Traumatic Knee Injury
Ashley Herrick[1], Gerardo Narez[1], Loic Dejardin[2], Wei Feng[2], Roger Haut[2], Tammy Haut Donahue[1]
[1]University of Massachusetts Amherst, [2]Michigan State University

Metabolism of Chondrocytes After Traumatic Overloading Determined by Click Chemistry Techniques
Annie Porter[1], Liyun Wang[1], X. Lucas Lu[1]
[1]University of Delaware

Can Exercise-Based Load Prevent or Reduce Age-Related Advanced Glycation End-Product Accumulation in Tendons?
Panth Doshi[1], Kelly Ott[1], Jennifer Puetzer[1]
[1]Virginia Commonwealth University

Parametric Patient-Specific Model Simulating Human Cervix Deformation During the First Stage of Labor
Arielle Feder[1], Erin Louwagie[1], Joy Vink[1], Kristin Myers[1]
[1]Columbia University

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Layer-Specific Mechanical and Collagen Microstructural Characterizations of Tricuspid Valve Leaflets
Katherine Casey[1], Mulan Tang[1], Devin Laurence[1], Chung-Hao Lee[1]
[1]The University of Oklahoma

MR Image-Based Characterization of Medial and Lateral Meniscal Geometries for Patient-Specific Finite Element Modeling
Kathryn Colone[1], Madison Lang[1], Kate Lindsey[1], Sofia Guarnieri[1], Amy Lerner[1]
[1]University of Rochester

Carbon Nano-onion-mediated Dual Targeting of P-selectin and P-glycoprotein to Overcome Cancer Drug Resistance
Yutong Liang[1], Hai Wang[1], Xiaoming He[1]
[1]University of Maryland, College Park

Computational Modeling of Arterial Hemodynamics in Pediatric Pulmonary Arterial Hypertension
Nathan Li[1], Christopher Tossas-Betancourt[1], C. Alberto Figueroa[1]
[1]University of Michigan

Efficacy of Poloxamer 188 in Mitigating Changes to Subchondral Bone Composition and Architecture Following Traumatic ACL Injury and Reconstruction
Gabriel Brown[1], Gerardo Narez[1], Loic Dejardin[2], Wei Feng[2], Roger Haut[2], Tammy Haut Donahue[1]
[1]University of Massachusetts Amherst, [2]Michigan State University

A Computational Model of the Impact of Cerebral Amyloid Angiopathy on Vaso-Responsiveness of Cerebral Arteries
Cole Theobald[1], Ryan Mahutga[1], Patrick Alford[1], Victor Barocas[1]
[1]University of Minnesota - Twin Cities

Using 4D-Flow MRI to Quantify Left Atrial Flow and WSS to Better Understand Atrial Remodeling and Stretch in Atrial Fibrillation Patients
Cody Johnson[1], Morgan Parks[1], Riley Parks[1], Matthew Kalscheur[1], Alexey Glukhov[1], Alejandro Roldan-Alzate[1]
[1]University of Wisconsin-Madison

Simulating Structural Covariance Networks in Schizophrenia Patients
Katherine Dash[1], Brendan Muldoon[1], Konasale Prasad[1]
[1]University of Pittsburgh

Magnetic Resonance Imaging (MRI) of Brain Motion: Phase Contrast Velocity Versus Displacement Encoding
David Bat[1], Blaise Simplice Talla Nwotchouang[2], Maggie Eppelheimer[2], Daniel Barrow[3], Francis Loth[2], John Oshinski[3]
[1]Georgia Institute of Technology, [2]University of Akron, [3]Emory University

Characterization of Glycocalyx Core Proteins in Human Endothelial Cells
John Mwangi[1], Theodora Stanley[1], Selina Banerjee[1], Ronodeep Mitra[1], Eno Ebong[1]
[1]Northeastern University

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Knee Contact Forces in Transtibial Amputees: Implications for Rehabilitation and Lifelong Fitness Exercises
Reymil Fernandez[1], Shaida Biglari[1], Scott J. Hazelwood[1], Stephen M. Klisch[1]
[1]California Polytechnic University, San Luis Obispo

A Repeatable Method for *In-Situ* Joint Alignment of Disarticulated Human Knees During *In-Vitro* Mechanical Testing
Zachary Pinkley[1], Kate Benfield[1], Trevor Lujan[1]
[1]Boise State University

The Relationship Between Perceived Confidence and Writing in a Biomedical Engineering REU Site
Elisabeth Reed[1], Donna Kain[1], Stephanie George[1]
[1]East Carolina University

A Computational Tool to Automate the Analysis of Stress-Strain Data from Tensile Tests of Soft Tissues
Miranda L. Nelson[1], Derek Q. Nesbitt[1], Trevor J. Lujan[1]
[1]Boise State University

The Relation Between Cortical Thickness and Morphology: A Study of Nonhuman Primate Brains
Mia Hoffman[1], Nagehan Demirci[1], Maria Holland[1]
[1]University of Notre Dame

Effect of Stress-fiber Contraction on the 3D Shape of the Aortic Heart Valve Interstitial Cell
Quan Nguyen[1], Alex Khang[1], Xinzeng Feng[1], Michael Sacks[1]
[1]University of Texas at Austin

Analysis of Boundary Conditions in Numerical Assessment of Paravalvular Leakage in Transcatheter Aortic Valve Replacement
Kyra Halbert-Elliott[1], Zhenglun Wei[2], Huang Chen[1], Sri Krishna Sivakumar[1], Breandan Yeats[1], Ajit Yoganathan[1], Prasad Dasi[1]
[1]Georgia Institute of Technology, [2]University of Massachusetts Lowell

Raman Needle Arthroscopy Towards *In Vivo* Monitoring of Engineered Cartilage Growth
Juncheng Zhang[1], Tianbai Wang[1], Magnus Jensen[2], Mark Grinstaff[1], Brian Snyder[1], Mads Bergholt[2], Michael Albro[1]
[1]Boston University, `[1]King's College of London

Stress-Relaxation Response of Porcine and Human Synovium in Confined Compression
Benjamin Johnston[1], Young Guang[1], Alexandra Davis[1], Lori Setton[1]
[1]Washington University in St. Louis

Quantification of the Flexural Rigidity of Peripheral Arterial Endovascular Catheter and Sheaths
Chase Hartquist[1], Vinay Chandrasekaran[1], Halle Lowe[1], Eric Leuthardt[1], Joshua Osbun[1], Mohamed Zayed[1], Guy Genin[1]
[1]Washington University in St. Louis

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Identifying Hemodynamic Predictors of Cerebral Aneurysm Growth Using Computational Fluid Dynamics
Allyson Weiss[1], Aaron Panduro[2], Ingrid Lan[1], Erica Schwarz[1], Alison Marsden[1], Nicholas Telischak[1]
[1]Stanford University, [2]California State University, Fresno

In Silico Modeling of Embolic Particle Drug Delivery for Liver Cancer
Autumn Zemlicka[1], Andrew Beiter[1], Premal Trivedi[2], Debanjan Mukherjee[1]
[1]University of Colorado Boulder, [2]University of Colorado Anschutz Medical Campus

Biaxial Mechanical Properties of Right Ventricular Myocardium in Advanced Pulmonary Arterial Hypertension
Michael Bennington[1], Daniela Valdez-Jasso[1]
[1]University of California, San Diego

Contrasting the Mechanics of Healthy and Asthmatic Airway Development Using *In Silico* Modeling
Neftali Lau, Mona Eskandari[1], Mohammad Ganjeh[1]
[1]University of California, Riverside

Collagen V Promotes Cell Contractility Compared to Collagen I
Shaina Royer[1], Nikhil Mittal[1], Sangyoon Han[1]
[1]Michigan Technological University

Exploration of the Impact of Blood Viscosity in the Development of Embolisms at the Pulmonary Artery of High-Risk Covid-19 Patients
Ifti Hossain[1], Diana Alatalo[1], Fatemeh Hassanipour[1]
[1]University of Texas at Dallas

Posters: MS Finalists Poster Session

Aspen Glade

Session Chair: Kristin Miller, Tulane University

Effects of Marathon Training on Male and Female Femoral Stress Fracture Risk
Clara Lin[1], Scott Hazelwood[1]
[1]California Polytechnic State University San Luis Obispo

Quantifying Euler-Bernoulli and Timoshenko Beam Theory Accuracy of Finite Element Analyses for Estimating Flexural Rigidity of a Bone Surrogate in Three-Point Bending with Finite Element Analysis
Mahsa Zojaji[1], Heidi-Lynn Ploeg[1], Baixuan Yang[1], Caitlyn J. Collins[2]
[1]Queen's University, [2]ETH Zürich

A Physics-Informed Machine Learning Model for the Identification of Active Contraction Properties in the Ventricular Myocardium
Igor Augusto Paschoalotte Nobrega[1], Wenbin Mao[1]
[1]University of South Florida

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Understanding the Effects of Long-Duration Spaceflight on Fracture Risk in the Human Femur Using Finite Element Analysis
Keyanna Henderson[1], Scott Hazelwood[1]
[1]California Polytechnic State University, San Luis Obispo

***In Vitro* Method to Quantify and Visualize Mechanical Wear in Human Meniscus Subjected to Joint Loading**
Kate Benfield[1], Zachary Pinkley[1], Katherine Hollar[1], Kirk Lewis[2], Trevor Lujan[1]
[1]Boise State University, [2]Idaho Sports Medicine Institute

On the Relation between Computational Fluid Dynamics-Derived Biomarkers and Coronary Artery Bypass Remodeling
Nhien Tran-Nguyen[1], Francesca Condemi[2], Stephen Fremes[3], Piero Triverio[1], Laura Jimenez-Juan[4]
[1]University of Toronto, [2]CorWave, [3]Sunnybrook Health Sciences Centre, [4]St. Michael Äôs Hospital

Sensitivity of the Shear Wave Speed-Stress Relationship to Properties of Ligament-Mimicking Mechanical Phantoms
Lesley Arant[1], Joshua Roth[1]
[1]University of Wisconsin - Madison

Maximum Ventricular Wall Loading Coincides with Periventricular White Matter Hyperintensity Locations
Valery Visser[1,2], Andreia Cacoilo[2], Johannes Weickenmeier[2]
[1]Eindhoven University of Technology, [2]Stevens Institute of Technology

A Comparative Study of Regular- and High-Fidelity Finite Element Algorithms for the Prediction of Aortic Flows
Yiyang Fu[1], Mehdi Najafi[1], Stephen Fremes[1], Laura Jimenez-Juan[1], David Steinman[1], Piero Triverio[1]
[1]University of Toronto

Load-Dependent Microstructural and Biomechanical Properties of Porcine Pulmonary Valve Cusps
Luke Hudson[1], Arshid Mir[1], Harold M. Burkhart[1], Chung-Hao Lee[1]
[1]University of Oklahoma

Macroscale and Microscale Responses of the Rat Lumbar Facet Capsular Ligament to Subfailure Repeated Cyclic Loading and a Ramp-and-Hold
Jonathan Marcelin[1], Sagar Singh[1], Beth Winkelstein[1]
[1]University of Pennsylvania

Role of Coherent Structures in Airflow Mediated Infectious Disease Spread with Expiratory Particles
Sara Meschi[1], Amirhossein Arzani[1]
[1]Northern Arizona University

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Characterizing and Modeling Adolescent Pectus Excavatum Anatomy to Inform Surgical Planning and Device Design
Delanie Lynch[1], Katelyn Greene[1], Ashley Weaver[1]
[1]Wake Forest School of Medicine

Transition to Turbulence Downstream an Eccentric Stenosis with Flexible Walls Under Steady Flow Using Laser Doppler Vibrometry for Whole Blood and a Newtonian Fluid
Rayanne Pinto Costa[1], Blaise Simplice Talla Nwotchouang[1], David A. Steinman[2], Francis Loth[1]
[1]The University of Akron, [2]University of Toronto

Improved Efficiency in Biomedical Modeling with Automated Removal of Mounting Hardware from Soft Tissue 3D Imaging Datasets
Sam Stephens[1], Neil Ingels[1], Jonathan Wenk[2], Morten Jensen[1]
[1]University of Arkansas, [1]University of Kentucky

Passive Leg Raise as a Simple and Robust Maneuver to Measure Pulmonary Vascular Distensibility
Callyn Kozitza[1], Farhan Raza[1], Naga Dharmavaram[1], Diana Tabima[1], Naomi Chesler[2]
[1]University of Wisconsin – Madison, [2]University of California, Irvine

Collagen Damage in Arteries - Choice of Analysis Technique Matters in Identifying Rate Dependence
William Anderl[1], Noah Pearson[1], Michael Yu[1], Kenneth Monson[1]
[1]University of Utah

Wavy Fiber Structure Improves Contractile Phenotype of Vascular Smooth Muscle Cells
Chun-Yu Lin[1], Pen-hsiu Grace Chao[1]
[1]National Taiwan University

Size-Dependent Solute Diffusivity in Synovial Explants Parallels Solute Transport Following Intra-Articular Delivery *In Vivo*
Alexandra Davis[1], Young Guang[1], Thomas McGrath[1], Benjamin Johnston[1], Christine Pham[1], James Fitzpatrick[1], Lori Setton[1]
[1]Washington University in St. Louis

A Viscodamage Model to Simulate Both Fatigue and Static Failures in Soft Fibrous Tissue
Bradley Henderson[1], Katelyn Cudworth[1], Danielle Siegel[1], Madison Krentz[1], Estefania Pena[2], Trevor Lujan[1]
[1]Boise State University, [2]University of Zaragoza

Computationally Enhanced 4D Flow MRI for the Assessment of Pre- and Post-Coarctation Repair Aorta Flow Dynamics
Labib Shahid[1], James Rice[1], Haben Berhane[2], Cynthia Rigsby[2], Joshua Robinson[2], Lindsay Griffin[2], Michael Markl[3], Alejandro Roldán-Alzate[1]
[1]University of Wisconsin-Madison, [2]Ann & Robert H. Lurie Children's Hospital of Chicago, [3]Northwestern University

The Effect of Header Characteristics on Head Kinematics of Women's Soccer Players
Gabriella Milef[1], Tanner Filben[1], Jordan Hemmen[2], Jillian Urban[1], Joel Stitzel[1]
[1]Wake Forest School of Medicine, [2]Virginia Tech

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Rheological Analysis of the Mechanical Properties of Murine Lungs Over the Lifespan
Olajumoke Harrison[1], Henry Rozycki[1], Rebecca Heise[1]
[1]Virginia Commonwealth University

Patient-Specific, *In-Vitro* Modeling of Aortic Coarctation Using 4D Flow MRI and Particle Image Velocimetry
James Rice[1], Labib Shahid[1], Haben Berhane[2], Cynthia Rigsby[3], Joshua Robinson[3], Lindsay Griffin[3], Michael Markl[2], Alejandro Roldán-Alzate[1]
[1]University of Wisconsin-Madison, [2]Northwestern University, [3]Ann & Robert H. Lurie Children's Hospital of Chicago

3D Visualization of the Podocyte Actin Network Using Integrated Membrane Extraction, Electron Microscopy, and Deep Learning
Chengqing Qu[1], Guy Genin[1], Hani Suleiman[1], Shumeng Jiang[1], Robyn Roth[1], Jeffrey Miner[1]
[1]Washington University in St. Louis

Finite Element Modeling of the Long Head of the Biceps Tendon
Miles Wing[1], Arin Ellingson[1], Paula Ludewig[1], Aaron Hellem[1], Victor Barocas[1], S. Cyrus Rezvanifar[1]
[1]University of Minnesota

Effect of Stimulus Waveform on Transcranial Magnetic Stimulation Metrics in Proximal and Distal Arm Muscles
Christopher Lynch[1], Thibault Roumengous[1], Carrie Peterson[1]
[1]Virginia Commonwealth University

Patient-Specific Artery Geometry and ABM/FEA/CFD Computational Framework
John Yoo[1], Jeremy Warren[1], Heather Hayenga[1], Clark Meyer[1]
[1]University of Texas at Dallas

Development of an Automated, Machine Learning-Based Methodology for Yield Point Identification from Tensile Testing Data of Soft Tissues
Joseph Kim[1], Timothy Chung[2], David Vorp[2], Madhavan Raghavan[1]
[1]University of Iowa, [2]University of Pittsburgh

D33 Characterization of Porous Polyvinylidene Fluoride Polymer for Biosensor Applications
Matthew Danley[1], Jack Kloster[1], Zhaolin Gao[1], Ping Zhao[1], Victor Lai[1]
[1]University of Minnesota Duluth

Comparison of Anabolic Osteoporosis Treatments: PTH Vs. PTHRP on the Activation of New Bone Formation and Improvements in Bone Microarchitecture
Tala Azar[1], Wenzheng Wang[1], Wei-Ju Tseng[1], Hongbo Zhao[1], Jing Du[1]
[1]University of Pennsylvania

Design, Construction, and Testing of a Differential Resistance Elliptical Exercise Machine
John Easton[1], Christopher Hurt[1], David Brown[2], Alan Eberhardt[1]
[1]University of Alabama at Birmingham, [2]University of Texas Medical Branch

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Toll-like Receptor-4 Modulates Inflammatory Response of Intervertebral Disc to Static but not Dynamic Injurious Loading

Hagar Kenawy[1], Samantha Marshall[1], James Rogot[1], Clark Hung[1], Nadeen Chahine[1]
[1]Columbia University

Live-Cell, Dynamic Imaging of Matrix Assembly in an *In Vitro* Model of Human Corneal Development

Alexandra Silverman[1], Seyed Mohammad Siadat[1], Jeffrey Ruberti[1]
[1]Northeastern University

Assessing the Hemodynamic Influence of Pulse Flow Modulation for Left Ventricular Assist Devices

Akshita Sahni[1], Jay Pal[2], Debanjan Mukherjee[1]
[1]University of Colorado Boulder, [2]University of Colorado Anschutz Medical Campus

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Thursday, June 17	11:00AM – 12:30PM EDT

Emerging Topics in Cardiovascular Mechanics

Alpine Drift

Session Chair: Danny Bluestein, Stony Brook University
Session Chair: Ender Finol, University of Texas at San Antonio

11:00AM **Development of an Abdominal Aortic Aneurysm Prognosis Classifier to Predict Patient Outcomes**
Timothy Chung[1], Nathan Liang[1], David Vorp[1]
[1]University of Pittsburgh

11:13AM **Polymeric Pediatric Heart Valve Replacements**
Sanchita S. Bhat[1], Hieu T. Bui[1], Milad Samaee[1], Subhadra Shashidharan[2], Susan P. James[3], Ajit P. Yoganathan[1], Lakshmi Prasad Dasi[1]
[1]Georgia Institute of Technology, [2]Emory University School of Medicine, [3]Colorado State University

11:26AM **Role of Mitral Valve Leaflet Pre-Strain in an Integrated Left Ventricle-Mitral Valve Model**
Hao Liu[1], Harshita Narang[1], Joseph Gorman[2], Robert Gorman[2], Michael Sacks[1]
[1]University of Texas at Austin, [2]University of Pennsylvania

11:39AM ***In Vivo* Analysis of Aortic Hemodynamics by Combining 4D Flow MRI and Complex Networks Theory**
Karol Cale[1], Andrea Guala[2], Diego Gallo[1], Jose Rodriguez-Palomares[2], Stefania Scarsoglio[1], Luca Ridolfi[1], Umberto Morbiducci[1]
[1]Politecnico di Torino, [2]Universitat Autonoma de Barcelona

11:52AM **Development of Predictive Model of Ischemia in Anomalous Aortic Origin of Coronary Artery**
Yasaman Farsiani[1], Jayanthi Parthasarathy[1], Silvana Molossi[2], Carlos Mery[3], Rajesh Krishnamurthy[1], Lakshmi Dasi[4]
[1]Nationwide Children's Hospital, [2]Texas Children's Hospital, Baylor College of Medicine, [3]Dell's Children's Medical Center, University of Texas at Austin, [4]Georgia Institute of Technology

12:05PM **Platelet Adhesion Dynamics: Machine Learning-Assisted Analysis of Adult and Cord Platelets and Development of a Multiscale Model**
Jawaad Sheriff[1], Peineng Wang[1], Peng Zhang[1], Ziji Zhang[1], Wadie Bahou[1], Yuefan Deng[1], Danny Bluestein[1]
[1]Stony Brook University

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Thursday, June 17	11:00AM – 12:30PM EDT

Multiscale Detection and Diagnosis in Biotransport

Mud Springs

Session Chair: Lyle Hood, University of Texas at San Antonio
Session Chair: Haishui Huang, The Ohio State University

11:00AM **An *Ex Vivo* Platform for Testing Diagnostic and Thrombolytic Capabilities of Ultrasound-aided Nanoparticles**
Connor Watson[1], Janna Sloand[1], Eric Rokni[1], Julianna Simon[1], Keefe Manning[1], Scott Medina[1]
[1]Penn State University

11:13AM **Deep Learning-enabled Label-free On-chip Detection and Selective Extraction of Cell Aggregate-laden Hydrogel Microcapsules**
Alisa White [1], Yuntain Zhang[1], James Shamul[1], Xiaoming He[1]
[1]University of Maryland

11:26AM **Whole brain perivascular space network reduces mean transport distance between**
Parenchyma and cerebrospinal fluid
Julian Rey[1], Uzair Farid[1], Christopher Najjoum[1], Kulam Magdoom[2], Thomas Mareci[1], Malisa Sarntinoranont[1]
[1]University of Florida, [2]National Institutes of Health

11:39AM **Group Refractive Index of Nanocrystalline Yttria-Stabilized Zirconia Transparent Cranial Implants**
David Halaney[1], Nitesh Katta[2], Hamidreza Fallah[3], Guillermo Aguilar[1], Thomas Milner[2]
[1]University of California, Riverside, [2]University of Texas, [3]University of Isfahan

11:52AM **Microfluidics Layout Design for Improved Circulating Tumor Cell Capture Efficiency**
Michael Hood[1], Jifu Tan[1]
[1]Northern Illinois University

12:05PM **Probing Neuropeptide Volume Transmission *In Vivo by* a Novel All-optical Approach**
Hejian Xiong[1], Hui Ouyang[1], Xueqi Xu[1], Emre Lacin[2], Tyler Kern[2], Daniel Kircher[2], X Xiuying Li[1], Celin Mateo[3], David Kleinfeld[3], Paul Slesinger[2], Zhenpeng Qin[1]
[1]University of Texas at Dallas, [2]Ichan School of Medicine at Mount Sinai, [3]University of California, San Diego

Thursday, June 17	11:00AM – 12:30PM EDT

Ocular and Reproductive Mechanics II: Structure and Function

Saddle Ridge

Session Chair: Andrew Feola, Georgia Institute of Technology
Session Chair: Kyoko Yoshida, University of Virginia

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11:00AM **A Convolutional Neural Network Algorithm for 3D Super-resolution of Pelvic Floor MRI Based on Low Inter-slice Resolution Data**
Fei Feng[1], James A. Ashton-Miller[2], John O.L. DeLancey[2], Jiajia Luo[3]
[1]Shanghai Jiao Tong University, [2]University of Michigan, [3]Peking University

11:13AM **Biomechanical Properties of Post-Menopausal Vaginal Samples in Relation to Pelvic Organ Prolapse**
Elvis Danso[1], Laurephile Desrosiers[2], Leise Knoepp[2], Kristin Miller[1]
[1]Tulane University, Ochsner Clinical School

11:26AM **A High-Accuracy Digital Volume Correlation for Soft Tissue Biomechanics Characterization Using Optical Coherence Tomography**
Fuqiang Zhong[1], Yi Hua[1], Junchao Wei[1], Manik Bansal[1], Juan Reynaud[2], Brad Fortune[2], Ian A. Sigal[1]
[1]University of Pittsburgh, [2]Devers Eye Institute, Legacy Health Research Institute

11:39AM **The Curvature and Collagen Network of the Human Lamina Cribrosa in Glaucoma and Control Eyes**
Cameron Czerpak[1], Yik Tung Tracy Ling[1], Joan Jefferys[1], Harry Quigley[1], Thao Nguyen[1]
[1]Johns Hopkins University

11:52AM **Assessment of the Poroelastic Mechanical Properties of Porcine Optic Nerve Head Using Micromechanical Testing and Biphasic Mixture Modeling**
Babak N. Safa[1], A. Thomas Read[1], C. Ross Ethier[1]
[1]Georgia Institute of Technology

12:05PM **Do Glycosaminoglycans Act as a Structural Constituent of the Scleral Tissue?**
Hamed Hatami-Marbini[1], Mohammad Pachenari[1]
[1]University of Illinois at Chicago

Thursday, June 17	**11:00AM – 12:30PM EDT**

PhD Student Paper Competition 5: Cardiovascular Fluid Biomechanics

Mogul Madness

Session Chair: Rana Zakerzadeh, Duquesne University
Session Chair: **Anne Robertson,** University of Pittsburgh

11:00AM **Spectral Bandedness in High Fidelity CFD Predicts Rupture Status in Intracranial Bifurcation Aneurysms**
Daniel MacDonald[1], Mehdi Najafi[1], Lucas Temor[1], David Steinman[1]
[1]University of Toronto

11:15AM **A Deep-Learning Approach for Direct Whole-Heart Mesh Reconstruction**
Fanwei Kong[1], Shawn Shadden[1]
[1]University of California, Berkeley

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11:30AM **Unraveling the Etiology of Discrete Subaortic Stenosis: Focus on Hemodynamics**
Jason Shar[1], Sundeep Keswani[2], K. Jane Grande-Allen[3], Philippe Sucosky[4]
[1]Wright State University, [2]Texas Children's Hospital, [3]Rice University, [4]Kennesaw State University

11:45AM **Wall Shear Stress Topological Skeleton Analysis in Image-Based Stented Coronary Bifurcation Models**
Valentina Mazzi[1], Claudio Chiastra[1], Diego Gallo[1], Umberto Morbiducci[1]
[1]Politecnico di Torino

12:00PM **Harmonic Distortion as a Noninvasive Means to Assess Blood Pressure Waveform and Arterial Stiffness**
Nicholas Milkovich[1], Anastasia Gkousioudi[1], Francesca Seta[1], Bela Suki[1], Yanhang Zhang[1]
[1]Boston University

12:15PM ***In Vitro* Assessment of the Effects of Cardiac Output and Valve Orientation on Bioprosthetic Pulmonary Valve Hemodynamics**
Nicole K. Schiavone[1], Christopher J. Elkins[1], Doff B. McElhinney[1], John K. Eaton[1], Alison L. Marsden[1]
[1]Stanford University

Thursday, June 17	**1:00PM – 2:30PM EDT**

Cardiac Function and Modeling

Saddle Ridge

Session Chair: Jonathan Wenk, University of Kentucky
Session Chair: **Anna Grosberg,** University of California, Irvine

1:00PM **Multiscale Model of Heart Growth During Pregnancy: Integrating Mechanical and Hormonal Signaling**
Kyoko Yoshida[1], Jeffrey Saucerman[1], Jeffrey Holmes[2]
[1]University of Virginia, [2]University of Alabama at Birmingham

1:13PM **ATP Utilization During Generation and Maintenance of Contractile Stress in Striated Muscle**
Andrew Schmidt[1], Alexander Grosberg[2], Anna Grosberg[1]
[1]University of California, Irvine, [2]New York University

1:26PM **Multiscale Modeling of LV Growth Under Autonomic Regulation of Baroreflex Feedback Loop**
Hossein Sharifi[1], Charles Mann[1], K Alexus Rockward[1], Kenneth Campbell[1], Jonathan Wenk[1]
[1]University of Kentucky

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1:39PM **Histo-Mechanics of the Passive Right Ventricular Myocardium**
Sotirios Kakaletsis[1], Gabriella P. Sugerman[1], Tomasz Jazwiec[2], Marcin Malinowski[2], Tomasz A. Timek[2], Manuel K. Rausch[1]
[1]University of Texas at Austin, [2]Cardiothoracic Surgery Spectrum Health

1:52PM **Sex Differences in Right Ventricular Functional Remodeling in an Animal Model of Pulmonary Arterial Hypertension**
Ethan Kwan[1], Daniela Velez-Rendon[2], Hao Mu[1], Daniela Valdez-Jasso[1]
[1]University of California San Diego, [2]University of Illinois at Chicago

2:05PM **Evaluation of Constrained Mixture Theory on Cell-Sparse Systems: Application to Cerebral Aneurysms**
Elizabeth Shih[1], Victor Barocas[1], Patrick Alford[1]
[1]University of Minnesota – Twin Cities

Thursday, June 17	**1:00PM – 2:30PM EDT**

Cardiovascular Design, Devices and Imaging

Mud Springs

Session Chair: Choon Hwai Yap, Imperial College London
Session Chair: **Caitriona Lally,** Trinity College Dublin

1:00PM **Annular Holding Strength and Microstructure in a Diseased Animal Model: An *Ex Vivo* Study**
Sanchita Bhat[1], Beatrice Ncho[1], Md. Tausif Salim[1], Emma Hazenberg[1], Dharani Balakumar[1], Andrew Siefert[1], Robert Gorman[2], Joseph Gorman[2], Ajit Yoganathan[1]
[1]Georgia Institute of Technology, [2]University of Pennsylvania

1:13PM **Made to Measure: 3D Printing Patient Specific Paediatric Stents**
Orla McGee[1], Sam Geraghty[1], Celia Hughes[1], Parastoo Jamshidi[2], Damien Kenny[3], Moataz Attallah[2], Caitriona Lally[1]
[1]Trinity College Dublin, [2]University of Birmingham, [3]Our Lady's Hospital, Crumlin

1:26PM **Hemodynamic Diversities Between Four Stent Graft Systems Via Patient-Based Simulations**
Anastasios Raptis[1], Michalis Xenos[2], George Kouvelos[3], Konstantinos Spanos[3], Athanasios Giannoukas[3], Miltiadis Matsagkas[3]
[1]Institute of Vascular Diseases, Larissa, [2]University of Ioannina, [3]University of Thessaly, Larissa

1:39PM **Experimental Framework for MRI-Based Measurement of Myocardial Stiffness in 3D-Printed Heart Phantoms**
Fikunwa Kolawole[1], Tyler Cork[1], Michael Loecher[1], Seraina Dual[1], Marc Levenston[1], Daniel Ennis[1]
[1]Stanford University

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1:52PM **Factors Explaining the Differences in 2D and 3D Fetal Echocardiography Strain Measurements**
Meifeng Ren[1], Wei Xuan Chan[1], Aimee Armstrong[2], Andreas Tulzer[3], Gerald Tulzer[3], Martin Lindsay Buist[1], Choon Hwai Yap[4]
[1]National University of Singapore, [2]The Heart Center, Nationwide Children's Hospital, Columbus, Ohio, [3]Dept of Pediatric Cardiology, Kepler University Hospital, Linz, [4]Imperial College London

2:05PM **Hypertrophic Cardiomyopathy Progression Characterized via Spatiotemporal Strain Mapping from 4D Ultrasound**
Frederick W. Damen[1], Daniel P. Gramling[1], Craig J. Goergen[1]
[1]Purdue University

Thursday, June 17	**1:00PM – 2:30PM EDT**

PhD Student Paper Competition 6: Mechanobiology and Musculoskeletal Tissue Engineering

Mogul Madness

Session Chair: Brianne Connizzo, Boston University
Session Chair: **Ryan Pedrigi**, University of Nebraska-Lincoln

1:00PM **Slow Stretch Mirroring ACL Growth Rates Drives Zonal Ligament-To-Bone Enthesis Maturation**
Ethan Brown[1], Jennifer Puetzer[1]
[1]Virginia Commonwealth University

1:15PM **Unilateral, Daily Bouts of Muscle Loading Leads to Mineral and Extracellular Adaptation of the Immature Achilles Enthesis in Mice**
Elahe Ganji[1], Bill Duncan[1], Angela Livingston[1], Noelle Whyte[2], Matthew Stepanovich[2], Megan Killian[2]
[1]University of Delaware, [2] University of Michigan

1:30PM **Mechano-Regulation of Embryonic Meniscus Development**
Tonia Tsinman[1], Xi Jiang[1], Saima Ahmed[2], Aurelie Levillain[2], Yuming Huang[2], Eiki Koyama[3], Niamh Nowlan[2], Nathaniel Dyment[1], Robert Mauck[1]
[1]University of Pennsylvania, [2]Imperial College of London, [3]Children's Hospital of Philadelphia

1:45PM **Targeting Hedgehog Signaling to Improve Zonal Tendon-to-bone Repair**
Timur Kamalitdinov[1], Keitaro Fujino[1], Xi Jiang[1], Mary Kate Evans[1], Miltiadis Zgonis[1], Andrew Kuntz[1], Nathaniel Dyment[1]
[1]University of Pennsylvania

2:00PM **Curvature Sensing IRSp53 Is Critical for Migrational Persistence in Cells Crawling On Suspended Nanofibers**
Apratim Mukherjee[1], Bahareh Behkam[1], Shiro Suetsugu[2], Amrinder Nain[1]
[1]Virginia Tech, [2]Nara Institute of Science and Technology

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2:15PM **Mechanical Stimulation Mediates the Changes in Multiscale Tendon Mechanics Observed During Embryonic Development**
Benjamin Peterson[1], Spencer Szczesny[1]
[1]Pennsylvania State University

Poster Session

Poster Session IV	Thursday, June 17, 2:30PM – 4:00PM EDT

Posters: Computational and Experimental Biofluid Mechanics II

Aspen Glade

Session Chair: John LaDisa, Marquette University
Session Chair: Alejandro Roldan-Alzate, University of Wisconsin-Madison

Validation of Hepatic Factor Computational Fluid Dynamics Simulations for Pre-Surgical Planning
Reza Rasooli[1], K. Banu Kose[2], S. Samaneh Lashkarinia[1], Kerem Pekkan[1]
[1]Koc University, [2]Istanbul Medipol University

Automated Estimation of Patient-Specific Boundary Conditions for Cardiovascular Simulations: An Optimal Control Approach
Elisa Fevola[1], Francesco Ballarin[2], Laura Jimenez-Juan[3], Stephen Fremes[3], Piero Triverio[4], Stefano Grivet-Talocia[1], Gianluigi Rozza[2]
[1]Politecnico di Torino, [2]SISSA - International School for Advanced Studies, [4]St Michael's Hospital and Sunnybrook Research Institute, [4]University of Toronto

Computational Assessment of a Novel Design of Trileaflet Mechanical Heart Valve Implanted in Aortic Position
Syed Samar Abbas[1], Iman Borazjani[1]
[1]Texas A&M University

Characterizing the Local Resistance and Inertance of Aneurysm Segment to Study the Changes Induced by Flow Diverters in 0D Brain Model
Sara Hadad[1], Fernando Mut[1], Juan R. Cebral[1]
[1]George Mason University

Effect of Blood Pressure Conditions on Transcatheter Aortic Valve Performance and Coronary Flow
Brennan Vogl[1], Rajat Gadhave[1], Mohamad Alkhouli[2], Scott Lilly[3], Hoda Hatoum[1]
[1]Michigan Technological University, [2]Mayo Clinic, [3]The Ohio State University

A Computational Investigation of the Impact of Graft Geometry on Hemodynamic Performance for a Right-Heart Pump Anastomosis
Nicolas Tobin[1], Bryan Good[1], William Weiss[2], Keefe Manning[1]
[1]The Pennsylvania State University, [2]Penn State Hershey Medical Center

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Effect of Postural Adjustment and Repositioning on Contact Penetrations in Human Body Models
Juliette Caffrey[1], Casey Costa[1], Wade von Kleeck[1], Ashely Weaver[1], Jason Hallman[2], F. Scott Gayzik[1]
[1]Wake Forest University, [2]Toyota Motor Eng. & Mfg.

Pre-Surgical Planning of Femoropopliteal Bypass Operation Based on Patient Specific *In Silico* Simulation
K. Banu Kose[1], Muhammed Bayram[2], Cagdas Topel[2], Senol Piskin[3]
[1]Medipol University, [2]Istanbul Mehmet Akif Ersoy Thoracic and Cardiovascular Surgery Training and Research Hospital, [3]Istinye University

The Effect of Aorta Shape on Type a Dissection Risk
Jessica Williams[1], David Marlevi[2], Marie Billaud[1], Thomas Gleason[1], Elazer Edelman[2]
[1]Brigham and Women's Hospital, [2]Massachusetts Institute of Technology

Computational Analysis of Quantitative Echocardiographic Assessments of Functional Mitral Regurgitation: Vena Contracta Area (VCA) Method
Tongran Qin[1], Andres Caballero[1], Rebecca Hahn[2], Raymond McKay[3], Wei Sun[1]
[1]Georgia Institute of Technology, [2]Columbia University Medical Center, [3]The Hartford Hospital

Significance of Gags in Unconfined Compression Response of Posterior Porcine Sclera
Anshul Bhardwaj[1], Hamed Hatami-Marbini[1]
[1]University of Illinois at Chicago

Posters: Soft Tissue Biomechanics

Aspen Glade

Session Chair: Thao (Vicky) Nguyen, Johns Hopkins University
Session Chair: Kristin Myers, Columbia University

The Effect of Permeability Boundary Conditions on the Reserve Zone Chondrocyte Subjected to Different Loading Rates
Masumeh Kazemi[1], John Williams[1]
[1]University of Memphis

A Continuum Mechanics Approach to Model Stiffness Sensing by Smooth Muscle Cells
Ali Akbar Karkhaneh Yousefi[1], Claudie Petit[1], Stephane Avril[1]
[1]Mines Saint-Etienne, Université de Lyon

Tissue Growth and Resorption Finite Element Model to Evaluate Expanders That Aid in Cleft Palate Repair
Tyler Gathman[1], Katherine Brought[2], Robert Tibesar[1], Arthur Erdman[1], David Nedrelow[1]
[1]University of Minnesota, [2]Iowa State University

Mechanical Testing of Type II Collagen Networks: Towards Modulating Mechanics, Identifying Single-Fiber Properties, and Establishing Multiscale Models
Phoebe Szarek[1], David M. Pierce[1]
[1]University of Connecticut

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Spatial Heterogeneity of the White Matter Stiffness in the Corpus Callosum of the Mouse Brain
Xuesong Zhang[1], Johannes Weickenmeier[1]
[1]Stevens Institute of Technology

A Volumetric Growth and Remodeling Framework Towards Predicting the Progression of Osteoarthritis in Articular Cartilage
Muhammed M. Rahman[1], Thomas S. E. Öst[2], Corey P. Neu[3], David M. Pierce[1]
[1]University of Connecticut, [2]FOI Swedish Defense Research Agency, [3]University of Colorado Boulder

Lung Lobar Sliding Helps Reduce Parenchymal Distortion During Breathing
Adam Galloy[1], Ryan Amelon[1], Joseph Reinhardt[1], Madhavan Raghavan[1]
[1]University of Iowa

Numerically Modelling Skin-PPE Interaction to Reduce Injury in Healthcare Workers During the COVID-19 Pandemic
Rikeen Jobanputra[1], Sravani Royyuru[1], Jack Hayes[1], Marc Masen[1]
[1]Imperial College London

On the Characterization of Embryonic Curvatures Using Bezier Curves
Ashok Ramasubramanian[1]
[1]Union College

Specimen-Specific Fiber-Based Modeling and Simulation of Sclera Collagen Fiber Microstructure and Biomechanics
Fengting Ji[1], Manik Bansal[1], Bingrui Wang[2], Yi Hua[1], Felix Matuschke[3], Markus Axer[3], Ian Sigal[1]
[1]University of Pittsburgh, [2]Southwest Jiaotong University, [3]Forschungszentrum Jülich GmbH

The Anisotropic Mechanical Properties of Human Uterus
Shuyang Fang[1], James McLean[1], Joy Vink[1], Christine Hendon[1], Kristin Myers[1]
[1]Columbia University

Implementing Variable-Stiffness Springs for Modeling the Viscoelastic Behavior of the Porcine Urinary Bladder
Tyler Tuttle[1], Sara Roccabianca[1]
[1]Michigan State University

A Nonlinear Fibrous Viscoelastic Model Describes the Experimental Tensile Material Behavior of Human Cervix
Lei Shi[1], Joy Vink[1], Ronald Wapner[1], Kristin Myers[1]
[1]Columbia University

Investigating Conforming and Nonconforming Meshes in Human Lamina Cribrosa Subdomain Simulations
Hirut Kollech[1], Jonathan Vande Geest[1]
[1]University of Pittsburgh

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A Two-Scale Homogenization Scheme for Saturated Porous Media in Three Dimensions
Ashkan Almasi[1], Tim Ricken[2], David M. Pierce[1]
[1]University of Connecticut, [2]University of Stuttgart

Probing the Mechanical Properties of Chick Embryos Using Atomic Force Microscopy
Joel Lefever[1], Jack Edson[1], Ashok Ramasubramanian[1]
[1]Union College

Changes to Micturition Patterns and Urinary Bladder's Extracellular Matrix Mechanical Behavior in an Animal Model of Radiation Cystitis
Marissa Grobbel[1], Bernadette Zwaans[2], Elijah Ward[2], Laura Lamb[2], Sara Roccabianca[1]
[1]Michigan State University, [2]Beaumont Health

Modeling the Human Lens Capsule with Implanted Accommodative Intraocular Lens
Kurt Ameku[1], Ryan Pedrigi[1]
[1]University of Nebraska-Lincoln

Crosslinks and Toughness of Gelatin Hydrogels for Tissue Engineering
Anshul Shrivastava[1], Namrata Gundiah[1]
[1]Indian Institute of Science, Bengaluru

Ocular Biomechanics due to the Ground Blast Reinforcement of an Improvised Explosive Device at Various Heights
Alireza Karimi[1], Reza Razaghi[2], Christopher A Girkin[1], J. Crawford Downs[1]
[1]University of Alabama at Birmingham, [2]Research Department, Heel of Scene Ltd., Tokyo

Parallel Stage Mechanism for Image Guided and Targeted MR Elastography
Efe Ozkaya[1], Waiman Meinhold[2], Derek Petti[1], Emily Triolo[1], Paul Kennedy[3], Lazar Fleysher[3], Jun Ueda[2], Mehmet Kurt[1]
[1]Stevens Institute of Technology, [2]Georgia Institute of Technology, [3]BioMedical Engineering and Imaging Institute

Development of a Method to Quantify Elastin Content in Large Datasets of Bladder Tissue Histology with Machine Learning Algorithm
Eli Broemer[1], Sara Roccabianca[1]
[1]Michigan State University

Effect of Stent Orientation on Aortic Root Stress during Transcatheter Aortic Valve Deployment: A Computational Study
Atefeh Razavi[1], Srikrishna SivaKumar[1], Breandan Yeats[1], Vinod Thourani[2], Venkateshwar Polsani[2], Pradeep Yadav[2], Lakshmi Prasad Dasi[1]
[1]Georgia Institute of Technology, [2]Piedmont Heart Institute

Decoupling Hydrostatic and Deviatoric Strain Energy Density in Biomaterials with Poisson's Ratio Larger Than 0.5
Amevi Semodji[1], Katherine Hollar[1], Gunes Uzer[1], Trevor Lujan[1]
[1]Boise State University

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Effect of Region and Direction on Meniscus Elasticity as Measured by Atomic Force Microscopy
Kevin Orton[1], Wyndham Batchelor[1], Noel Ziebarth[1], Francesco Travascio[1], Alicia Jackson[1]
[1]University of Miami

Stress and Strain Distribution Analysis of Specimen-Specific Interweaved Fiber Sclera Model Under Equi-Biaxial Strain
Manik Bansal[1], Fengting Ji[1], Yi Hua[1], Fuqiang Zhong[1], Ian A. Sigal[1]
[1]University of Pittsburgh

Effect of Temperature on Equilibrium Compressive Modulus of Immature Bovine Articular Cartilage
C.V. Sise[1], Kimberly Kroupa[1], Jiashuai Fan[1], Clark Hung[1], Sinisa Vukelic[1], Gerard Ateshian1
[1]Columbia University

Inverse Finite Element Modeling of *Ex-Vivo* Organ-Scale Porcine Lung Based on 3d Digital Image Correlation and Controlled Pressure-Volume Loading
Mohammad Maghsoudi-Ganjeh[1], Crystal Mariano[1], Samaneh Sattari[1], Mona Eskandari[1]
[1]Univeristy of California-Riverside

Energy Dissipation in the Meniscus: A Parametric Study on Tissue Properties and Mechanical Loading Conditions
Massimiliano De Rosa[1], Alicia Jackson[1], Francesco Travascio[1]
[1]University of Miami

Efficacy of Combinational Therapy on Bone Restoration and Compensation After Contusion Spinal Cord Injury
Valerie Lallo[1], Michael Feeley[1], Anita Singh[1]
[1]Widener University

The Role of Glycosaminoglycans in Anterior and Posterior Scleral Swelling and Tensile Behavior
Mohammad Pachenari[1], Hamed Hatami-Marbini[1]
[1]University of Illinois at Chicago

Effects of Covid-19 Inflammation on the Regional Behavior of the Lung: A Computational Study
Sunder Neelakantan[1], Hamed Babaei[1], Reza Avazmohammadi[1]
[1]Texas A&M University

It Takes Both: on the Protein Interactions of Neurofibrillary Tangles and Amyloid Beta Plaques in Alzheimer's Disease
Trisha Gollamudi[1], Shima Jalalian[1], Johannes Weickenmeier[1]
[1]Stevens Institute of Technology

Development of a Novel Testing System to Evaluate Microscale Mechanics at the Vitreoretinal Interface
Joseph Phillips[1], Brittany Coats[1]
[1]University of Utah

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Posters: Tissue Engineering

Aspen Glade

Session Chair: Feng Xu, Xi'an Jiaotong University

Methacrylated Recombinant Collagen Peptide (RCP-MA) As Collagen Mimicking 3D Hydrogel Model for Cardiac Tissue Engineering
Dylan Mostert[1], Ignasi Jorba[1], Leda Klouda[1], Nicholas Kurniawan[1], Carlijn Bouten[1]
[1]Eindhoven University of Technology

Characterization of Oxidatively Responsive Thiol-Ene Networks for Tissue Engineering Applications
Tyler Touchet[1], Samuel Briggs[1], Lance Graul[1], Duncan Maitland[1]
[1]Texas A&M University

Characterization of an Electrospun Polyurethane with Tunable Chemistry and Thiol-ene Crosslinking for Biomedical Applications
Samuel Briggs[1], Scott Herting[1], Grace Fletcher[1], Mary Beth Browning Monroe[2], Duncan Maitland[1]
[1]Texas A&M University, [2]Syracuse University

Image Based Evaluation of *In Vivo Degradation* for Shape Memory Polyurethane Foam in Embolic Applications
Lance Graul[1], Thomas Cheung[1], Staci Jessen[1], Landon Nash[2], Duncan Maitland[1]
[1]Texas A&M University, [1]Shape Memory Medical Inc.

Investigating the Role of Patterned ECM Stiffness and Proliferation During Branching Morphogenesis in the Embryonic Kidney
Somdutta Chakraborty[1], Thomas Carroll[2], Victor Varner[1]
[1]The University of Texas at Dallas, [2]University of Texas Southwestern Medical Center

Computer-Aided Molecular Design of Water Compatible Monomer for Dental Application
Yonas. Rufael[1], Ruben Molina[1], Farhana Abedin[1]
[1]California State Polytechnic University Pomona

A Microfluidic Approach to Create Gradients in Collagen Fiber Anisotropy
Indranil M. Joshi[1], Mehran Mansouri[1], Adeel Ahmed[1], Steven W. Day[1], Vinay V. Abhyankar[1]
[1]Rochester Institute of Technology

Fabrication of 3D Printer Associated Rotatory Bioreactor for Vascular Tissue Engineered Structures
Khemraj Deshmukh[1], Arindam Bit[1], Esther Beltran[2], Kunal Mitra[3]
[1]National Institute of Technology, [2]University of Central Florida, [3]Florida Tech

Macroscale Mechanical Characterization of Heterogeneous Fibrin Gels with Varying Density
Julian Jimenez[1], Yifan Guo[1], Adrian Buganza-Tepole[1], Sarah Calve[2]
[1]Purdue University, [2]University of Colorado, Boulder

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An *In Vitro* Model of Bone Ingrowth in a Porous Titanium Scaffold
Alyssa Oberman[1], Brett English[2], Weidong Tong[2], Glen Niebur[1]
[1]University of Notre Dame, [2]DePuy Synthes

Development of a 3D *In Vitro* Vascularized Human Skin Equivalent Utilizing Collagen/Keratin Hydrogels
Kameel Zuniga[1], Neda Ghousifam[1], Mark Van Dyke[2], Marissa Rylander[1]
[1]University of Texas at Austin, [2]University of Arizona

Development and Utilization of a Vascularized 3D-Printed *In Vitro* Physiologically Representative Skin Tissue Platform for Burn Injury Investigation
Sean Brocklehurst[1], Neda Ghousafim[1], Kameel Isaac[1], Danielle Stolley[1], M. Nichole Rylander[1]
[1]University of Texas in Austin

Accelerated Degradation of Electrospun Polycaprolactone Tissue Engineering Scaffolds Under Dynamic Loading Conditions
Emily Clement[1], Johane Bracamonte[1], Joao Soares[1]
[1]Virginia Commonwealth University

Thursday, June 17	**4:00PM – 5:30PM EDT**

Computational and Experimental Modeling of Cardiovascular Interventions

Mud Springs

Session Chair: Luke Timmins, University of Utah
Session Chair: **Jessica Oakes,** Northeastern University

4:00PM ***In Vivo* Estimation of Regional Mechanical Properties of the Aortic Wall Accounting for the Active and Passive Effect of Periaortic Structures with an Inverse Finite Element Approach**
Johane Bracamonte[1], John Wilson[1], Joao Soares[1]
[1]Virginia Commonwealth University

4:13PM **Engineering Analysis of Aortic Wall Stress and Root Dilation in the V-Shape Surgery for Ascending Aortic Aneurysms**
Hai Dong[1], Minliang Liu[1], Tongran Qin[1], Liang Liang[2], Bulat Ziganshin[3], Hesham Ellauzi[3], Mohammad Zafar[3], Sophie Jang[3], John Elefteriades[3], Wei Sun[1]
[1]Georgia Institute of Technology, [2]University of Miami, [3]Yale University

4:26PM **Impact of Flow Rate on High Frequency Flow Instabilities in Intracranial Aneurysms, with Implications for Wall Vibration**
David Bruneau[1], Mehdi Najafi[1], Thangam Natarajan[2], Kristian Valen-Sendstad[2], David Steinman[1]
[1]University of Toronto, [2]Simula Research Laboratory

4:39PM **Hemodynamic Simulations to Predict Successful vs. Unsuccessful Catheter Interventions: Proof-of-Concept and Experimental Validation in Swine**
Ryan Pewowaruk[1], Luke Lamers[1], Alejandro Roldan-Alzate[1]
[1]University of Wisconsin - Madison

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4:52PM **A Novel Dynamic Blalock-Taussig Shunt Regulator: An *In Vitro* Study**
Milad Samaee[1], Subhadhara Shashidharan[2], Kevin Maher[3], Ajit Yoganathan[1], Lakshmi Prasad Dasi[1]
[1]Georgia Institute of Technology, [2]Emory University School of Medicine, [3]Children's Healthcare of Atlanta

5:05PM **Haemodynamic Analysis of Branched Endografts for Complex Aortic Arch Repair**
Sampad Sengupta[1], Yu Zhu[1], Mohamad Hamady[1], Yun Xu[1]
[1]Imperial College London

Thursday, June 17	**4:00PM – 5:30PM EDT**

Mechanobiology in Tissue and Cellular Engineering

Alpine Drift

Session Chair: Eno Ebong, Northeastern University
Session Chair: **Spencer Szczesny,** Penn State University

4:00PM **Tensional Homeostasis Regulates Chromatin Accessibility and Represses Matrix Degradation Pathways Through Yap/Taz**
Dakota Jones[1], Xi Jiang[1], Eddie Bonnevie[1], Elisabeth Lemmon[1], Mary Kate Evans[1], Su-Jin Heo[1], Nathaniel Dyment[1], Robert Mauck[1]
[1]University of Pennsylvania

4:13PM **Long-Term Effect of TBI-Like Shear Stimuli on Astrocytes**
Tasnim Shireen[1], Susan Hua[1]
[1]University at Buffalo SUNY

4:26PM **The Primary Cilium Regulates Mechanoresponsive Pathways in Tenocytes**
McKenzie Sup[1], Fei Fang[1], Stavros Thomopoulos[1]
[1]Columbia University

4:39PM **Mechanical Stiffness Regulates Chromatin Remodeling in Mesenchymal Stem Cells**
Samantha Kaonis[1], Soham Ghosh[1]
[1]Colorado State University

4:52PM **On the Relation Between 3D Aortic Valve Interstitial Cell Shape and Contractile Behavior**
Alex Khang[1], Quan Nguyen[1], Xinzeng Feng[1], Michael Sacks[1]
[1]The University of Texas at Austin

5:05PM **Escaping the Stiffness Trap: Adhesion Strength and Contractility Enable Metastatic Cells to Become Adurotactic**
Benjamin Yeoman[1], Gabe Shatkin[1], Pranjali Beri[1], Afsheen Banisadr[1], Parag Katira[2], Adam Engler[1]
[1]University of California, San Diego, [2]San Diego State University

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Thursday, June 17	4:00PM – 5:30PM EDT

Undergraduate Design Competition Live Session

Mogul Madness

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

4:00PM **The Development of a Mechanized Stepped Tension Brace for Treatment of Achilles Tendonitis in Collegiate Athletes**
Sneha Jeevan[1], Jack Latella[1], Mary Murray[1]
[1]University of Pittsburgh

4:15PM **Ventilators for the Developing World**
Grace L. Bugara[1], Taylor A. Corpuz[1], Maeve X. Enright[1], John B. Fortescue[1], Laurie A. Trainer[1], Vanessa S. Zighelboim[1], Michael Jaeggli[1], Lee Makowski[1], Marc Fuller[1]
[1]Northeastern University

4:30PM **Haptic Feedback to Aid the Visually Impaired**
John C. Tereck[1], Carter M. Roper[1], Peyton D. Duersel[1], Brandon M. Jackson[1], Matthew J. Kamin[1], Dario Martelli[1]
[1]The University of Alabama

4:45PM **Automatic Reclining Car Seat**
Md Joynal Abedin[1], Mohammad Shah Jalal[1], Alex Sullivan[1], Ahmee Cho[1], El Mokhtar Majdoub[1], Ahmed Ahmed[1], Parisa Saboori[1]
[1]The City College of New York

5:00PM **DynaCon PLS**
Robert Anhalt[1], Brooke Towns[1], Peter DiNapoli[1], Sebastian Moreno[1], Warren Dixon[1], Sean Niemi[1], Kimberly Stubbs[1]
[1]University of Florida

5:15PM **The MultiFlex Catheter - A Variable Stiffness Endovascular Catheter**
Halle R. Lowe[1], Vinay D. Chandrasekaran[1], Chase M. Hartquist[1], Jin V. Lee[1], Mohammed Zayed[1], Joshua W. Osbun[1], Eric C. Leuthardt[1], Michael Talcott[1], Guy M. Genin[1]
[1]Washington University in St. Louis

Thursday, June 17	4:00PM – 5:30PM EDT

Vascular Functioning and Modeling

Saddle Ridge

Session Chair: Hai-Chao Han, University of Texas, San Antonio
Session Chair: **Chiara Bellini,** Northeastern University

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4:00PM **Computational Modeling on Transmural Distribution of Coronary Perfusion and Myocardial Work**

Lei Fan[1], Ravi Namani[1], Jenny Choy[2], Ghassan Kassab[2], Lik Chuan Lee[1]
[1]Michigan State University, [2]California Medical Innovation Institute

4:13PM **A Probabilistic and Anisotropic Failure Metric for Risk Assessment of Ascending Thoracic Aortic Aneurysm**

Minliang Liu[1], Liang Liang[2], Qing Zou[1], Yasmeen Ismail[1], Xiaoying Lou[3], Glen Iannucci[3], Edward Chen[3], Bradley Leshnower[3], John Elefteriades[4], Wei Sun[1]
[1]Georgia Institute of Technology, [2]University of Miami, [3]Emory University, [4]Yale University

4:26PM **Bent Buckling of Arteries with Non-Circular Cross Section**

Yasamin Seddighi[1], Hai-Chao Han[1]
[1]University of Texas San Antonio

4:39PM **Differential propensity of dissection along the aorta**

Ehsan Ban[1], Cristina Cavinato[1], Jay Humphrey[1]
[1]Yale University

4:52PM **AI-Accelerated Multiscale Modeling for Multi-Platelet Aggregation at Millisecond And Molecular Resolutions**

Peng Zhang[1], Yicong Zhu[1], Changnian Han[1], Jawaad Sheriff[1], Yuefan Deng[1], Danny Bluestein[1]
[1]Stony Brook University

5:05PM **Coupling NO-cGMP-PKG Chemical Pathway with Hemodynamics Model to Understand Regulation of Vascular Tone in the Pulmonary Vascular Tree**

Haritha Mullagura[1], Vasilina Filonova[2], Hamidreza Gharahi[2], C. Alberto Figueroa[2], Seungik Baek[1]
[1]Michigan State University, [2]University of Michigan

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Friday, June 18	11:00AM – 12:30PM EDT

Bioprinting and Biomanufacturing

Alpine Drift

Session Chair: Lijie Grace Zhang, George Washington University
Session Chair: **David Corr,** Rensselaer Polytechnic Institute

11:00AM **Mechanical Cues Drive the Robust Assembly of Microfabricated Stem Cell-Derived Cardiac Tissues**
Samuel DePalma[1], Austin Stis[1], Domenica Passariello[1], Christopher Davidson[1], Adam Helms[1], Brendon Baker[1]
[1]University of Michigan

11:13AM **Silk-Based Bio-ink with Interpenetrating Network for Extrusion Bio-printing**
Xuan Hao (Ernest) Tan[1], Wen Xin Tan[1], Cho Hong James Goh[1]
[1]National University of Singapore

11:26AM **3D Printed Microstructures for Regenerative Osteochondral Implants**
Kevin Eckstein[1], Camila Uzcategui[1], Stephanie Bryant[1], Robert McLeod[1], Virginia Ferguson[1]
[1]University of Colorado at Boulder

11:39AM **Migration Patterns of Contractile Cell Fragments on ECM Mimicking Suspended Fibers**
Abinash Padhi[1], Brooke Danielson[2], Deema Alabduljabbar[3], Ji Wang[1], Daniel Conway[2], Rakesh Kapania[1], Amrinder Nain[1]
[1]Virginia Tech, [2]Virginia Commonwealth University, [3]University of California Davis

11:52AM **Tunable Physical and Soluble Microenvironmental Cues Synergistically Enhance Tenocyte Migration**
Robert Kent[1], Mohamed Said[1], Megan Busch[1], Daniel Matera[1], William Wang[1], Samuel DePalma[1], Harrison Hiraki[1], Megan Killian[1], Adam Abraham[1], Jae-Won Shin[2], Ariella Shikanov[1], Brendon Baker[1]
[1]University of Michigan, [2]University of Illinois Chicago

12:05PM **Single Cell Analysis of VCAM-1 Protein Expression by Micropatterned Endothelial Cells**
Meghan Fallon[1], Monica Hinds[1]
[1]Oregon Health & Science University

Friday, June 18	11:00AM – 12:30PM EDT

Cardiovascular Tissue Engineering and Mechanobiology

Saddle Ridge

Session Chair: Emma Lejeune, Boston University
Session Chair: **Daniela Valdez-Jasso,** University of California, San Diego

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11:00AM **Lymphocyte Nanomechanics in Response to Stent Implantation**
Konstantinos Kapnisis[1], Andreas Stylianou[2], Despoina Kokkinidou[1], Marianna Prokopi[1], Andreas Anayiotos[1]
[1]Cyprus University of Technology, [2]European University Cyprus

11:13AM **SarcGraph: Automated Segmentation, Tracking, and Analysis of Sarcomeres in Human Induced Pluripotent Stem Cell Derived Cardiomyocytes**
Bill Zhao[1], Emma Lejeune[1]
[1]Boston University

11:26AM **Post-Stretch Recovery of Vascular Smooth Muscle Cells is Strain Rate Dependent**
Samuel Boland[1], Patrick Alford[1]
[1]University of Minnesota

11:39AM **Microenvironmental Determinants of Organized Stem Cell-Derived Cardiac Tissues on Synthetic Fibrous Matrices**
Samuel DePalma[1], Christopher Davidson[1], Austin Stis[1], Adam Helms[1], Brendon Baker[1]
[1]University of Michigan

11:52AM **Changes in Right Ventricle Viscoelasticity with Maturation**
Wenqiang Liu[1], Michael Nguyen-Truong[1], Kevin Labus[1], Jeremiah Easley[1], Christian Puttlitz[1], Zhijie Wang[1]
[1]Colorado State University

12:05PM **Signaling Network Model of TSC1 Knock-Out Recapitulates a Degradative Vascular Smooth Muscle Cell Phenotype**
Ana Estrada[1], Jay Humphrey[1]
[1]Yale University

Friday, June 18	**11:00AM – 12:30PM EDT**

Valvular Modeling I

Mud Springs

Session Chair: Michael Sacks, University of Texas at Austin
Session Chair: **Manuel Rausch,** University of Texas at Austin

11:00AM **Functional Mechanics of the Murine Pulmonary Heart Valve**
Xinzeng Feng[1], Yifei Liu[2], Hao Liu[1], Christopher Breuer[3], David McComb[2], Michael Sacks[1]
[1]University of Texas at Austin, [2]The Ohio State University, [3]Nationwide Children's Hospital

11:13AM **Pressure Drop and Recovery with MitraClip: An *In Vitro* Study**
Shelley Gooden[1], Breandan Yeats[1], Vinod Thourani[2], Konstantinos Boudoulas[3], Lakshmi Dasi[1]
[1]Georgia Institute of Technology, [2]Piedmont Heart Institute, [3]The Ohio State University Wexner Medical Center

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11:26AM **Evaluation of Affine Fiber Kinematics in Porcine Tricuspid Valve Leaflets**
Colton Ross[1], Arshid Mir[1], Harold Burkhart[1], Chung-Hao Lee[1]
[1]The University of Oklahoma

11:39AM **The Tricuspid Valve (Mal)adapts in Ovine Models of Ventricular Heart Disease**
William Meador[1], Artur Iwasieczko[2], Tomasz Jazwiec[2], Mrudang Mathur[1], Marcin Malinowski[2], Tomasz Timek[2], Manuel Rausch[1]
[1]University of Texas at Austin, [2]Spectrum Health

11:52AM **Comparative Computational Analysis of PASCAL and MitraClip Implantation in a Patient-Specific Left-Heart Model**
Ryan Errthum[1], Andres Caballero[1], Wei Sun[1]
[1]Georgia Institute of Technology

12:05PM **Polymeric TAVR Durability and Hydrodynamics Testing, Enhanced by Machine Learning for Tracking Leaflets Motion**
Brandon Kovarovic[1], Steven Crimarco[1], Ziji Zhang[1], Oren Rotman[1], Marvin Slepian[2], Danny Bluestein[1]
[1]Stony Brook University, [2]University of Arizona

Friday, June 18	**1:00PM – 2:30PM EDT**

Emerging Solid Mechanics Topics in Mechanobiology

Saddle Ridge

Session Chair: Edward Sander, University of Iowa
Session Chair: **Chiara Bellini,** Northeastern University

1:00PM **Modeling the Astrocytic Lamina and its Response to Increase in Intraocular Pressure**
Yik Tung Tracy Ling[1], Arina Korneva[1], Harry Quigley[1], Thao Nguyen[1]
[1]Johns Hopkins University

1:13PM **Oral All-Trans Retinoic Acid Treatment Alters Scleral Biomechanics and Induces Myopia**
Dillon Brown[1], Machelle Pardue[2], Ross Ethier[1]
[1]Georgia Institute of Technology, [2]Atlanta VA

1:26PM **Intraarticular MMP-1 in the Facet Joint Modifies the Capsular Ligament's Response to Load & that Response Correlates with the Extent of Degraded Collagen**
Meagan Ita[1], Sagar Singh[1], Beth Winkelstein[1]
[1]University of Pennsylvania

1:39PM **Effect of ECM Heterogeneity on Cell Mechanosensing**
Maria Proestaki[1], Jacob Notbohm[1]
[1]University of Wisconsin-Madison

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1:52PM **Mechanical Stress in Pancreatic Cancer: Signaling Pathway Adaptation Activates Cytoskeletal Remodeling and Enhances Cell Migration**
Maria Kalli[1], Ruxuan Li[2], Gordon B. Mills[3], Triantafyllos Stylianopoulos[2], Ioannis Zervantonakis[2]
[1]University of Cyprus, [2]University of Pittsburgh, [3]Oregon Health & Science University

2:05PM **Computational Analysis of the Role of Collagen Network Viscoelasticity in Rapid-Stretch *In-Vitro* Axon Injury Models**
Maryam Nikpasand[1], Jill Middendorf[1], Jonathan Marcelin[2], Beth Winkelstein[2], Victor Barocas[1]
[1]University of Minnesota, [2] University of Pennsylvania

Friday, June 18	**1:00PM – 2:30PM EDT**

Emerging Topics in Cell and Tissue Engineering

Alpine Drift

Session Chair: Will Richardson, Clemson University
Session Chair: **Soham Ghosh,** Colorado State University

1:00PM **Rapid Formation of 3D Tumor Model with Tumor-Stroma Interface at Extremely High Cell Density**
Cih Cheng[1], Bumsoo Han[1], George T Chiu[1]
[1]Purdue University

1:13PM **Nanomechanical Signature of Sarcomas Can Be Predictive of Response to Chemotherapy**
Andreas Stylianou[1,2], Fotios Mpekris[2], Chrysovalantis Voutouri[2], Triantafyllos Stylianopoulos[2]
[1]European University Cyprus, [2]University of Cyprus

1:26PM **Characterization of Thermal and Optical Properties of Porcine Pancreas Tissue for Plasmonic Photothermal Therapy**
Forhad Akhter[1], Santiago Manrique-Bedoya[1], Chris Moreau[1], Andrea Smith[1], Kathryn Mayer[1], Yusheng Feng, Lyle Hood[1]
[1]University of Texas at San Antonio

1:39PM **An *In Vivo* Demonstration of Adhesion Strength as a Predictive Measure of Metastatic Potential**
Katherine Birmingham[1], Pranjali Beri[1], Jerry Tuler[1], Benjamin Yeoman[1], Adam Engler[1]
[1]University of California San Diego

1:52PM **Contact Guidance During Breast Cancer Dissemination**
Kristen Loesel[1], Harrison Hiraki[1], Brendon Baker[1], Carole Parent[1]
[1]University of Michigan

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2:05PM **The Role of Ligand Density and Degradability in Hydrogel Induced Breast Cancer Dormancy**
Cindy Farino[1], Shantanuq Pradhan[1], John Slater[1]
[1]University of Delaware

Friday, June 18	1:00PM – 2:30PM EDT

Valvular Modeling II

Mud Springs

Session Chair: Wei Sun, Georgia Institute of Technology
Session Chair: **Lakshmi Dasi,** Georgia Institute of Technology

1:00PM **Clinical Risk Assessment of Post-TAVR Cardiac Conduction Abnormality Using Patient-Specific Bicuspid Aortic Valve Models**
Salwa Anam[1], Matteo Bianchi[1], Brandon Kovarovic[1], Ram Ghosh[1], Ashraf Hamdan[2], Rami Haj-Ali[2], Danny Bluestein[1]
[1]Stony Brook University, [2]Tel-Aviv University

1:13PM **Neo-Sinus and Sinus Flows After Transcatheter Aortic Valve Implantation of Evolut, SAPIEN 3, Accurate Neo and Allegra**
Hoda Hatoum[1], Shelley Gooden[2], Yasaman Farsiani[2], Milad Samaee[2], Janarthanan Sathananthan[3], Scott Lilly[4], Abul Rahman Ihdayhid[5], Vinod Thourani[6], Lakshmi Prasad Dasi[2]
[1]Michigan Technological University, [2]Georgia Institute of Technology, [3]St Paul's and Vancouver General Hospital, [4]The Ohio State University, [5]Monash Health, [6]Piedmont Hospital

1:26PM **Frequency Effect on Transcatheter Valve Motion and Fluid Dynamics in an Accelerated Environment**
Sailahari Ponnaluri[1], Keefe Manning[1], Michael Sacks[2]
[1]Penn State University, [2]University of Texas at Austin

1:39PM **Fluid-Structure Interaction Modeling of Patient-Specific Bicuspid Aortic Valves**
Tongran Qin[1], Andres Caballero[1], Wenbin Mao[2], Brian Barrett[1], Norihiko Kamioka[3], Stamatios Lerakis[3], Wei Sun[1]
[1]Georgia Institute of Technology, [2]University of South Florida, [3]Emory University

1:52PM **Patient-Specific Prediction of IMR Recurrence After Mitral Valve Surgical Repair**
Harshita Narang[1], Bruno Rego[1], Robert Gorman[2], Joseph Gorman[2], Michael Sacks[1]
[1]The University of Texas at Austin, [2]University of Pennsylvania

2:05PM **Towards Non-Invasive Computational-Mechanics and Imaging-Based Diagnostic Framework for Patients with Transcatheter Aortic Valve Replacement**
Vahid Khodaei[1], Zahra K. Motamed[1]
[1]McMaster University

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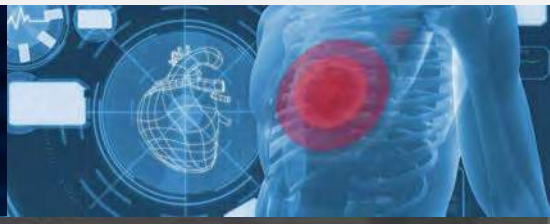

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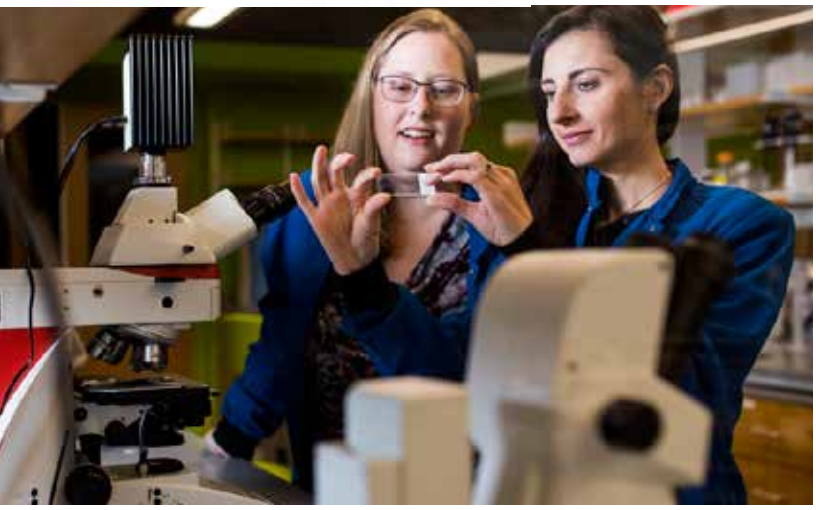
Northeastern Bioengineering



Professors Chiara Bellini and Jessica Oakes in the ISEC lab

The Department of Bioengineering offers students a broad education built on fundamentals in science, mathematics, and engineering, with a focus on the biological applications of engineering. The program is designed to provide a rigorous engineering training along with a comprehensive understanding of the biological constraints intrinsic to designing artificial systems to interface with, augment, replace, repair, or monitor living systems. These constraints depend on the properties of the biological system involved and the functionality that is being created.

The living system may be the human body; an ecosystem; or, more broadly, a bioreactor, tissue culture system, or any system with living components. The presence of naturally occurring biological tissue places special constraints on the design and implementation of artificial constructs and their interface to living systems. Bioengineers are engineers with comprehensive understanding of the engineering requirements intrinsic to working within a biological context.

Bioengineering is a relatively new field driven by the recognition that engineering of biological systems or systems that interface with living systems requires a multidisciplinary approach that takes into account the mechanical, electrical, chemical, and materials properties of the biological system. With that in mind, the bioengineering program has been designed to provide a rigorous engineering education that endows a broad understanding of the quantitative analysis of biological systems and a deep expertise in one of four areas of bioengineering.

Students joining the Bioengineering department will have unique opportunities in the classroom, research labs, and experiential learning. The projects that they may be able to contribute to include bio-bandages that monitor bacterial growth or that help damaged ligaments heal faster; sheets of cells folded like origami to form a working kidney; and new materials that–like a leaf in the sun–automatically sense and adapt to changes in the environment. This is truly an exciting time!

Total Students Enrolled
600

Curriculum concentrations
Biomedical Devices and Bioimaging
Cell and Tissue Engineering
Biomechanics

Research Areas
Intrinsically interdisciplinary, the Bioengineering department engages faculty from across the college and university, pursuing research in:

- Biocomputing & Information Processing (bioimaging, bioinformatics, simulation)
- Systems & Synthetic Biology (biomotor control, cell and tissue engineering, environmental biology, mechanobiology, metabolic engineering)
- Biodevices (biomaterials, BioMEMs, legal and regulatory issues, nanomaterials)

Total Co-op Employers
300

Representative Co-op Employers
Abiomed
Becton Dickenson
bluebird bio
Boston Scientific
Brigham and Women's
Eli Lilly
Hologic
Johnson & Johnson
Lyndra
Moderna
Solid Biosciences
Takeda
Thermo Fisher
Wyss Institute

Employer Types
Biotechnology
Alternative Biofuels
Medical Devices
Pharmaceuticals
Tissue Engineering
Imaging

Typical Co-op Jobs
Medical device design, drug development, process development, bioinformatics, genetic engineering, synthetic biology, biomedical imaging, biomedical materials, biomedical device and product manufacturing

Kerry Eller, Goldwater and Truman Scholar

Kritika Singh, Rhodes Scholar plans for PhD then MD

Jacob Potts, Fulbright Fellow

Minhal Ahmed, Mitchell Scholar, recently accepted to Harvard Medical School

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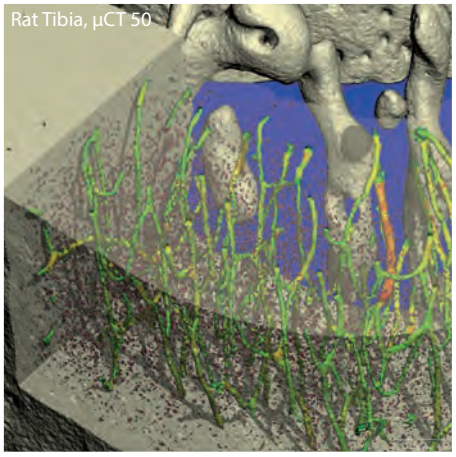

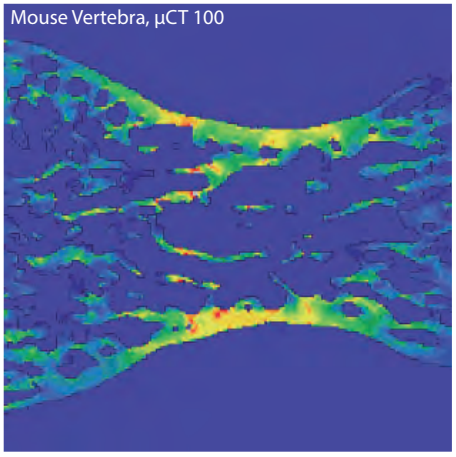

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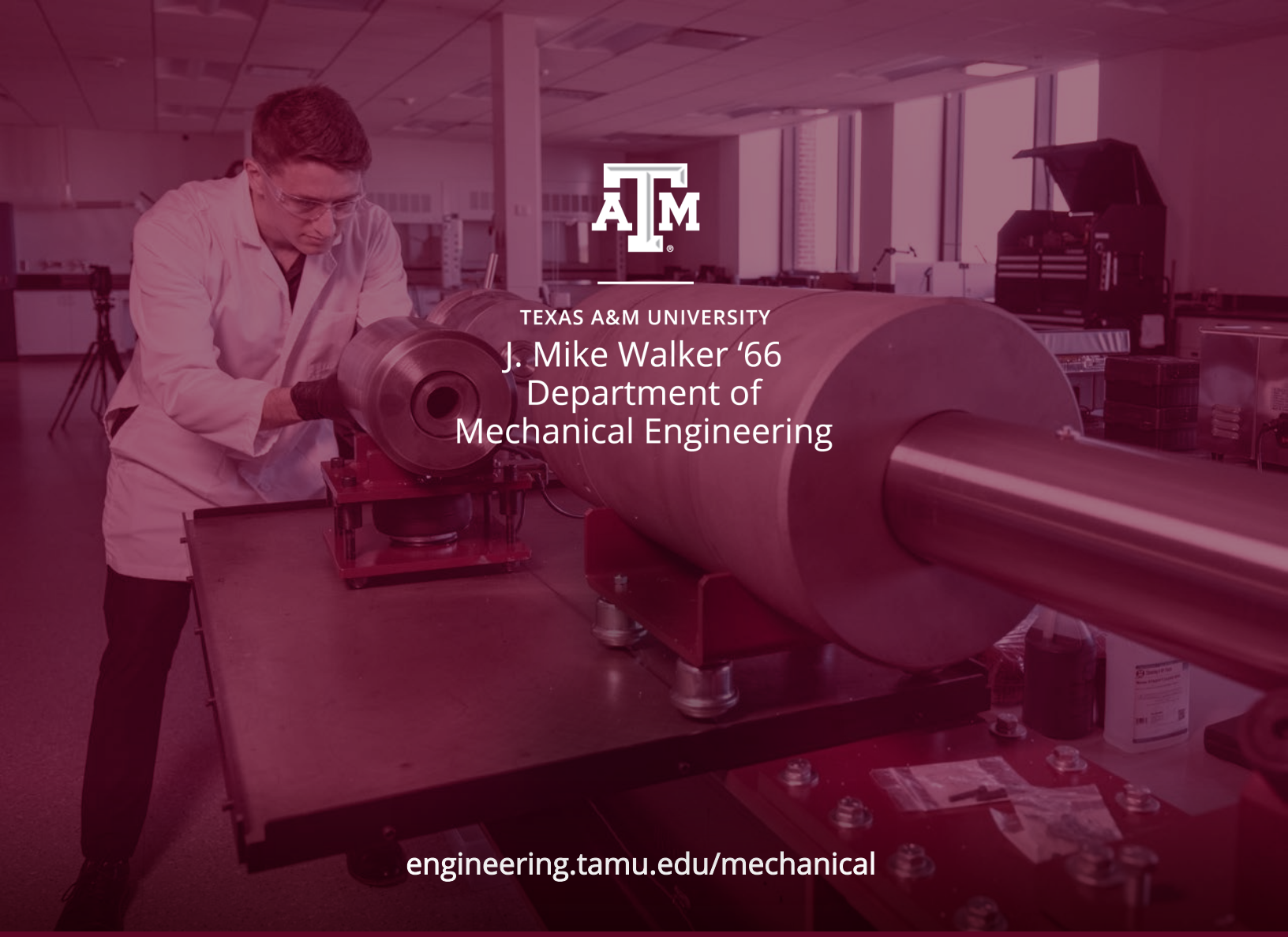

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- Micro and Nanosystems
- Robotics and Mechatronics
- Turbomachinery

To learn more about faculty, post-doctoral, and/or graduate student positions available in our department that are focused on Biomechanics, Biomechanical Engineering, Medical Technologies, and/or Human Health, please email Dr. Michael Moreno at michael.moreno@tamu.edu and/or Dr. Chandler Benjamin at ccbenjamin@tamu.edu

UCI Samueli School of Engineering | Department of Biomedical Engineering

The UCI **Department of Biomedical Engineering's** mission is to inspire engineering minds for the advancement of human health.

Established in 2002, the growth of biomedical engineering in the UCI Samueli School has been rapid. The department merges UCI's strengths in medicine, biological sciences and engineering. BME faculty are competitive in garnering extramural grants, with expenditures topping $30M on an annual basis. Strong ties with many of Orange county's more than 300 biomedical device and biotech companies provide students and faculty with distinct opportunities to solve contemporary medical challenges.

The UCI BME Department offers two undergraduate degree programs, an M.S. degree program, a Professional Masters of Engineering degree, a Ph.D. degree in biomedical engineering program, and a combined M.D./Ph.D. degree in conjunction with the UCI School of Medicine. There are currently 30 full-time faculty and 58 affiliated faculty. Research areas include micro/nano medicine, biophotonics, biocomputation and tissue engineering, with clinical emphases in neuroengineering, cardiovascular diseases, cancer and ophthalmology. Included in these opportunities are major campus research centers at the Beckman Laser Institute (biophotonics), the Edwards Lifesciences Center for Advanced Cardiovascular Technology, the Chao Family Comprehensive Cancer Center, the Integrated Nanosystems Research Facility, the Laboratory of Fluorescence Dynamics, and the Micro/nano Fluidics Fundamentals Focus Center. Because of its interdisciplinary nature, biomedical engineering attracts students with a variety of backgrounds.

http://www.bme.uci.edu

Please join us in 2022 for an in-person conference!