

# **LEAD Project Workshop on Mechanics, Modeling and Simulation of Aortic Dissection**

Schloss Seggau, Austria      October 19-21, 2020



**AORTIC DISSECTION**  
MECHANICS - MODELING - SIMULATION

Coordinated by

**Gerhard A. Holzapfel**, Institute of Biomechanics, TU Graz

**Malte Rolf-Pissarczyk**, Institute of Biomechanics, TU Graz

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## **Conference Venue**

Hotel Schloss Seggau  
Seggauberg 1  
8430 Leibnitz, Austria

<https://www.seggau.at/>

	<b>Monday Oct 19</b>	<b>Tuesday Oct 20</b>	<b>Wednesday Oct 21</b>	
9:00	<b>Lead 1</b>	<b>Lead 5</b>	<b>Lead 9</b>	9:00
9:15	M Rolf-Pissarczyk	TS Müller	S Ranftl	9:15
9:30	GA Holzapfel	G Brenn	W von der Linden	9:30
9:45	<b>Lead 2</b>	<b>Lead 6</b>	<b>Lead 10</b>	9:45
10:00	R Schussnig	D Pacheco	A Pepe	10:00
10:15	T-P Fries	O Steinbach	D Schmalstieg	10:15
10:30	Coffee break	Coffee break	Coffee break	10:30
10:45				10:45
11:00	<b>Guest Lecture 1</b>	<b>Lead 7</b>	<b>Guest Lecture 5</b>	11:00
11:15	CA Nienaber	V Badeli	U Windberger	11:15
11:30	(Royal Brompton Hospital, London)	M Kaltenbacher	(Medical University Vienna)	11:30
11:45		<b>Lead 8</b>		11:45
12:00	<b>Phase I: Report</b>	A Jafarinia	<b>Phase II: Proposal</b>	12:00
12:15		T Hochrainer		12:15
12:30		<b>Phase II: Proposal</b>		12:30
12:45				12:45
13:00	Lunch	Lunch	Lunch	13:00
13:15				13:15
13:30				13:30
13:45				13:45
14:00				14:00
14:15				14:15
14:30	<b>Lead 3</b>	<b>Guest Lecture 3</b>	<b>Guest Lecture 6</b>	14:30
14:45	GM Melito	JD Humphrey	Y Zhang	14:45
15:00	K Ellermann	(Yale University, USA)	(Boston University, USA)	15:00
15:15	<b>Lead 4</b>			15:15
15:30	I Gupta	<b>Phase II: Proposal</b>	<b>GCCE</b>	15:30
15:45	M Schanz			15:45
16:00	Coffee Break	Coffee Break		16:00
16:15				16:15
16:30	<b>Guest Lecture 2</b>	<b>Guest Lecture 4</b>		16:30
16:45	K Bäumlér	MK Rausch		16:45
17:00	(Stanford University, USA)	(U of Texas at Austin, USA)		17:00
17:15				17:15
17:30	<b>Phase I: Report</b>	S Sherifova		17:30
17:45		B Marussig		17:45
18:00		G Wolkerstorfer		18:00
18:15				18:15
18:30				18:30
18:45		Dinner at Buschenschank		18:45
19:00	Dinner at the Hotel	www.weingut-kratzer.at		19:00

<b>Guest Lecture</b>	Lectures of invited international experts
<b>LEAD</b>	Presentation of past and current research activities within the LEAD project (ca. 20 min) + short talk presenting an outlook of future research steps (Phase II)
<b>Phase I + II</b>	Discussion and write-up
<b>GCCE</b>	Update of the current state and discussion

**Christoph A. Nienaber** (Royal Brompton Hospital, London)

“Stent grafts in the ascending and descending aorta”

Monday, October 19, 11:00-12:00



Professor Nienaber is a consultant cardiologist at Royal Brompton Hospital, with his research and clinical activities focused on the diagnosis and non-surgical treatment of acute and chronic aortic pathologies, such as aneurysms and aortic dissections.

His role sees him consult with patients who have aortic conditions, and their families, to help them understand their disease better and provide the best treatment option. He is the co-founder of IRAD (International Registry of Aortic Dissection), which operates as a global network for acute aortic conditions. Through this, he has pioneered new endovascular techniques to treat aortic dissection, and he initiated and participated in guideline-changing trials. He has co-edited the Springer book on “Aortic Dissection and Related Syndromes”.

He developed his academic career at University Medical Center Hamburg-Eppendorf, undertaking a temporary post at UCLA School of Medicine. He chaired internal medicine and cardiology at Universitätsmedizin Rostock until May 2015 when he took on his role at Royal Brompton Hospital in London.

For more details see: <https://www.rbht.nhs.uk/specialists/professor-christoph-nienaber>

**Kathrin Baeumler** (Stanford University, USA)

“Fluid-structure interaction simulations of patient-specific aortic dissection and validation with 4D Flow MRI”

Monday, October 19, 16:30-17:30



Currently Dr. Baeumler is Research Engineer at the Department of Radiology – Diagnostic Radiology, Stanford University. She received her PhD from the University of Erlangen-Nuremberg in Germany. Her PhD Thesis from 2014 has a focus on numerical simulations of the Navier-Stokes equations with a free boundary and is entitled “Simulation of single drops with variable interfacial tension”. Her Thesis is based on an interdisciplinary project about single drop flow with concentration-induced Marangoni convection funded by the DFG.

She is now working together with Alison Marsden, Professor from the Institute for Computational and Mathematical Engineering and the Departments of Pediatrics and Bioengineering, and with Dominik Fleischmann, Professor of Radiology, Chief of Cardiovascular Imaging, Director of Computed Tomography, and Medical Director of the Stanford Radiology 3D Lab.

For more details see: <https://cbcl.stanford.edu/people/kathrin-baeumler>

**Jay D. Humphrey** (Yale University, USA)

“Aortic dissection: from mouse to mathematical models”

Tuesday, October 20, 14:30-15:30



Jay Humphrey is John C. Malone Professor of Biomedical Engineering and Chair at Yale University. He holds a PhD in mechanical engineering from the Georgia Institute of Technology (Atlanta, US) and a post-doctorate in cardiovascular medicine from John Hopkins University (Baltimore, US). He chaired the scientific committee of the World Congress of Biomechanics in 2014, held in Boston and attended by more than 4,000 people. He co-founded the *Biomechanics and Modeling in Mechanobiology* journal in 2001, which today plays a leading role in the field of biomechanics. Jay Humphrey has written a large number of peer-reviewed journal papers (285+) and 4 books, which have been universally praised. His works are considered essential references, and engineering students throughout the world rely on his introductions to biomechanics and works on cardiovascular biomechanics.

Jay Humphrey's research interests involve vascular mechanics and mechanobiology: using genetic, pharmacologic, and surgical models to elucidate mechanisms that underlie diverse vascular diseases; developing theoretical frameworks for understanding vascular disease progression and designing clinical interventions; and using computational models to design and evaluate tissue engineered vascular grafts based on concepts of mechanobiology and immunobiology.

For more details see: <https://seas.yale.edu/faculty-research/faculty-directory/jay-humphrey>

**Manuel K. Rausch** (The University of Texas at Austin, USA)

“Particle-based computational modeling of arterial disease”

Tuesday, October 20, 16:30-17:30



Manuel Rausch is Assistant Professor at the Department of Biomedical, Aerospace Engineering & Engineering Mechanics, The University of Texas at Austin. His research focuses on soft tissue biomechanics, nonlinear continuum mechanics, numerical modeling, material characterization and constitutive modeling. Originally from Germany, Dr. Rausch earned his PhD from Stanford University in 2013 before taking on the role of Director of R&D at a small medical device company. After a two year stint in industry, Dr. Rausch returned to academia as a post-doctoral fellow at Yale University. As of 2017, Dr. Rausch is an assistant professor. He uses experimental as well as computational tools to characterize and understand the mechanical behavior of biological soft tissues such as myocardium, vascular soft tissue, heart valve tissue, and skin to improve diagnostic and therapeutic methods, and medical device design.

For more details see: <https://www.bme.utexas.edu/people/faculty-directory/rausch>  
<https://sites.utexas.edu/rausch/>

**Ursula Windberger** (Medical University of Vienna)

“The influence of red blood cell properties on the bulk blood behavior in simple shear flow, and the effect of red blood cells on clot stiffness”

Wednesday, October 21, 11:00-12:00



Ursula Windberger is Associate Professor and group leader at the Center for Biomedical Research (Division of Decentralized Biomedical Facilities) at the Medical University of Vienna. In 1999 she defended her Habilitation in “Experimental Surgery”. Her research interest is hemorheology, in particular comparative approaches, fluidity and suspension stability of blood of various vertebrates, exercise and hemorheology. In addition, she is also focusing on material science, in particular on the rheological characterization of nanocomposite materials and on kinetic (rheological) studies.

For more details see:

<https://www.meduniwien.ac.at/hp/biomedizinische-forschung-alt/lehre-forschung/rheologie-rheology/hemorheology/team/ursula-windberger/>

**Katherine Y. Zhang** (Boston University, USA)

“Structural and mechanical inhomogeneity in arterial ECM:  
implications for physiology and aortic dissection”

Wednesday, October 21, 14:30-15:30



Professor Zhang is full Professor at the Departments of Mechanical Engineering, Biomedical Engineering and Materials Science & Engineering of Boston University. She is also the Associate Chair for the Graduate Research Programs in Mechanical Engineering at Boston University.

Professor Zhang’s research focuses on understanding the mechanical behavior of soft biological tissues and composites at multi-scale using both experimental techniques and advanced computational modeling. Her research integrates the knowledge in biology, nonlinear solid mechanics, and finite element modeling, especially of complex materials and constitutive behavior. Professor Zhang believes that the interplay between fundamental analysis and clinical application will provide the greatest gains. Through her research, she hopes to provide insights on understanding the relationship between microscopic biological processes and changes in macroscopic tissue mechanics. Professor Zhang’s current research projects are in the characterization of the biomechanical behavior of native and engineered blood vessels using an integrative approach of mechanical testing combined with multi-scale modeling.

For more details see: <https://www.bu.edu/eng/profile/katherine-yanhang-zhang-ph-d/>