

CV – KASPARS MALECKIS

CONTACT INFORMATION

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EDUCATION

- 2017** **Ph.D. Biomedical Engineering**, University of Nebraska-Lincoln
Dissertation title: “Towards precision nanomanufacturing for mechanical design: from individual nanofibers to mechanically biomimetic nanofibrillary vascular grafts”.
- 2012** **M.S. Engineering Mechanics**, University of Nebraska-Lincoln, dual degree with:
- 2012** **M.S. Materials Engineering**, University of Rouen, France
Thesis title: “Mechanical properties and structure of DNA and collagen nanofilaments”
- 2010** **B.S. Civil Engineering**, Riga Technical University, Latvia.
Thesis title: “Analysis of pre-stressed timber-FRP composite beam performance”

PROFESSIONAL EXPERIENCE

- 2019-now** **Assistant Professor**, Department of Biomechanics, University of Nebraska Omaha, Omaha, Nebraska
- Developed aortic grafts with windkessel-preserving properties
 - Developed peripheral bypass grafts that resist kinking, buckling, and thrombosis
 - Developed and customized artery and vascular device benchtop test systems
 - Taught Human Physiology and Anatomy and Biomaterials courses
 - Served on departmental doctoral, graduate, and undergraduate committees
- 2017-2019** **Postdoctoral Research Associate**, CASEA laboratory, University of Nebraska Medical Center, Omaha, Nebraska
- Developed mechanically biomimetic nanostructured vascular graft material that shows improved surgical handling and regeneration *in vivo*
 - Characterized and analyzed mechanical properties of endovascular stents and stent grafts

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- Developed biomimetic small and large diameter vascular grafts and stent-grafts
- Evaluated occlusion and burst events for ER-REBOA and Coda endovascular balloons in over 50 human cadaveric abdominal and thoracic aortas
- Studied vascular smooth muscle cell interactions with biomimetic nanofibrillar materials under physiological deformations
- Performed biaxial mechanical analysis of human and animal soft tissues

2012-2017 **Graduate Research Assistant**, Dr. Yuris Dzenis laboratory of advanced nanomaterials and nanomanufacturing, University of Nebraska-Lincoln, Lincoln, Nebraska

- Developed and tested non-linear and anisotropic nanostructured vascular graft materials
- Manufactured and characterized individual biological and synthetic nanofibers
- Planned and managed undergraduate student research projects
- Collaborated with scientists from US and international universities, national labs, and other institutions
- Developed grant proposals

2006-2010 **Construction Designer**, JMR-Frame Ltd., Riga, Latvia.

- Designed timber and steel structures for civil and industrial buildings
- Developed and altered technical projects of civil buildings
- Collaborated with architects and engineers
- Supervised on-site and factory assembly processes

RESEARCH INTERESTS

- Nanostructured materials
- Development of biomimetic cardiovascular materials and devices
- Biological and biocompatible polymers

GRANT/CONTRACT SUPPORT

Active

- Lower Extremity Bypass Graft With Physiologic Longitudinal Pre-Stretch
 - Funding Agency: NIH P20 RPL project (NHLBI)
 - Project Period: 2024-2027
 - Budget: \$758,415
 - Role: PI (Parent Project PI: Kamenskiy)

- Effects of Aortic Compliance and Windkessel Reduction on Cardiac and Aortic Pathophysiology
 - Funding Agency: NIH R01 (NHLBI)
 - Project Period: 2019-2024
 - Budget: \$3,040,498
 - Role: Co-Investigator (PI: Desyatova)
- Mechanically and Chemically Optimized Vascular Graft
 - Funding Agency: University of Nebraska
 - Project Period: 2021-2023
 - Budget: \$40,000
 - Role: Co-PI (PI: Morin)

Completed

- Evaluation of Stents Subjected to Axial, Bending, and Torsional Deformation
 - Funding Agency: Qmedics AG
 - Project Period: 2020
 - Budget: \$8,000
 - Role: PI
- Evaluation of Stents Subjected to Axial, Bending, and Torsional Deformation
 - Funding Agency: Qmedics AG
 - Project Period: 2019-2020
 - Budget: \$17,709
 - Role: PI
- Rapid Acute Endovascular Management of Non-Compressible Truncal and Junctional Hemorrhage and Long-Term Analysis of Stent-Graft Durability in Young Military Trauma Populations (W81XWH-16-2-0034, Log 14361001)
 - Funding Agency: USAMRMC
 - Project Period: 2016-2019
 - Budget: \$1,429,240
 - Role: Postdoc. Research. (PI Kamenskiy/MacTaggart)

EXPERIMENTAL EXPERTISE

Cardiovascular Device and Material Development and Characterization

- Development and characterization of biomimetic nanostructured vascular grafts and stent grafts
- Mechanical evaluation and optimization of NiTi endovascular stents, stent-grafts, and NiTi material properties
- Occlusion and burst event characterization for resuscitative endovascular balloon occlusion of aorta (REBOA) catheter balloons in human and pig aortas

Tissue and Cell Experiments

- Cell isolation from human and animal tissue
- Static and mechanically stimulated cell culture
- Mechanical characterization of human and animal soft tissues

Manufacturing of Nanostructured Materials

- Electrospinning of biological and synthetic polymer nanofiber materials for biomedical applications
- Development of hierarchical nanomaterials

Structural Characterization Techniques for Polymer-Based Materials and Nanomaterials

- Polarized Raman spectroscopy
- Electron microscopy – SEM, TEM, ED, and HRTEM
- Polarized light microscopy
- X-ray diffraction
- Thermal analysis – TGA, DSC
- Fluorescence microscopy

Mechanical testing

- Nanomechanical testing
- Uniaxial tensile, three-point bending, uniaxial compression, torsion, and fatigue testing
- Biaxial tensile testing
- Dynamical mechanical testing
- In-situ SEM tensile testing

TEACHING EXPERIENCE

Human Physiology and Anatomy I. Taught at the University of Nebraska Omaha, Spring 2020.

Biomaterials. Developed and taught at the University of Nebraska Omaha, Fall 2021, Fall 2022, and Fall 2023.

Methods in Cardiovascular Biomaterials Research. Developed and taught at the University of Nebraska Omaha, Spring 2023 and Spring 2024.

HONORS AND AWARDS

2021 **UNEMED award** for successful commercialization of “Novel Aortic Stent Graft” patent, Omaha, NE.

2015 **Carl Klason Award** at PolyChar 23rd World Forum on Advanced Materials, Lincoln, NE.

2013 **NSF Travel Award** for ASME-IMECE conference, San Diego, CA.

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- 2013** **NSF Travel Award** for NRF-NSF Advanced Manufacturing Workshop, Seoul, Korea.
- 2010** **Mobility and Accommodation Grant** for EU-US Atlantis program.
- 2010** **Prizewinner of 51st Student Scientific Conference**, Riga Technical University, section of Building Constructions.
- 2000** **President of Latvia Award** for excellence in Nikolai Rubinstein’s 5th international pianist competition in Paris, France.

PATENTS AND INVENTIONS

- 2020** MacTaggart J, Kamenskiy A, **Maleckis K**, inventors. Bypass Graft. International Patent Application. PCT/US2019/054401. 2020.
- 2019** MacTaggart J, Kamenskiy A, **Maleckis K**, Desyatova A, inventors. Stent-graft. United States Patent Application PCT/US2019/030041. 2019.
- 2018** Dzenis Y, Kamenskiy A, MacTaggart J, **Maleckis K.**, inventors. Design Considerations of Polymer Nanofiber-Based Material for Vascular Reconstruction Procedures. United States Provisional Patent 62/621,927. 2018.

MEMBERSHIPS IN PROFESSIONAL SOCIETIES

- 2018-2020** American Heart Association.
- 2017-2018** Society of Mechanics of Biomaterials and Tissues.
- 2017-2018** Biomedical Engineering Society.
- 2016-2017** American Heart Association.
- 2013-2014** American Society of Mechanical Engineers.
- 2012-2013** Materials Research Society.

ORAL PRESENTATIONS AND WORKSHOPS AT NATIONAL AND INTERNATIONAL MEETINGS

- 2022** **Oral presentation** at the University of Nebraska Medical Center’s Surgery Research Forum (online).
- 2017** **Oral presentation** at 7th International Conference on Mechanics of Biomaterials and Tissues, symposium: Biomedical materials. Waikoloa, HI.

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- 2015** **Oral presentation** at PolyChar 23rd World Forum on Advanced Materials, symposium: Biomaterials, Drug Delivery, and Tissue Engineering. Lincoln, NE.
- 2013** **Oral presentation** at ASME-IMECE, symposium: Advanced Nanomanufacturing and Mechanics of Structural Nanomaterials, San Diego, CA.
- 2013** **Student participant** in US delegation of NRF-NSF Advanced Manufacturing Workshop, Seoul, South Korea.
- 2012** **Oral presentation** at SES 49th annual technical meeting symposium of Nanoengineering for Regenerative Medicine and Tissue Engineering, Atlanta, GA.
- 2012** **Oral presentation** at MRS spring meeting, symposium: DNA nanotechnology. San Francisco, CA

POSTER PRESENTATIONS AT NATIONAL AND INTERNATIONAL MEETINGS

- 2018** **Poster presentation** at the Military Health System Research Symposium (MHSRS) Conference, Kissimmee FL. August, 2018.
- 2017** **Poster presentation** at BMES/FDA Medical Devices Conference. Washington, DC. May, 2017.
- 2013** **Poster presentation** at ASME-IMECE, symposium: Advanced Nanomanufacturing and Mechanics of Structural Nanomaterials, San Diego, CA. November, 2013.

PEER-REVIEWED PUBLICATIONS

- 2022** Keiser C., **Maleckis K.**, Struczewska P., Jadidi M., MacTaggart J., Kamenskiy A.: “A method of assessing peripheral stent abrasiveness under cyclic deformations experienced during limb movement”, *Acta Biomater.* 153, 331-341.
- 2021** **Maleckis K.**, Keiser C., Lichter E.Z., Jadidi M., Desyatova A., MacTaggart J., Kamenskiy A.: “Safe balloon inflation parameters for resuscitative endovascular balloon occlusion of the aorta”, published in *J Trauma Acute Care Surg.* 91, 302-309.
- 2021** **Maleckis K.**, Kamenskiy A., Lichter E.Z., Oberley-Deegan R., Dzenis Y., MacTaggart J.: “Mechanically tuned vascular graft demonstrates rapid endothelialization and integration into the porcine iliac artery wall”, published in *Acta Biomater.* 125, 126-137.

- 2020** Jadidi M, Habibnezhad M, Anttila E, **Maleckis K**, Desyatova A, MacTaggart J, Kamenskiy A.: "Mechanical and structural changes in human thoracic aortas with age", published in Acta Biomater. 103, 172-188.
- 2019** Papkov D., Delpouve N., Delbreilh L., Araujo S., Stockdale T., Mamedov S., **Maleckis K.**, Zou Y., Andalib M.N., Dargent E., Dravid V.P., Holt M.V., Pellerin C., Dzenis Y.A.: "Quantifying polymer chain orientation in strong and tough nanofibers with low crystallinity: toward next generation nanostructured superfibers", published in ACS Nano 13 (5), 4893-4927.
- 2019** MacTaggart J., Poulson W., Seas A., Deegan P., Lomneth C., Desyatova A., **Maleckis K.**, Kamenskiy A.: "Stent design affects femoropopliteal artery deformation", published in Annals of Surgery 46 (5), 684-704.
- 2018** **Maleckis K.**, Dzenis Y.: "Continuous DNA nanofibers with extraordinary mechanical properties and high molecular orientation", published in Macromolecular Materials and Engineering 303 (10), 1800302.
- 2018** **Maleckis K.**, Anttila E., Aylward P., Poulson W., Desyatova A., MacTaggart J., Kamenskiy A.: "Nitinol Stents in the femoropopliteal artery: a mechanical perspective on material, design, and performance", published in Annals of Biomedical Engineering 46 (5), 684-704.
- 2018** Desyatova A., Poulson W., MacTaggart J., **Maleckis K.**, Kamenskiy A.: "Cross-sectional pinching in human femoropopliteal arteries due to limb flexion, and stent design optimization for maximum cross-sectional opening and minimum intramural stresses", published in Journal of The Royal Society Interface 15 (145) 20180475.
- 2017** **Maleckis K.**, Deegan P., Poulson A., Seviars C., Desyatova A., MacTaggart J., Kamenskiy A.: "Comparison of femoropopliteal artery stents under axial and radial compression, axial tension, bending, and torsion deformations", published in Journal of the Mechanical Behavior of Biomedical Materials 75, 160-168.
- 2017** Desyatova A., Poulson W., Deegan P., Lomneth C., Seas A., **Maleckis K.**, J. MacTaggart, A. Kamenskiy: "Limb flexion-induced twist and associated intramural stresses in the human femoropopliteal artery", published in the Journal of the Royal Society Interface 14 (128) 20170025.
- 2016** **Maleckis K.***, Papkov D.*, Zou Y., Andalib M. N., Goponenko A., Dzenis Y. A.: "Nano to Macro: Mechanical Evaluation of Macroscopically Long Individual Nanofibers", published in MEMS and Nanotechnology 5, 35-43.

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- 2022** C. Keiser, **K. Maleckis**, J. Mactaggart, A. Kamenskiy: “Comparative Assessment of Peripheral Stent Abrasiveness under Cyclic Deformations Experienced During Limb Flexion”, JVS-Vascular Science.
- 2018** **K. Maleckis**, P. Deegan, T. Kalil, J. MacTaggart, A. Kamenskiy: “Safe Balloon Occlusion Pressures and Volumes for Resuscitative Endovascular Balloon Occlusion of the Thoracic and Abdominal Aorta”, Military Health System Research Symposium (MHSRS).
- 2017** **K. Maleckis**, Y. Dzenis, A. Kamenskiy, J. MacTaggart: “Biomimetic Nanofiber-Based Graft Material for Vascular Applications”, 7th International Conference on Mechanics of Biomaterials and Tissues.
- 2017** **K. Maleckis**, P. Deegan, C. Sievers, A. Desyatova, J. MacTaggart, A. Kamenskiy: Mechanical Evaluation of Peripheral Artery Stents”, BMES/FDA Frontiers in Medical Devices Conference.

PROFESSIONAL SERVICE

- 2023-present** AHA CDA Bioengineering and Technology Peer Reviewer
- 2021-2022** NSF Reviewer
- 2020-present** Reviewer, Acta Biomaterialia