



Exponent[®]
Engineering & Scientific Consulting

Lisa M. Lallo, Ph.D., P.E.

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Professional Profile

Dr. Lallo's expertise is in understanding how materials used in a variety of industries from manufacturing, rail, and chemical to consumer products and biomedical devices wear, deteriorate over time in harsh environments, and then in some cases fail. Dr. Lallo's education and professional experience involve the overlap of physics, mechanical engineering, and materials science. As a result of being immersed in a number of manufacturing environments, Dr. Lallo has also developed a significant expertise in machine operation safeguarding and related areas of occupational safety.

Industrial and Occupational Safety

Given Dr. Lallo's experience in a number of manufacturing settings, she investigates machine safeguarding and other workplace safety issues, such as lock-out / tag-out and the use of both administrative and engineering controls to reduce residual risk of machine operation. Dr. Lallo is well-versed in numerous machine-related ANSI standards and OSHA regulations. As examples, she has investigated accidents involving industrial lathes, automated pickers, gantry systems, forklifts, and scissor lifts. As a certified forklift operator and a volunteer with Habitat for Humanity since 2008, Dr. Lallo has hands-on construction and jobsite experience.

Friction and Wear Degradation of Industrial Materials

Dr. Lallo investigates the role of tribology (friction, wear, adhesion, and lubrication) on the failure of systems with interacting components or sliding surfaces. Dr. Lallo has investigated the failures of bearings, fasteners, and brake systems. She also investigates the wear of medical devices for product development.

Analysis of Material Failures in Manufacturing, Process, Consumer Product and Biomedical Device Industries

Dr. Lallo uses her interdisciplinary background to assist in root cause failure analysis investigations that span a variety of industries. Dr. Lallo has worked on root cause analyses for composite structure failures and explosions, wear and fretting of electrical and biomedical components, and industrial equipment collapses. Her investigations have included composite hydrogen tank explosions, offshore crane bearing failures, gantry robot collapses, corrosion of railcars, wear and corrosion of shoulder and spine implants, and wear and fretting of electrical terminal connections.

Experimental Mechanical Testing Capabilities

Dr. Lallo has expertise in both custom and standardized testing to evaluate consumer products and medical devices. Dr. Lallo routinely uses electromechanical, electrodynamic, and servohydraulic load

frames to understand material properties, including coefficient of friction, strength, stiffness, and adhesion. She also investigates fracture, wear, and fatigue behavior of polymeric and composite materials. Dr. Lallo uses various characterization techniques to look at surfaces and material microstructure. These techniques include optical microscopy, polarized light microscopy, profilometry, white light interferometry, atomic force microscopy, nanoindentation, CT scanning, and scanning electron microscopy.

Prior to joining Exponent, Dr. Lallo completed her doctoral research at the University of Pennsylvania, where she worked in collaboration with the USDA Forest Products Laboratory to develop, manufacture, and characterize transparent, biodegradable, stiff, and tough sheets of nanocellulose. These materials serve as a potential natural and biodegradable alternative to current plastics in the pulp and paper and packaging industries.

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering and Applied Mechanics, University of Pennsylvania, 2019

M.S.E., Mechanical Engineering and Applied Mechanics, University of Pennsylvania, 2017

B.S., Physics, Saint Joseph's University, 2014

B.A., Theology, Saint Joseph's University, 2014

John A. Goff Doctoral Departmental Award, 2019

NSF Graduate Research Fellowship, 2015-2019

Society of Tribologists and Lubrication Engineers Philadelphia Section Student Scholarship, 2018

John Henry Towne Fellowship (Penn), 2014

Phi Beta Kappa Honors Society, 2013

John P. McNulty Scholar (SJU), 2010-2014

Licenses and Certifications

Licensed Professional Engineer, Utah, #12544524-2202

OSHA Forklift Operator, Classes 1,4, and 5 (2012-present)

Prior Experience

Nanoindentation Tool Manager, University of Pennsylvania, 2017-2019

Laboratory Safety Coordinator, University of Pennsylvania, 2017-2019

Engineering Intern, Parts Life Inc., Cinnaminson, NJ, 2014

Professional Affiliations

Community Resilience Advisor, Habitat for Humanity International

National Association of Women Business Owners (NAWBO) South Jersey Board of Directors

American Society of Mechanical Engineers (ASME)

Society for Experimental Mechanics (SEM)

Society of Tribologists and Lubrication Engineers (STLE)TAPPI

ASTM

Publications

(Maiden name: Mariani)

Mariani LM, Johnson WR III, Considine JM, Turner KT. Printing and Mechanical Characterization of Cellulose Nanofibril Materials. *Cellulose* 2019; 26, 4: 2639-2651.

Bradley LC, Bade, ND, Mariani LM, Turner KT, Lee D, Stebe KJ. Rough Adhesive Hydrogels (Rad gels) for Underwater Adhesion. *ACS Applied Materials and Interfaces* 2017; 9, 33: 27409-27413.

Mariani LM, Esposito CM, Angiolillo PJ. Observations of Stick-Slip Friction in Velcro. *Tribology Letters* 2014; 56, 2: 189-196.

Presentations

Invited Seminars:

Mariani LM. Mechanical properties of printed cellulose nanofibril thin films. Summer Student Research Symposium, University of Pennsylvania, Philadelphia, PA, 2019.

Mariani LM. Surface properties and mechanics of additively manufactured cellulose nanofibril films. STLE Philadelphia section, Oreland, PA, 2018.

Selected Conference Presentations and Seminars:

Mariani LM, Vankayalapati GS, Considine JM, Turner KT. Characterization of fiber alignment and mechanical properties of printed cellulose nanofibril films. Society for Experimental Mechanics, Reno, NV, 2019.

Vankayalapati GS, Pande SS, Mariani LM, Considine JM, Clemons CM, Turner KT. Preparation and characterization of cellulose nanofibril and polymer composite laminates. Society for Experimental Mechanics, Reno, NV, 2019.

Mariani LM, Turner KT. Mechanical characterization of printed cellulose nanofibril thin films. Mechanical Engineering and Applied Mechanics Departmental Seminar, University of Pennsylvania, Philadelphia, PA, 2018.

Mariani LM, Considine JM, Turner KT. Mechanical characterization of cellulose nanofibril materials made by additive manufacturing. Society for Experimental Mechanics, Greenville, SC, 2018.

Wolf S, Jiang Y, Mariani L, Liu T, Huang G, Ablajan K, Liang XX, Gilmartin P, Toledo T, Li M, Walsh P, Turner K, Fakhraai Z. Measuring hardness of stable glasses using nanoindentation, American Physics Society March Meeting, Los Angeles, CA, 2018.

Mariani LM, Turner KT. Adhesion of cellulose nanofibril thin films. Poster presentation, Gordon Research Seminars Adhesion, Mount Holyoke College, South Hadley, MA, 2015.

Mariani LM, Esposito CM, Angiolillo PJ. Stick-slip friction and ageing in Velcro. American Physics Society March Meeting, Denver, CO, 2014.

Mariani LM, Esposito CM, Angiolillo PJ. Velcro as a model system for stick-slip friction. Northeast Conference of Undergraduate Women in Physics, Cornell University, Ithaca, NY, 2013.