



**Exponent**<sup>®</sup>  
Engineering & Scientific Consulting

## Michelle L. Chen, Ph.D.

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### Professional Profile

Dr. Chen specializes in solid mechanics, soft tissue biomechanics, and material modeling. She uses both experimental and computational approaches to aid clients, including finite element analysis and laboratory testing for material characterization. With Exponent, Dr. Chen applies her expertise to problems in the medical device, consumer electronics, oil & gas, and consumer products industries. Dr. Chen has expertise in non-linear finite element analysis with a specialty in multi-scale, anisotropic constitutive models used for the analysis of experimental test data. She has expertise in design of experiments for mechanical testing of soft tissues, including the use of advanced imaging and image processing techniques to capture 3-D deformation under loading. Dr. Chen also has experience with protocol development for experiments on both animal and human tissue with expertise in developing and interpreting protocols and results from test sequences performed on different species.

Prior to joining Exponent, Dr. Chen was a graduate research assistant in the Mechanical Engineering department at Johns Hopkins University. Her doctoral work investigated how the structure and mechanical properties of soft biological tissues adapt, or remodel, in response to changes in mechanical load, chemistry, or pathology. Through this work, she captured the 3-D deformation of the skin and eyes in both animal and human studies. She applied these methods to study cyclic loading in collagenous substrates, skin response to needle injection, and glaucoma. Dr. Chen served as a teaching assistant for the graduate courses, “Computational Solid Mechanics” and “Biosolid Mechanics”, as well as the undergraduate course, “Mechanics Based Design”. Her work has been published in the peer-reviewed journals, *Journal of the Royal Society Interface*, *Physical Review E*, and the *Journal of the Mechanical Behavior of Biomedical Materials*.

Dr. Chen received a Master of Science degree in Materials Engineering from University of Illinois at Chicago. There, she used molecular dynamics simulations to study mechanical metamaterials that can be used in smart structures.

### Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, Johns Hopkins University, 2019

M.S.E., Mechanical Engineering, Johns Hopkins University, 2016

M.S., Materials Engineering, University of Illinois, Chicago, 2014

B.S., Materials Science, Northwestern University, 2012

## Publications

M.L. Chen, J.W. Ruberti, T.D. Nguyen, "Increased Stiffness of Collagen Fibrils following Cyclic Tensile Loading", *Journal of the Mechanical Behavior of Biomedical Materials*, Vol. 82, pp. 345-354, 2018.

B.J. Murienne, M.L. Chen, H.A. Quigley, T.D. Nguyen, "The contribution of glycosaminoglycans to the mechanical behaviour of the posterior human sclera", *Journal of the Royal Society Interface*, Vol. 13, Issue 119, 2016.

M.L. Chen and E.G. Karpov, "Bistability and thermal coupling in elastic metamaterials with negative compressibility", *Physical Review E*, Vol. 90, Issue 13, 2014.

## Presentations

Chen ML, Ruberti JW, Nguyen TD. Modeling Mechanical Property Changes of Collagen Fibrils Following Cyclic Loading. SB3C, Tucson, AZ, 2017

Chen ML. Karpov EG. SPIE Nanoscience 2017. Bistability and thermal coupling in elastic metamaterials with negative compressibility. SPIE Nanoscience, San Diego, CA, 2017

Chen ML, Susilo ME, Ruberti JW, Nguyen TD. A micro-mechanical model to determine changes of collagen fibrils under cyclic loading. APS March Meeting, Baltimore, MD, 2016