



Exponent[®]
Engineering & Scientific Consulting

Baptiste Coudrillier, Ph.D., P.E., CRE

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Professional Profile

Dr. Coudrillier specializes in solid mechanics, custom mechanical testing, product reliability testing, and finite element analysis (FEA). He utilizes this combination of analytical, experimental, and numerical techniques to analyze a wide range of problems, from materials evaluations to failure analyses of complex systems. His extensive experience in laboratory-based testing has included developing mechanical testing capabilities to examine different failure phenomena, including fatigue, high rate/impact, adhesion, and creep.

Dr. Coudrillier has applied his expertise to assist clients in the consumer electronics and medical device industries with issues related to mechanical design and failure analysis. For this work, he utilizes a variety of testing capabilities, including standardized and custom mechanical testing as well as imaging techniques such as computed tomography scanning, nanoindentation, digital image correlation (DIC), and profilometry. He couples these experimental tests with data analysis, image processing, and mechanical or thermal FEA to evaluate experimental results and develop a thorough understanding of observed issues.

Before joining Exponent, Dr. Coudrillier was a graduate research assistant in the department of Mechanical Engineering at Johns Hopkins University and then a postdoctoral fellow in the department of Biomedical Engineering at Georgia Institute of Technology and Emory University. His research focused on understanding the mechanisms leading to vision loss in glaucoma, the second most common blinding disease in the US. This included developing experimental testing equipment and finite element models of the eye to understand the effects of elevated intraocular pressure in the disease. Through his graduate work, he developed a strong background in the characterization of the mechanical behavior of nonlinear elastic and anisotropic biological tissues. In his postdoctoral work, he developed a novel x-ray microtomography imaging method to study the microstructure of soft tissues and strengthened his expertise in the structure/property relationship of soft composite materials. Dr. Coudrillier has served as a teaching assistant for the graduate courses: "Nonlinear Continuum Mechanics," "Biosolid Mechanics," and "Computational Solid Mechanics," at Johns Hopkins University.

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, Johns Hopkins University, 2013

M.Sc., Mechanical Engineering, Johns Hopkins University, 2009

M.S., Mechanical Engineering and Materials Science and Engineering, École des Ponts ParisTech, France, 2009

B.S., Mechanical Engineering and Materials Science and Engineering, École des Ponts ParisTech,

France, 2008

First place - Ph.D. Student Paper Competition, Bioengineering Division, ASME 2012

First place - Ph.D. Student Paper Competition, Applied Mechanics Division, ASME 2011

Licenses and Certifications

Licensed Mechanical Engineer, California, #38821

Certified Reliability Engineer, #35164

Prior Experience

Visiting scholar at the Diamond Light Source (the UK's national synchrotron), Science and Technology Facilities Council Grant, 2013-2015

Research and Development Engineer, Michelin Automotive Tires, Clermont Ferrand, France, 2007-2008

Professional Affiliations

American Society of Mechanical Engineers — ASME

Association for Research in Vision and Ophthalmology — ARVO

Languages

French

Publications

Kramer SLB, Jones A, Mostafa A, Ravaji B, Tancogne-Dejean T, Roth CC, Gorji MB, Pack K, Foster JT, Behzadinasab M, Sobotka JC, McFarland JM, Stein J, Spear AD, Newell P, Czabaj MW, Williams B, Simha H, Gesing M, Gilkey LN, Jones CA, Dingreville R, Sanborn SE, Bignell JL, Cerrone AR, Keim V, Nonn A, Cooreman S, Thibaux P, Ames N, Connor DO, Parno M, Davis B, Tucker J, Coudrillier B, Karlson KN, Ostien JT, Foulk III JW, Hammetter CI, Grange S, Emery JM, Brown JA, Bishop JE, Johnson KL, Ford KR, Brinckmann S, Neilsen MK, Jackiewicz J, Ravi-Chandar K, Ivanoff T, Salzbrenner BC, Boyce BL. The third Sandia Fracture Challenge: deterministic and probabilistic modeling of ductile fracture of additively-manufactured material. *International Journal of Fracture* 2019; 219(1-2):209-229.

Feola A, Coudrillier B, Mulvihill J, Geraldles DM, Vo N., Albon J., Abel R., Samuels B., Ethier CR. Deformation of the lamina cribrosa and optic nerve due to changes in cerebrospinal fluid pressure. *Investigative ophthalmology & visual science* 2017; 58(4).

Coudrillier B, Campbell IC, Read T, Geraldles DM, Vo N, Feola A, Mulvihill J, Albon J, Abel R, Ethier CR. Effects of peripapillary scleral stiffening on the deformation of the lamina cribrosa. *Investigative ophthalmology & visual science* 2016; 57(6).

Coudrillier B, Geraldles DM, Vo N, Atwood R, Reinhard C, Campbell IC, Raji Y, Albon J, Abel R, Ethier CR. Phase-contrast micro-computed tomography measurements of the intraocular pressure-induced deformation of the porcine lamina cribrosa. *IEEE transactions on medical imaging* 2015; 35(4).

Coudrillier B, Geraldles D, Vo N, Albon J, Abel R, Campbell IC, Ethier CR. A novel micro-computed tomography (μCT) method to measure IOP-induced deformation of the Lamina Cribrosa (LC).

Investigative Ophthalmology & Visual Science 2015; 56(7).

Coudrillier B, Pijanka JK, Jeffery J, Sorensen T, Quigley HA, Boote C, Nguyen TD. Glaucoma-related changes in the mechanical properties and collagen micro-architecture of the human sclera. *PlosOne* 2015; 10(7):e0131396.

Coudrillier B, Pijanka JK, Jeffery J, Sorensen T, Quigley HA, Boote C, Nguyen TD. Effects of Age and Diabetes on Scleral Stiffness. *Journal of Biomechanical Engineering* 2015; 137(7).

Coudrillier B, Pijanka JK, Jeffery J, Sorensen T, Quigley HA, Boote C, Nguyen TD. Collagen structure and mechanical properties of the human sclera: Analysis for the Effects of Age. *Journal of Biomechanical Engineering* 2015; 137(4).

Campbell IC, Coudrillier B, Mensah J, Abel RL, Ethier CR. Automated segmentation of the lamina cribrosa using Frangi's filter: a novel approach for rapid identification of tissue volume fraction and beam orientation in a trabeculated structure in the eye. *Journal of the Royal Society Interface*, 2015:12(104).

Tonge TK, Murienne B, Coudrillier B, Rothkopf W, Alexander S, Nguyen TD. Minimal preconditioning effects observed for inflation tests of planar tissues. *Journal of Biomechanical Engineering* 2013; 135(11):11402.

Nguyen C, Cone FC, Nguyen TD, Coudrillier B, Pease ME, Steinhart MR, Oglesby EN, Jeffery J, Quigley HA. Studies of scleral biomechanical behavior related to susceptibility for retinal ganglion cell loss in experimental mouse glaucoma. *Investigative Ophthalmology & Visual Science* 2013; 54(3):1767-1780.

Coudrillier B, Boote C, Quigley HA, Nguyen TD. Scleral anisotropy and its effects on the mechanical response of the optic nerve head. *Biomechanics and Modeling in Mechanobiology* 2012; 12(5):941-963. doi: 10.1007/s10237-012-0455-y.

Pijanka JK, Coudrillier B, Ziegler K, Sorensen T, Meek KM, Nguyen TD, Quigley HQ, Boote C. Quantitative mapping of collagen fiber orientation in non-glaucoma and glaucoma posterior human sclerae. *Investigative Ophthalmology & Visual Science* 2012; 53(9):5258-5270.

Coudrillier B, Tian J, Alexander S, Myers K, Quigley HA, Nguyen TD. Mechanical response of the human posterior sclera: age and glaucoma related changes measured using inflation testing. *Investigative Ophthalmology & Visual Science* 2012; 53(4):1714-1728.

Myers KM, Coudrillier B, Boyce BL, Nguyen TD. The inflation response of the posterior bovine sclera. *Acta Biomaterialia* 2010; 6(11):4327-4335.

Review Papers

Campbell IC, Coudrillier B, Ethier CR. Biomechanics of the posterior eye: A critical role in health and disease. *Journal of Biomechanical Engineering* 2014; 136(2).

Presentations

Coudrillier B, Gerald M, Vo N, Campbell C, Albon J, Abel R, Ethier CR. Phase-contrast micro-tomography measurements of intraocular pressure-induced deformation of the porcine lamina cribrosa. Podium presentation at SB3C 2015, Snow Bird, UT, 2015.

Coudrillier B, Abel R, Albon J, Campbell IC, Ethier CR. Multimodal imaging of the Lamina Cribrosa (LC). Poster presentation at the World Congress of Biomechanics, Boston, MA, July 2014.

Coudrillier B, Abel R, Albon J, Campbell IC, Ethier CR. Micro-computed Tomography (µCT) for the structural analysis of the Lamina Cribrosa (LC). Poster presentation at the Association for Research in Vision and Ophthalmology, Orlando, FL, May 2014.

Coudrillier B, Pijanka JK, Boote C, Jeffery J, Quigley HA Nguyen TD. Age and glaucomarelated changes in the anisotropic mechanical response of the sclera. Podium presentation at the International Society for Eye Research. Sarasota, FL, October, 2013.

Coudrillier B, Pijanka JK, Boote C, Jeffery J, Quigley HA Nguyen TD. Age and glaucomarelated changes in the anisotropic mechanical response of the sclera. Poster presentation at the Association for Research in Vision and Ophthalmology, Seattle, WA, May, 2013.

Coudrillier B, Nguyen, TD. A microstructurally inspired viscoelastic model for collagenous tissue. Podium presentation at the American Physical Society, Baltimore, MD, March 22, 2013.

Coudrillier B, Boote C, Nguyen TD. Anisotropy of the Sclera: Effects on the optic nerve head deformation. Podium presentation at European Solid Mechanics Conference, Graz, Austria, July 10, 2012.

Coudrillier B, Boote C, Nguyen TD. Anisotropy of the sclera: Effects on the optic nerve head deformation. Podium presentation at the Summer Bioengineering Conference, Fajardo, Puerto Rico, June 22, 2012.

Coudrillier B, Quigley, HA, Nguyen TD. Age and glaucoma related changes in the mechanical response of the human sclera. Poster presentation at the Association for Research in Vision and Ophthalmology, Fort Lauderdale, FL, May 8, 2012.

Coudrillier B, Boote C, Nguyen TD. Anisotropic properties of the posterior human sclera. Podium Presentation at the International Mechanical Engineering Congress and Exposition, Denver, CO, November 14, 2011.

Nguyen TD, Coudrillier B. Anisotropic behavior of the human sclera: Effects of age and glaucoma. Society of Engineering Science, Northwestern University, Evanston IL, October 10, 2011.

Coudrillier B, Boote C, Quigley HA Nguyen TD. Scleral collagen structure: Effect of the scleral anisotropy on the mechanical response of the optic nerve head. Podium presentation at the Summer Bioengineering Conference, Farmington, PA, June 22, 2011.

Coudrillier B, Quigley HA Boote C, Nguyen TD. Effects of age and glaucoma on the biomechanical response of the human sclera. Podium presentation at the Association for Research in Vision and Ophthalmology, Fort Lauderdale, FL, May 5, 2011.

Coudrillier B, Quigley HA Myers KM, Nguyen TD. Viscoelastic properties of the human posterior sclera.

Podium presentation at the International Mechanical Engineering Congress and Exposition, Vancouver, Canada, November 15, 2010.