

MARIA HOLLAND

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Aerospace & Mechanical Engineering
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EDUCATION

Ph.D. , Mechanical Engineering Stanford University (Stanford, CA) Dissertation: “Computational Modeling of the Brain: Development, Health, and Disease” Advisor: Ellen Kuhl	2017
M.S. , Mechanical Engineering Stanford University (Stanford, CA)	2013
B.S. , Mechanical Engineering University of Tulsa (Tulsa, OK) Magna cum laude, Minors: Mathematics & Chinese	2011
Certificate , Chinese Language & Culture Xiamen University (Xiamen, Fujian Province, China)	2010

PROFESSIONAL APPOINTMENTS

University of Notre Dame (Notre Dame, IN)	
Associate Professor, Dept. of Aerospace & Mechanical Engineering	2025– present
Assistant Professor, Dept. of Aerospace & Mechanical Engineering	2022–2025
Clare Boothe Luce Assistant Professor, Dept. of Aerospace & Mechanical Engineering	2017–2022
Assistant Professor, Bioengineering Graduate Program	2017–
Member, Institute for Precision Health	2018–
Member, Neuroscience & Behavior Program	2019–
University of Galway (Galway, Ireland)	
Adjunct Lecturer, College of Science and Engineering	2024–
Stanford University (Stanford, CA)	
Visiting Assistant Professor, Department of Mechanical Engineering	2017

JOURNAL PUBLICATIONS

Key: corresponding*; graduate and undergraduate students; postdocs. The lead trainee is typically first author, while the senior author is last.

Under review:

R1. Jafarabadi F, Datta M, **Holland MA*** (submitted). “Secondary damage in traumatic brain injury: bridging the gaps through computational approaches.”

Preprinted and under review:

P2. Taneja K, Saito K, Kawasaki H, **Holland MA*** (submitted). “Astrocytes in white matter respond to tensile cues during cortical folding: a numerical study.” bioRxiv: 10.1101/2025.10.17.683172

- P1. Demirci N, Coalson TS, **Holland MA**, Van Essen DC, Glasser MF* (submitted). “Compensating cortical thickness for cortical folding-related variation.” bioRxiv: 10.1101/2025.05.03.651968

Peer-reviewed publications:

- J24. Moreno-Flores O, **Holland MA**, Ledwon J, Gosain AK, and Tepole AB* (2024). “Numerical Investigation of New Rete Ridge Formation in a Multi-Layer Model of Skin Subjected to Tissue Expansion”. *Journal of Biomechanics* 176:112346. DOI: 10.1016/j.jbiomech.2024.112346
- J23. Wang X, Wang S, and **Holland MA*** (2024). “Axonal Tension Contributes to Consistent Fold Placement”. *Soft Matter*, 10.1039/D4SM00129J. DOI: 10.1039/D4SM00129J
Code: [github/mholla/axon_tension](https://github.com/mholla/axon_tension)
- J22. Consolini J, Oberman AG, Sayut J, Damen FW, Goergen CJ, Ravosa MJ, and **Holland MA*** (2024). “Investigation of direction- and age-dependent prestretch in mouse cranial dura mater”. *Biomechanics and Modeling in Mechanobiology*. DOI: 10.1007/s10237-023-01802-6 Code and data: [github/mholla/BMMB24](https://github.com/mholla/BMMB24)
- J21. Demirci N and **Holland MA*** (2024). “Scaling patterns of cortical folding and thickness in early human brain development in comparison with primates”. *Cerebral Cortex*, bhad462. DOI: 10.1093/cercor/bhad462 Code and data: [github/mholla/CERCOR24](https://github.com/mholla/CERCOR24)
- J20. Demirci N, Jafarabadi F, Wang X, Wang S, and **Holland MA*** (2023). “Consistency and variation in the placement of cortical folds: A perspective”. *Brain Multiphysics* 5:100080. DOI: 10.1016/j.brain.2023.100080
- J19. Demirci N, Hoffman ME, and **Holland MA*** (2023). “Systematic cortical thickness and curvature patterns in primates”. *NeuroImage*, 120283. DOI: 10.1016/j.neuroimage.2023.120283 Code: [github/mholla/NIMG23](https://github.com/mholla/NIMG23) Data: on Zenodo
- J18. Wang S*, Wang X, and **Holland MA** (2023). “Multi-physics modeling and finite-element formulation of neuronal dendrite growth with electrical polarization”. *Brain Multiphysics*, 100071. DOI: 10.1016/j.brain.2023.100071 Code: [github/mholla/BMPHI23](https://github.com/mholla/BMPHI23)
- J17. Jafarabadi F, Wang S, and **Holland MA*** (2023). “A Numerical Study on the Influence of Cerebrospinal Fluid Pressure on Brain Folding”. *Journal of Applied Mechanics* 90 (7):071006. DOI: 10.1115/1.4057020 Code: [github/mholla/JAM23](https://github.com/mholla/JAM23)
- J16. Consolini J, Demirci N, Fulwider A, Hutsler JJ, and **Holland MA*** (2022). “Bok’s Equi-Volume Principle: Translation, Historical Context, and a Modern Perspective”. *Brain Multiphysics*, 100057. DOI: 10.1016/j.brain.2022.100057 Code: [github/mholla/BMPHI22](https://github.com/mholla/BMPHI22)
- J15. Wang S, Saito K, Kawasaki H, and **Holland MA*** (2022). “Orchestrated Neuronal Migration and Cortical Folding: A Computational and Experimental Study”. *PLOS Computational Biology*. DOI: 10.1371/journal.pcbi.1010190 Code: [github/mholla/PL0SCB2022](https://github.com/mholla/PL0SCB2022)
- J14. Demirci N and **Holland MA*** (2022). “Cortical thickness systematically varies with curvature and depth”. *Human Brain Mapping* 43:(6), 2064–2084. DOI: 10.1002/hbm.25776 Code: [github/mholla/HBM22](https://github.com/mholla/HBM22)
- J13. Darayi M, Hoffman ME, Sayut J, Wang S, Demirci N, Consolini J, and **Holland MA*** (2021). “Computational Models of Cortical Folding: A Review of Common Approaches”. *Journal of Biomechanics*. DOI: 10.1016/j.jbiomech.2021.110851
- J12. Lee T, **Holland MA**, Weickenmeier J, Gosain AK, and Tepole AB* (2021). “The Geometry of Incompatibility in Growing Soft Tissues: Theory and Numerical Characterization”. *Journal of the Mechanics and Physics of Solids* 146:104177. DOI: 10.1016/j.jmps.2020.104177

- J11. Wang S, Demirci N, and Holland MA* (2021). “Numerical Investigation of Biomechanically Coupled Growth in Cortical Folding”. *Biomechanics and Modeling in Mechanobiology*. DOI: 10.1007/s10237-020-01400-w Code: [github/mholla/BMMB21](#)
- J10. Darayi M and Holland MA* (2020). “Surface Pressure Reduces Stability in Bilayered Systems under Compression”. *International Journal of Non-Linear Mechanics* 127:103589. DOI: 10.1016/j.ijnonlinmec.2020.103589 Code: [github/mholla/NLM20](#)
- J9. Holland MA, Budday S, Li G, Shen D, Goriely A*, and Kuhl E (2020). “Folding Drives Cortical Thickness Variations”. *The European Physical Journal Special Topics* 229 (17-18):2757–2778. DOI: 10.1140/epjst/e2020-000001-6
- J8. Colin J, Darayi M, and Holland MA* (2019). “Stiffness Contrast and Separation Influence Wrinkling of Adjacent Layers in a Homogeneous Matrix”. *Journal of Applied Mechanics* 86 (4):041004. DOI: 10.1115/1.4042430 Code: [github/mholla/JAM19](#)
- J7. Colin J and Holland MA* (2019). “Layer Wrinkling in an Inhomogeneous Matrix”. *International Journal of Solids and Structures* 156-157:119–125. DOI: 10.1016/j.ijsolstr.2018.08.004 Code: [github/mholla/IJSS19](#)
- J6. Holland MA, Budday S, Goriely A, and Kuhl E* (2018). “Symmetry Breaking in Wrinkling Patterns: Gyri Are Universally Thicker than Sulci”. *Physical Review Letters* 121:228002. DOI: 10.1103/physrevlett.121.228002
- J5. Oomen PJA, Holland MA, Bouten CVC, Kuhl E, and Loerakker S* (2018). “Growth and Remodeling Play Opposing Roles during Postnatal Human Heart Valve Development”. *Scientific Reports* 8 (1). DOI: 10.1038/s41598-018-19777-1
- J4. Holland MA, Li B, Feng XQ, and Kuhl E* (2017). “Instabilities of Soft Films on Compliant Substrates”. *Journal of the Mechanics and Physics of Solids* 98:350–365. DOI: 10.1016/j.jmps.2016.09.012 Code: [github/mholla/JMPS17](#)
- J3. Holland MA, Miller KE, and Kuhl E* (2015). “Emerging Brain Morphologies from Axonal Elongation”. *Annals of Biomedical Engineering* 43 (7):1640–1653. DOI: 10.1007/s10439-015-1312-9
- J2. Holland MA, Kosmata T, Goriely A, and Kuhl E* (2013). “On the Mechanics of Thin Films and Growing Surfaces”. *Mathematics and Mechanics of Solids* 18 (6):561–575. DOI: 10.1177/1081286513485776
- J1. Zöllner AM, Holland MA, Honda KS, Gosain AK, and Kuhl E* (2013). “Growth on Demand: Reviewing the Mechanobiology of Stretched Skin”. *Journal of the Mechanical Behavior of Biomedical Materials* 28:495–509. DOI: 10.1016/j.jmbbm.2013.03.018

OPINIONS

- O1. Holland MA*, Maisel K, Ibberson CB, Wiley LK, Burnett DC, Mace EM, and Elting MW (2024). “Extended Time, Elevated Expectations: The Unappreciated Downsides of Pausing the Tenure Clock”. *Proceedings of the National Academy of Sciences* 121 (34):e2403489121. DOI: 10.1073/pnas.2403489121

OTHER SCHOLARLY PRODUCTS

- S3. “Curveball” (code repository). Code: [github/mholla/curveball](#)
- S2. “Hitchhiker’s Guide to Abaqus” (documentation).
Code: [github/mholla/hitchhikers-guide-to-abaqus](#) DOI: 10.5281/zenodo.1243270

S1. “Growth” (code repository). Code: [github/mholla/growth](https://github.com/mholla/growth) DOI: [10.5281/zenodo.3862950](https://doi.org/10.5281/zenodo.3862950)

HONORS & AWARDS

- National Science Foundation CAREER Award 2022
- Clare Boothe Luce Professorship, Henry Luce Foundation 2017–2022
- Diversifying Academia, Recruiting Excellence (DARE) Fellowship, Stanford University 2015–2017
- National Science Foundation Graduate Research Fellowship 2013
- Brit and Alex d’Arbeloff Graduate Fellowship, Stanford University 2011–2016
- Phi Beta Kappa 2011
- China Scholarship Council Scholarship, Chinese Ministry of Education 2009–2010
- Barry M. Goldwater Scholarship 2008–2010

GRANTS & FELLOWSHIPS

Active (External)

- NSF CMMI-2421742 Standard Grant 9/1/2024–8/31/2027
Axonal tension as an driver of cortical fold placement and compact wiring
(Holland, PI)
- NIH NINDS R01 (R01NS135852) Collaborative Research in Computational Neuroscience
US-Japan Research Proposal 9/6/2023–8/31/2026
CRCNS: Defining the role of astrogenesis in cortical folding
(Holland, PI; Kawasaki, co-I)
- NIH NIGMS R35 Maximizing Investigators’ Research Award 9/21/2022–7/31/2027
Computational Biomechanics Modeling of Inflammation
(Holland, PI)
- NSF CMMI-2144412 CAREER Program 3/1/2022–2/28/2027
CAREER: Unfolding the cortex: Biomechanics-informed analysis of cortical thickness
+ Research Experiences for Undergraduates Supplements
(Holland, PI)

Completed

- Notre Dame International Asia Research Collaboration Grant 1/1/2022–12/30/2022
In vivo calibration of an *in silico* model of brain development
(Holland, PI)
- Pontificia Universidad Católica de Chile Open Seed Fund 1/1/2021–6/30/2022
Mechanical correction of brain cortical thickness with deep learning
(Sahli Costabal, PI)
- I-CTSI Core Pilot 7/1/2019–6/30/2022
Mechanobiology of dura mater growth: an *in vivo* and *ex vivo* longitudinal study
(Holland, PI; Collaborators Ravosa & Goergen)
- NSF IIS-1850102 CISE Research Initiative 6/1/2019–5/31/2022
CRII: SCH: A computational toolbox for analysis of big brain data

+ Research Experiences for Undergraduates Supplement
(Holland, PI)

ND Advanced Diagnostics & Therapeutics Discovery Award 8/16/2018–8/15/2019
Cortical thickness variation as a biomarker for Autism Spectrum Disorders
(Holland, PI)

NSF OISE-1515340 East Asia & Pacific Summer Institute 6/1/2015–5/31/2016
EAPSI: Investigation of the wrinkling and buckling behavior of layered
soft materials with applications in the developing brain
(Holland, PI)

NSF DGE-1147470 Graduate Research Fellowship 9/1/2013–8/31/2017
Establishing, calibrating, and validating a mechanistic, patient-specific,
multiscale model for heart failure through sarcomerogenesis
(Holland, Fellow)

PRESENTATIONS

Keynotes and Invited Talks at Conference and Workshops

- K9. *From Evolution to Bioengineering of Biological Patterning Mechanisms - Mathematical Advances and Challenges Workshop*. Banff International Research Station for Mathematical Innovation and Discovery; Granada, Spain, June 2024.
- K8. *4D Cellular Physiology Conference*. Howard Hughes Medical Institute Janelia Research Campus; Ashburn, VA, March 2024 (*declined due to maternity leave*)
- K7. “Biomechanical modeling of cortical folding: hypotheses, predictions, and testing,” *Biophysics of Organoids Workshop*. Princeton, NJ, February 2023.
- K6. “Mechanical and biological contributors to consistent cortical thickness patterns in primates,” *Society for Engineering Science Annual Conference*. College Station, TX, October 2022.
- K5. “Role of cerebrospinal, meningeal, and skull constraints on cortical folding,” *European Solid Mechanics Conference*. Galway, Ireland, July 2022.
- K4. “Patterns of growth and thickness in the cerebral cortex,” *American Physical Society, March Meeting*. Chicago, IL, Mar 2022.
- K3. “Closer Look: Numerical Investigation of biomechanically coupled growth in cortical folding,” *Closer Look Open Journal Club*. Virtual, October 2021
- K2. “Mechanics-informed analysis of cortical thickness,” *International Brain Mechanics and Trauma Lab International Workshop*. Virtual, April 2021.
- K1. “The role of physical forces in the evolution of cortical morphogenesis,” *American Physical Society, March Meeting*. Denver, CO (meeting canceled; talk delivered at the Virtual March Meeting), Mar 2020.

Invited Seminars

- I20. Rutgers University, Department of Biomedical Engineering. New Brunswick, NJ, November 2023.
- I19. University of Illinois Urbana-Champaign, Department of Mechanical Science and Engineering. Urbana-Champaign, IL, November 2023.

- I18. Washington University in St. Louis, Department of Mechanical Engineering and Materials Science. St. Louis, MO, October 2023.
- I17. Missouri University of Science and Technology, Engineering and Psychological Science. Rolla, MO, October 2023.
- I16. University of Minnesota, Department of Biomedical Engineering, Barocas Group. Minneapolis, MN (virtual) Aug 2023.
- I15. KTH Royal Institute of Technology, Department of Biomedical Engineering and Health Systems, Dual Group. Stockholm, Sweden, July 2023.
- I14. Pontificia Universidad Católica de Chile, Computational Medicine Group. Santiago, Chile, May 2021.
- I13. Purdue University, Weldon School of Biomedical Engineering. West Lafayette, IN, March 2021.
- I12. University of Florida, Department of Biomedical Engineering. Gainesville, FL, March 2021.
- I11. University of Connecticut Department of Mechanical Engineering. Storrs, CT, Oct 2019.
- I10. Stanford University School of Engineering. Stanford, CA, Nov 2018.
- 19. Indiana U. - Purdue U. Indianapolis Department of Mechanical & Energy Engineering. Indianapolis, IN, Sep 2018.
- 18. University of Xiamen School of Architectural & Civil Engineering. Xiamen, China, July 2018.
- 17. Tsinghua University Institute of Biomechanics and Medical Engineering. Beijing, China, July 2018.
- 16. University of Texas at El Paso Department of Mechanical Engineering. El Paso, TX, March 2017.
- 15. Catholic University of America Department of Mechanical Engineering. Washington, D.C., March 2017.
- 14. University of Tulsa Department of Mechanical Engineering. Tulsa, OK, March 2017.
- 13. Villanova University Department of Mechanical Engineering. Villanova, PA, February 2017.
- 12. University of Texas at Dallas Department of Mechanical Engineering. Richardson, TX, February 2017.
- 11. University of North Texas Department of Mechanical & Energy Engineering. Denton, TX, January 2017.

Conference Presentations (graduate and undergraduate students; postdocs)

- C49. Wang X & **Holland MA**. “Integrating physics-informed neural networks and symbolic regression to discover a reaction-diffusion model of neutrophil swarming,” *U.S. National Congress of Computational Mechanics*. Chicago, IL, July 2025.
- C48. Taneja K, Saito K, Kawasaki H, & **Holland MA**. “An in silico study on the role of astrocytes in cortical folding,” *U.S. National Congress of Computational Mechanics*. Chicago, IL, July 2025.
- C47. Anantha Krishnan A & **Holland MA**. “Modeling inflammation-induced hypertrophy and altered motility in the murine colon,” *U.S. National Congress of Computational Mechanics*. Chicago, IL, July 2025.

- C46. Godin C & **Holland MA**. “Cortical curvedness patterns alter with volumetric expansion during infancy: A longitudinal analysis,” *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Santa Ana Pueblo, NM, June 2025.
- C45. Taneja K, Saito K, Kawasaki H, & **Holland MA**. “Deep folds in the brain result from cortex pulling on astrocytes: A numerical study,” *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Santa Ana Pueblo, NM, June 2025.
- C44. Wang X & **Holland MA**. “Discovering the reaction-diffusion equation of neutrophil swarming using physics-informed machine learning,” *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Santa Ana Pueblo, NM, June 2025.
- C43. Jafarabadi F & **Holland MA**. “A poroelastic approach for modeling cerebral edema formation,” *Biomedical Engineering Society Annual Meeting*. Baltimore, MD, October 2024.
- C42. Taneja K & **Holland MA**. “A numerical study on the effect of cortical diffusivity on brain tissue gyrification,” *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Lake Geneva, WI, June 2024.
- C41. Demirci N & **Holland MA**. “Scaling of brain morphology in human development and primate evolution,” *J.B. Johnston Club Annual Meeting*. Washington, DC, November 2023.
- C40. Wang S, Datta M, & **Holland MA**. “A biomechanical model of nodular and infiltrative brain tumors,” *Society for Engineering Science*. Minneapolis, Minnesota, October 2023.
- C39. Wang S, Datta M, & **Holland MA**. “Estimating tumor mechanical environment from non-invasive medical imaging,” *U.S. National Congress of Computational Mechanics*. Albuquerque, NM, July 2023.
- C38. Wang S, Wang X, & **Holland MA**. “Multi-physics modeling of neural dendrite growth with electrical polarization,” *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Vail, CO, June 2023.
- C37. Demirci N & **Holland MA**. “Evolution of human cortical thickness and morphology throughout growth and development,” *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Vail, CO, June 2023.
- C36. Demirci N, Hoffman ME, Kalla O, Maslak R, & **Holland MA**. “Cortical thickness consistently correlates with cortical morphology for both humans and non-humans,” *Society for Neuroscience Annual Meeting*. San Diego, CA, November 2022.
- C35. Wang S, Saito K, Kawasaki H, & **Holland MA**. “Calibration and validation of a biomechanical model of neuronal migration and cortical folding,” *Biomedical Engineering Society Annual Meeting*. San Antonio, TX, October 2022.
- C34. Demirci N & **Holland MA**. “Correlation between cortical morphology and thickness due to forces generated during folding,” *World Congress of Biomechanics*. Taipei, Taiwan, July 2022.
- C33. Demirci N & **Holland MA**. “Cortical thickness correlates with cortical morphology among human and non-human primate brains,” *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Chesapeake Bay, MD, June 2022.
- C32. Wang S, Saito K, Kawasaki H, & **Holland MA**. “An integrated study of orchestrated neuronal migration and cortical folding,” *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Chesapeake Bay, MD, June 2022.
- C31. Jafarabadi F & **Holland MA**. “Computational modeling of brain bilayer under cerebrospinal fluid pressure,” *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Chesapeake Bay,

MD, June 2022.

- C30. Wang X & **Holland MA**. “Computational modeling of connectivity-driven cortical scaling and folding,” *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Chesapeake Bay, MD, June 2022.
- C29. Sayut J & **Holland MA**. “Development of 3D brain structures from histology images,” *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Chesapeake Bay, MD, June 2022. **BS Student Paper Competition finalist**
- C28. Jafarabadi F & **Holland MA**. “Instability of bilayered systems under surface pressure: The effect of cerebrospinal fluid on cortical folding,” *American Physical Society March Meeting*. Chicago, IL, March 2022.
- C27. Consolini J & **Holland MA**. “Investigation of the Law of Volume Constancy in Cortical Laminae,” *American Physical Society March Meeting*. Chicago, IL, March 2022.
- C26. Wang S & **Holland MA**. “Multifield modeling of brain development,” *American Physical Society March Meeting*. Chicago, IL, March 2022.
- C25. Wang X & **Holland MA**. “Computational Modeling of White Matter with Axon Connectivity,” *American Physical Society March Meeting*. Chicago, IL, March 2022.
- C24. Demirci N & **Holland MA**. “Cortical thickness correlates with cortical morphology,” *Society for Neuroscience annual meeting*. Virtual, Nov 2021.
- C23. Wang S, Demirci N, Castro Solar V, Sahli Costabal F, **Holland MA**. “Unfolding the cortex via a physics-informed graph neural network,” *Ibero-Latin-American Congress on Computational Methods in Engineering and Pan American Congress on Computational Mechanics*. Virtual, Nov 2021.
- C22. Wang S, Demirci N, Castro Solar V, Sahli Costabal F, **Holland MA**. “Unfolding the cortex via a mechanics-informed graph neural network,” *International Symposium on Computer Methods in Biomechanics and Biomedical Engineering*. Virtual, Sep 2021.
- C21. Wang S, Demirci N, **Holland MA**. “Is heterogeneous cortical growth necessary to recapitulate cortical thickness patterns seen in the brain?” *U.S. National Congress of Computational Mechanics*. Virtual, July 2021.
- C20. Demirci N and **Holland MA**. “Cortical thickness distribution of the human cerebral cortex identified by curvature at local scales,” *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Virtual, June 2021.
- C19. Wang S, Demirci N, Castro Solar V, **Holland MA**, and Sahli Costabal F. “In vivo quantification of brain morphologies via mechanics-informed deep learning approach,” *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Virtual, June 2021.
- C18. Hoffman ME, Demirci N, and **Holland MA**. “The relation between cortical thickness and morphology: a study of nonhuman primate brains,” *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Virtual, June 2021. **BS Student Paper Competition Finalist**
- C17. Wang S and **Holland MA**. “Coupled bio-mechanical growth in cerebral gyrification,” *World Congress of Computational Mechanics*. Paris, France, July 2020 (meeting canceled).
- C16. Darayi M and **Holland MA**. “Buckling under pressure: Does the cerebrospinal fluid affect the wrinkling instabilities in the brain?” *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Virtual, June 2020.

- C15. Demirci N and **Holland MA**. “Quantitative investigation of the folding patterns of the human cerebral cortex,” *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Virtual, June 2020.
- C14. Wang S and **Holland MA**. “Numerical investigation of biomechanically-coupled growth in brain gyrification,” *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Virtual, June 2020.
- C13. Hoffman ME, Sayut JP, and **Holland MA**. “Analyzing the cortical thickness of mammalian species through the segmentation of magnetic resonance imaging scans,” *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Virtual, June 2020.
- C12. Demirci N, Wang S, and **Holland MA**. “Mechanics-informed big data analysis of cortical thickness,” *Sixth Annual Brain Initiative Investigators Meeting*. Washington, D.C., Jan 2020.
- C11. **Holland MA**, Kuhl E, and Goriely A. “Passive physical forces in gyrification lead to characteristic cortical thickness variations,” *Society for Neuroscience Annual Meeting*. Chicago, IL, Oct 2019.
- C10. **Holland MA**. “Kinematic measures influence cortical thickness,” *Biomedical Engineering Society Annual Meeting*. Philadelphia, PA, Oct 2019.
- C9. **Holland MA**, Darayi M, Hoffman ME, Twohy K, Hardan AY, Goriely A, and Kuhl E. “Image-based analysis of cortical thickness patterns,” *U.S. National Congress of Computational Mechanics*. Austin, TX, July 2019.
- C8. Darayi M, Colin J, and **Holland MA**. “Linear stability analysis of bilayer wrinkling in an infinite-sized homogeneous matrix,” *U.S. National Congress of Computational Mechanics*. Austin, TX, July 2019.
- C7. **Holland MA**, Kuhl E, and Goriely A. “Cortical thickness differences emerge from passive physical forces generated by growth,” *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Seven Springs, PA, June 2019.
- C6. **Holland MA**, Goriely A, and Kuhl E. “Physiological and pathological cortical thickness variations,” *World Congress of Computational Mechanics*. New York, NY, July 2018.
- C5. **Holland MA**, Hardan AY, Goriely A, and Kuhl E. “Thickness variations resulting from symmetry breaking in soft matter instabilities,” *U.S. National Congress for Theoretical and Applied Mechanics*. Chicago, IL, June 2018.
- C4. **Holland MA**, Li B, Feng XQ, and Kuhl E. “Instabilities in growing or compressed bilayered systems with low stiffness contrast,” *World Congress of Computational Mechanics*. Seoul, South Korea, July 2016.
- C3. Vijayakumar N, **Holland MA**, and Kuhl E. “A mechanical model for cortical folding during brain development,” *Summer Biomechanics, Bioengineering and Biotransport Conference*. Snowbird, UT, June 2015.
- C2. **Holland MA** and Kuhl E. “The effect of white matter anisotropy on cortical folding during development,” *World Congress of Computational Mechanics*. Barcelona, Spain, July 2014.
- C1. **Holland MA**, Steinmann P, and Kuhl E. “Theory and numerics of volume and surface growth in the developing brain,” *U.S. National Congress of Computational Mechanics*. Raleigh, NC, July 2013.

Internal Presentations

- “Local shape analysis of curvature and thickness in the cerebral cortex,” University of Notre Dame Department of Applied & Computational Mathematics & Statistics. Notre Dame, IN, Apr 2022.
- “Biomechanics: A new tool for understanding brain development,” St. Mary’s College Master of Autism Studies Program. Notre Dame, IN, Mar 2019.
- “Neuromechanics across the scales,” University of Notre Dame Department of Biological Sciences. Notre Dame, IN, Jan 2019.

TEACHING

Awards

- Canvas Legend for Accessibility Consideration 2024

Instructor of Record

Notre Dame AME 20241: Solid Mechanics

- Spring 2023: 61 students
- Spring 2025: 56 students

Notre Dame AME 60624: Continuum Mechanics

- Fall 2021: 10 students
- Spring 2020: 10 students (switched to virtual halfway through)

Notre Dame AME 40572/50 572/60572: Introduction to Biomechanics (new course developed)

- Fall 2024: 40 students
- Fall 2023: 27 students
- Fall 2022: 18 students
- Spring 2022: 24 students
- Spring 2021: 44 students (virtual)
- Fall 2019: 37 students
- Spring 2019: 40 students
- Spring 2018: 34 students

Guest Lectures

- Animal Biomechanics, Saint Mary’s University 2022
- Physics of the Brain, Notre Dame 2021, 2022
- Master of Autism Studies Program, Saint Mary’s University 2019

Course Assistant

- Stanford Graduate Summer Institute: Jumpstart Your Academic Job Search 2016–2017
- Stanford ME 337: Mechanics of Growth 2013

Pedagogical Training

- Teaching Well With AI Academy (Notre Dame) 2025
- A Practical Guide to Teaching and Learning in STEM conference (Notre Dame) 2018
- Stanford EDUC 297: Teaching and Learning in Higher Education 2016
- Stanford ENGR 312: Science and Engineering Course Design 2015

RESEARCH ADVISING

Postdoctoral Scholars

- Redowan Niloy (Texas Tech Ph.D. '24) 2024–
- Ahilan Anantha Krishnan (U. Denver Ph.D. '23) 2024–
Presentations: C47
- Karan Taneja (UCSD Ph.D. '23) 2023–
Presentations: C42, C45, ??, C48,

Postdoc Alumni:

- Shuolun Wang (NJIT Ph.D. '18) 2019–2023
Presentations: C12, C14, C17, C19, C21, C22, C23, C26, C32, C35, C38, C39, C40
Publications: J11, J13, J15, J18, J17, J20, J23
Placement: Senior Soft Matter Simulations Scientist at Avery Dennison

Graduate Students

- Masah Abubaker (Notre Dame BIOE Ph.D. program) 2024–
- Eshan Dey (Notre Dame AME Ph.D. program) 2024–
- Cameron Godin (Notre Dame BIOE Ph.D. program, post-quals) 2023–
Presentations: C46
- Xincheng Wang (Notre Dame AME Ph.D. program, post-quals) 2021–
Presentations: C25, C30, C38, C44, C49
Publications: J18, J20, J23
- Fatemeh Jafarabadi (Notre Dame BIOE Ph.D. program, post-candidacy) 2021–
Presentations: C28, C31, C43, ??, ??
Publications: J17, J20, R1

Graduate Alumni:

- Nagehan Demirci (Notre Dame BIOE Ph.D.) 2019–2023
Thesis: *Wystematic cortical folding patterns in human and non-human primate populations*
Presentations: C12, C15, C18, C19, C20, C21, C22, C23, C24, C34, C33, K6, C36, C37, C41
Publications: J11, J13, J14, J16, J19, J20, J21
Awards: Center for Research Computing Award for Computational Sciences & Visualization (2022)
Placement: Postdoctoral Research Associate at Washington University in St. Louis School of Medicine, Mallinckrodt Institute of Radiology
- Mohsen Darayi (Notre Dame AME Ph.D.) 2018–2022
Thesis: *Investigation of the buckling instabilities in multilayer systems under constrains, focusing on the mechanics of brain folding*

Presentations: C8, C9, C16, K5
Publications: J8, J10, J13
Placement: Staff Scientist at Cleveland Clinic

- Jack Consolini (Notre Dame AME M.S.) 2020–2022
Thesis: *In silico model for determination of in vivo pre-stretch in neonatal and adult murine cranial dura mater*
Presentations: C27
Publications: J13, J16, J22
Awards: Kaneb Center Award for Teaching Excellence (2022), Graduate School Outstanding Graduate Student Teacher Award (2022)
Placement: Research Engineer at Hospital for Special Surgery
- Katie Lindsley (Notre Dame Bioengineering M.S.) 2020–2021
Thesis: *Instabilities in concave surfaces*
Placement: Development Engineer at Zimmer

Undergraduate Alumni:

- Jackson Ballow (Notre Dame B.S. Computer Science ‘24) 2023–2024
- Lydia Csaszar (Saint Mary’s B.S. Computing & Applied Math ‘22; Notre Dame B.S. Computer Engineering ‘23) 2022–2024
- Renee Maslak (Notre Dame B.S. Physics in Medicine ‘24) 2022–2024
Presentations: C36
- Nia McGee (University of St. Thomas ‘25) 2023
- Reed Snedeker (Notre Dame B.S.M.E. ‘25) 2023
- Olivia Kalla (Notre Dame B.S.M.E. ‘24) 2021–2023
Presentations: C36
- Lorcan O’Rourke (University College Dublin B.S. Electrical Engineering ‘23) 2022
Awards: Naughton Fellow
- Andrew Fulwider (Notre Dame B.S. Chemical Engineering ‘22 & B.A. German ‘22) 2019–2023
Publications: J16
- John Sayut (Notre Dame B.S.M.E. ‘22) 2019–2022
Publications: J13, J22
Presentations: C13, C29
Awards: Sorin Scholar (2019), Naughton Fellow (2020, canceled), SB3C BS Student Paper Competition finalist (2022), **NSF Graduate Research Fellowship (2022)**
Placement: Ph.D. program at U. Michigan
- Mia Hoffman (Notre Dame B.S.M.E. ‘21, **undergraduate thesis**) 2018–2021
Publications: J13, J19
Presentations: C9, C13, C18
Awards: **NSF Graduate Research Fellowship (2021)**
Placement: Ph.D. program at U. Washington
- Kyra Twohy (Notre Dame B.S.M.E. ‘18) 2018
Presentations: C9
Placement: Ph.D. program at U. Delaware

- Nithya Vijayakumar (Stanford B.S.M.E. '15) 2014
Presentations: C3
Placement: M.D. program at U. Michigan
- Nick Forsch (Wash U. B.S.M.E. '14) 2013
Placement: Ph.D program at U.C. San Diego

Supervisory Committees

- Anne Kerachni (IMT Atlantique Ph.D.) defense 2025
- Axel González Cornejo (ND AME Ph.D.) qualifying exam 2025
- Erick Gomez (ND AME Ph.D.) qualifying exam 2025
- George Pan (ND AME Ph.D.) qualifying exam 2024
- Lauren Hawthorne (ND BIOE Ph.D.) qualifying exam 2023
- Kang Yang (ND AME Ph.D.) qualifying exam 2023
- Kristyna Wang (ND AME Ph.D.) qualifying exam 2023
- Victor Zucatti da Silva (ND AME Ph.D.) qualifying exam 2023
- Qihao Zhuo (ND AME Ph.D.) qualifying exam 2022
- Ciera McFarland (ND AME Ph.D.) qualifying exam 2022
- Daniel Solomons (PUC Chile, Biological & Medical Engineering, Ph.D.) candidacy and defense 2022–2025
- Gozde Basara (ND AME Ph.D.) candidacy and defense 2021–2023
- David Kelly (AME Ph.D.) qualifying exam 2021
- Yunyang Gu (ND AME M.S.) thesis defense 2021
- Zoë Penko (AME Ph.D.) qualifying exam 2020
- Erin Archibeck (ND AME B.S.) DaVinci program 2020
- Adam Hellinghausen (ND AME B.S.) DaVinci program 2020
- Marzieh Mirhoseini (ND AME Ph.D.) qualifying and candidacy 2019–2021
- Megan Levis (ND BioE Ph.D.) candidacy and defense 2019–2021
- Roopak Karulkar (AME Ph.D.) qualifying exam 2019

SERVICE

Professional Service

- Member, Modeling and Analysis of Biological Systems (MABS) study section 2025–2031
- Editorial board member, *Brain Research Bulletin* 2025–
- Editorial board member, *Brain Multiphysics* 2022–2024
- Organizer, “Imaging-based methods in computational medicine ” Minisymposium 2023
U.S. National Congress on Computational Mechanics, Albuquerque, NM

- Organizer, Future Faculty Poster Session 2022–
Summer Bioengineering, Biomechanics, and Biotransport Conference
- Member, New PI Slack Membership Advisory Board 2022–2025
- Guest Editor, “Brain Morphology and Morphogenesis” special issue 2022
Brain Multiphysics
- Co-chair, “Cardiovascular growth and remodeling mechanics” Minisymposium 2022
World Congress of Biomechanics, Taipei, Taiwan (virtual)
- Guest Editor, “Image-Based Methods in Computational Medicine” special issue 2021
Engineering with Computers
- Fellow, NSF CMMI Game Changer Academy for Advancing Research Innovation 2021
- Organizer, “Machine Learning for Biological Modelling and Simulation” Minisymposium 2021
Pan American Congress on Computational Mechanics, Rio de Janeiro, Brazil (virtual)
- Organizer, “Imaging-based methods in computational medicine” Minisymposium 2021
International Symposium on Computer Methods in Biomechanics and Biomedical Engineering, Bonn, Germany (virtual)
- Organizer, “Growth and remodeling of living tissues” Minisymposium 2021
U.S. National Congress on Computational Mechanics, Chicago, IL (virtual)
- Organizer, “Imaging-based methods in computational medicine ” Minisymposium 2021
U.S. National Congress on Computational Mechanics, Chicago, IL (virtual)
- Organizer, “Mechanics of brain development” Minisymposium 2020
World Congress on Computational Mechanics, Paris, France (meeting canceled)
- Organizer, “Imaging-based modeling in biomechanics” Minisymposium 2019
U.S. National Congress on Computational Mechanics, Austin, TX
- Panelist, National Science Foundation (Division of Civil, Mechanical & Manufacturing Innovation, Collaborative Research in Computational Neuroscience)
- Reviewer, *Journal of the Mechanics and Physics of Solids*, *Journal of Biomechanics*, *Journal of the Mechanical Behavior of Biomedical Materials*, *Nature Communications*, *PLOS Computational Biology*, *Cerebral Cortex*, *Human Brain Mapping*, *Brain Multiphysics*, *Mathematics and Mechanics of Solids*, *Computational Mechanics*, *Engineering With Computers*, *International Journal of Non-Linear Mechanics*, *Advanced Biosystems* (for complete list, see Publons)

University & Department Service

- AME faculty search committee, member 2024–2025
- Bioengineering minor committee, member 2023
- Grand Challenge Scholars Program, steering committee member 2022–
- AME Diversity & Inclusion Coordinator 2019–2021
- AME faculty search committee, member 2019–2020
- Notre Dame Introduction to Engineering Summer Program, speaker 2018
Lectured on “Introduction to [Brain] Biomechanics”.

- Notre Dame College of Engineering Future Faculty Workshop, moderator 2018
Participated in panel on “Preparing a Research and Teaching Statement”.
- Stanford University Career Education, instructor 2016–2017
Presented workshop on “Writing an Effective Diversity Statement”.
- Stanford University Committee for Graduate Studies, student member 2014–2017
Reviewed, formulated, and approved policies governing graduate education.
- Stanford University Office of Community Standards, judicial panelist 2015–2016
Adjudicated cases involving violations of academic integrity.

Mentoring

- Building Bridges, mentor 2019–
Mentored first-year underrepresented student to adjust to college and explore majors.
- Advancing Women Leaders, mentor 2018–2020
Met regularly with mentee to discuss personal & professional development.
- Society of Women Engineers and El Centro Chicano y Latino, mentor 2012–2015
Met regularly one-on-one with three undergraduates to facilitate the transition to college and advise on majors, courses, activities, time management, etc.

Outreach

- Biomechanics in the Wild student blog, podcast, and Youtube channel, creator 2019–
Started student-written blog to introduce interesting biomechanics topics to the general public.
- High School outreach, speaker 2018, 2022
Spoke to classes at Coon Rapids and Blaine High Schools in Minnesota.
- ScienceWorld, interviewee 2020
Described the science of yo-yo-ing for a student-oriented science magazine.
- American Society of Mechanical Engineers, “Pizza and Professors” speaker 2019
Spoke to undergraduate students about my research.

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

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- American Physical Society (APS), member 2020–
 - Biomedical Engineering Society (BMES), member 2019–
 - Society for Neuroscience (SfN), member 2019–
 - Society of Women Engineers (SWE), member 2019–
 - American Society of Mechanical Engineers (ASME), member 2018–
 - International Association for Computational Mechanics (IACM), member 2018–
 - US Association for Computational Mechanics (USACM), member 2018–
 - American Society for Engineering Education (ASEE), member 2018–