

# GUS DOMEL

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## EDUCATION

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### HARVARD UNIVERSITY

**Ph.D., Engineering Sciences: Materials Science and Mechanical Engineering**

Cambridge, MA

**Master of Science, Engineering Sciences: Materials Science and Mechanical Engineering**

May 2019

March 2016

Thesis: *Bio-Inspired Design for Mechanical and Biomechanical Applications*

Fellowships:

Harvard's SEAS Full Fellowship and Scholarship

Harvard's Peirce Fellowship

Harvard's Winston Chen Fellowship

Harvard's Kao Fellowship

Teaching Fellow: Mechanics of Solids

Harvard Courses: Solid Mechanics, Plasticity and Deformation, Computational Design of Materials, Soft Matter, Computational Fluid Dynamics, Fracture Mechanics, Anatomy and Physiology, Biomaterials, Innovation and Entrepreneurship

MIT Courses: Human Factors Engineering, Structural Mechanics

### NORTHWESTERN UNIVERSITY

**Bachelor of Science in Mechanical Engineering**

Evanston, IL

June 2014

GPA: 3.99/4.00

Graduated #1 in School of Engineering and Applied Science Class of 2014

Mechanical Engineering Academic Achievement Award 2014

Courses: Advanced Finite Element Stress Analysis, Mechanical Vibrations, Dynamic Systems, Computer Aided Design, Fluid Mechanics, Thermodynamics, Design and Manufacturing, Engineering Analysis I-IV, Engineering Design and Communication I-II, Engineering Mechanics, Electronics Design, Computer Integrated Manufacturing, Machine Elements, Machine Dynamics, Probability, Statistics

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## WORK AND RESEARCH EXPERIENCE

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**ENGINEERING SYSTEMS INC., *Biomechanical Engineering Intern*, Aurora, IL**

Summers 2014 & 2015

- Assisted in a wide variety of accident reconstruction cases, ranging from airplane crashes to slip and fall cases
- Tested and studied different metacarpal and phalanx bone fractures associated with saw injuries, using real human bone mounted in ballistics gel hand matrices as a flesh surrogate
- Performed torque testing of specialty ladders to assist in the development of ANSI A14 ladder twist failure criterion
- Completed research on injuries sustained from vehicular rear impacts

**MIT AGELAB, *Researcher*, Cambridge, MA**

Oct. 2014 – May 2015

- Evaluated the effect of smart technology on driving capabilities via a driving simulator
- Experimentally assessed the performance of participants on various driving metrics, such as driver workload, attention, etc.

**COMPUTATIONAL SOLID MECHANICS LAB, *Research Assistant*, Northwestern (Dr. Wing Liu)** Sept. 2013 – Mar. 2014

- Published a paper discussing homogenized models for filled elastomers, allowing for quicker and more efficient relating of the microstructures of the elastomers to their damping properties
- Performed research on nickel titanium shape memory alloys to better understand and improve their ultra-high cycle fatigue life

**NEUROSCIENCE AND ROBOTICS LAB, *Research Assistant*, Northwestern (Dr. Colgate)**

May 2011 – Mar. 2014

- Designed and built a device that uses multiple load cells to measure forces exerted by fingers when in contact with surfaces, in order to develop next generation touch screens
- Researched the difference in a person's cognitive perception of a physical surface that is explored using only the index finger, as opposed to also using a thumb in conjunction with the index finger, as part of a pinch grip

**ARGONNE NATIONAL LABORATORY, Research Assistant, Lemont, IL**

Summer 2013

- Designed graphical user interface for a nuclear power plant, enabling diagnosis and management of plant malfunctions from a remote location
- Prepared extensive nuclear power plant analysis report based on 250 trial simulations run using the graphical user interface
- Programmed sequences in Java and Python to diagnose nuclear reactor malfunctions and display results on the graphical user interface

**MOTOROLA SOLUTIONS, INC., Mechanical Engineering Intern, Schaumburg, IL**

Summer 2012

- Developed mockups of radio repeaters to verify cable assembly layout and spacing, and presented the results to team members for analysis and redesign
- Designed 5 different fixture plates and adapters for use by failure analysis team in compressive testing of microphone housings
- Completed tolerance analyses to ensure parts of the different fixture plates and adapters would align
- Performed water immersion testing on radios to identify infiltration locations

**MOTOROLA MOBILITY, INC., Mechanical Engineering Intern, Libertyville, IL**

Summer 2011

- Completed failure analysis and redesign for volume and power buttons of the *Droid Razr* cell phone and presented all redesign changes to mechanical, electrical, and chemical engineering divisions
- Performed deformation testing on *Droid Razr* batteries to determine the maximum damage that prevented their proper functioning
- Prescribed a suggested process of battery removal, based on deformation results, to avoid damage which would prevent continued use of the battery

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## PUBLICATIONS AND PRESENTATIONS

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- Domel, August G., Mehdi Saadat, James C. Weaver, Hossein Haj-Hariri, Katia Bertoldi, George V. Lauder, “Shark skin-inspired designs that improve aerodynamic performance”. *Journal of the Royal Society Interface* (2018): vol. 15. Press Coverage: *National Geographic, Newsweek, Physics World*
- Moore, John, Ruizhe Ma, August G. Domel, Wing Kam Liu, “An Efficient Multiscale Model of Damping Properties for Filled Elastomers with Complex Microstructures.” *Composites Part B: Engineering* (2014): 262-270.
- Moore, John A., Dana Frankel, Rajesh Prasannavenkatesan, August G. Domel, Gregory B. Olson, and Wing Kam Liu. "A Crystal Plasticity-based Study of the Relationship between Microstructure and Ultra-High-Cycle Fatigue Life in Nickel Titanium Alloys." *International Journal of Fatigue*, Volume 91, Part 1, October 2016, Pages 183–194 (2016).
- Pu, W., Choi, J., Olson, T., Amir, E., Girju, C., Park, Y., Vilim, R., and August G. Domel (2013). Description of New PRODIAG Algorithms and Simulation-Based Acceptance Tests, Technical Report, Argonne National Laboratory, Argonne, Illinois.
- Samost, Aubrey, David Perlman, August G. Domel, Bryan Reimer, Bruce Mehler, Alea Mehler, Jonathan Dobres, Thomas McWilliams. “Assessing The Relative Impact of Smartwatch and Smartphone Use on Workload, Attention, and Driving Performance in a Driving Simulator.” *Human Factors and Ergonomics Society New England Conference*. April 17, 2015. Paper.
- Domel, August G., Aubrey Samost, David Perlman, Bryan Reimer, Bruce Mehler, Alea Mehler, Jonathan Dobres, Thomas McWilliams. “Assessing The Relative Impact of Smartwatch and Smartphone Use on Workload, Attention, and Driving Performance in a Driving Simulator.” *Proceedings of Human Factors and Ergonomics Society New England Conference*. April 17, 2015. Cambridge, Massachusetts. Presentation.
- Samost, A., Perlman, D., Domel, August G., Reimer, B., Mehler, B., Mehler, A., Dobres, J., & McWilliams, T. “Comparing the Relative Impact of Smartwatch and Smartphone Use While Driving on Workload, Attention, and Driving Performance.” *Proceedings of the Annual Meeting of the Human Factors and Ergonomics Society*, Los Angeles, October 26-30, 2015.
- Zhexin, X; Domel, A; Wenguang, S; Knubben, E; Weaver, J; Bertoldi, K; Wen, L. “A Bio-inspired Soft Robotic Gripper Inspired by the Cephalopod Tentacles”. *The Society for Integrative and Comparative Biology*, San Francisco, January 3-7, 2018. Presentation.
- Lauder, George V., Dylan K. Wainwright, August G. Domel, James C. Weaver, Li Wen, and Katia Bertoldi. “Structure, Biomimetics, and Fluid Dynamics of Fish Skin Surfaces.” *APS - Physical Review Fluids* 1, 060502, October 18, 2016.

- M. Saadat, F. E. Fish, A. G. Domel, V. Di Santo, G. V. Lauder, and H. Haj-Hariri. “On the Rules for Aquatic Locomotion.” *APS – Physical Review Fluids* 2, 083102, August 18, 2017.

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### CERTIFICATIONS

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- Fundamentals of Engineering License #: 061.038010
- OSHA 1910 General Industry 10-hour Certification #: 36-701519745

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### ACADEMIC PROJECTS

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- Modeled auxetic stent for use during angioplasty procedure
- Designed Boeing oxygen mask deployment system to reduce the weight of the current system by 40% while maintaining the same speed and reliability, and then presented the new design to Boeing system safety engineers
- Designed wine opener for Project Revolve that eliminates pain for those with arthritis and other disabilities of the wrist, and presented design with video evidence to Project Revolve’s marketing team
- Designed plastic toy spider injection mold to create several hundred toy spiders in a few hours
- Modeled vein expansion and rupture associated with metamaterial stents
- Redesigned p-n junction CdTe Solar Cell to improve theoretical efficiency

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### LEADERSHIP AND ACTIVITIES

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- **ENGINEERS WITHOUT BORDERS, Co-Founder and President** Dec. 2012 – Mar. 2014
  - Assisted in the successful implementation of a water well for a sustainable clean water in Kimuka, Kenya
  - Led design and financial preparations for implementation trip to Kenya
  - Helped build organization to over 100 participating members
- **MECHANICAL ENGINEERING UNDERGRADUATE ADVISORY BOARD** Sept. 2012 – Mar. 2014
  - Recommended and assisted with changes to mechanical engineering curriculum
- **NATIONAL HONORARY ENGINEERING SOCIETY, TAU BETA PI** Apr. 2012 – Present
- **INTRAMURAL SPORTS (FOOTBALL, BASKETBALL, AND SOFTBALL)** Sept. 2010 – Present

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### SKILLS

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- CAD: Solid Works, Unigraphics NX, and Pro/ENGINEER
- FEA: Abaqus, Comsol
- Programming skills: Python, Matlab
- Other: Instron Tensile/Compressive Machine, MircoVu, PSI-Plot, Tolerance Analysis, and Laser Cutting