REBECCA E. TAYLOR
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Professor Rebecca Taylor holds a bachelors degree in Mechanical Engineering from Princeton University, a Masters of Mechanical Engineering from Stanford University, a Ph.D. in Mechanical Engineering from Stanford University, and a Ph.D. Minor in Bioengineering from Stanford University. She completed post-doctoral training in the lab of James Spudich in Biochemistry at the Stanford University School of Medicine, where she was a Ruth L. Kirschstein National Research Service Award (F32) fellow. She is the recipient of the NSF CAREER award, the AFOSR Young Investigator Program Award and the 2021 CMU Dean's Early Career Fellowship.

At Carnegie Mellon University, Professor Taylor runs the Microsystems and Mechanobiology Laboratory in the Mechanical Engineering Department. She holds courtesy appointments in Biomedical Engineering and Electrical and Computer Engineering. Her research focuses on the development and application of nanoscale biosensors and actuators that can interface with condensed matter as well as molecular and cellular biosystems. She is inspired by the heart, an organ whose contractile function is derived from its exquisite structure at the molecular level up through the tissue level; to enable the creation of dynamic, engineered systems with structure across multiple scales, her group employs self-assembly methods with structural DNA nanotechnology to augment and extend existing top-down microfabrication strategies.

EDUCATION

Stanford University, Stanford, CA
Ph.D. Mechanical Engineering, 2013
Ph.D. Minor Bioengineering, 2013
M.S. Mechanical Engineering, 2010

Princeton University
B.S.E. Mechanical Engineering 2001
with a Certificate in Robotics & Intelligent Systems

ACADEMIC APPOINTMENTS

2021- Present Associate Professor, Department of Mechanical Engineering; Courtesy appointments in Biomedical Engineering and Electrical and Computer Engineering, Carnegie Mellon University, Pittsburgh, PA.

2016-2021 Assistant Professor, Department of Mechanical Engineering; Courtesy appointments in Biomedical Engineering and Electrical and Computer Engineering, Carnegie Mellon University, Pittsburgh, PA.

FORMER POSITIONS

2013-2016 Postdoctoral Fellow, Spudich Biochemistry Lab, Stanford University School of Medicine, Stanford, CA.

2001-2006 Mechanical Design Engineer, FactorsNY, New York City, NY.

SELECTED HONORS AND AWARDS

CMU Dean's Early Career Fellow, July 1, 2021.
NSF CAREER Award, CMMI Advanced Manufacturing, National Science Foundation, 2020.
Voted "Best Faculty Advisor" by Graduating Seniors in Mechanical Engineering, 2019
Wimmer Fellow, Eberly Center, Carnegie Mellon University, 2018

AFOSR-Young Investigator Program Awardee, AFOSR, 2017
Donald L. and Rhonda Struminger Faculty Fellow, Carnegie Mellon University, 2016
Denise Denton Emerging Leaders Workshop Participant and Travel Grant Awardee, 2016
NIH F32 Ruth L. Kirschstein National Research Service Award (NRSA), 2014
Founding Committee Chair of student-run BioMechanical Conference at Stanford (BMECS), Stanford University, 2010
Stanford DARE Fellowship (Diversifying Academia Recruiting Excellence), 2010-2012
Stanford Lieberman Fellowship (declined), Stanford University, 2010
Visiting Researcher, Kamm Mechanotransduction Lab, MIT, Cambridge, MA, 2009.
Honorable Mention Poster Award, ASME Summer Bioengineering Conference, 2008
Outstanding Poster Award, Biomedical Computation at Stanford (BCATS) Conference, 2007
Stanford Bio-X Bowes Fellowship, Stanford University, 2007
Stanford Graduate Fellowship (declined), Stanford University, 2007
New Jersey Space Grant for summer undergraduate research, New Jersey Space Grant Consortium, 2001
National Merit Finalist, 1997

PUBLICATIONS

(* denotes corresponding author; underline denotes students advised by R.E. Taylor)

1. Kumar, S., Dhami, I., Thadke, S., Ly, D. H. & **Taylor, R. E**. Rapid self-assembly of γPNA nanofibers at constant temperature. *Biopolymers* e23463, 2021.
2. Wijesekara*, P., Liu*, Y., Wang, W., Johnston, E. K., Sullivan, M. L. G., **Taylor, R. E.** & Ren, X. Accessing and Assessing the Cell-Surface Glycocalyx Using DNA Origami. *Nano Letters*. 21(11):4765–4773, 2021.
3. Liu*, Y., Wijesekara*, P., Kumar, S., Wang, W., Ren, X. & **Taylor, R. E.** The effects of overhang placement and multivalency on cell labeling by DNA origami. *Nanoscale*. 13:6819-6828, 2021.
4. Babatunde, B., Arias, D. S., Cagan, J, & **Taylor R. E.** Generating DNA Origami Nanostructures through Shape Annealing. *Applied Sciences*. 11(7), 2021.
5. Wang, W., Arias, D. S., Deserno, M., Ren, X. & **Taylor, R. E.** Emerging Applications at the Interface of DNA Nanotechnology and Cellular Membranes: Perspectives from Biology, Engineering and Physics. *APL Bioengineering*, 4(4):041507, 2020.
6. Danielsson, B. E., Tieu, K. V., Bathula, K., Armiger, T. J., Vellala, P., **Taylor, R. E.**, Dahl, K. N., & Conway, D. (2020). Lamin microaggregates lead to altered mechanotransmission in progerin-expressing cells. *Nucleus*, 11(1):194-204.
7. *Harmatz, I. M., Travers. M. J. & **Taylor, R. E.** (2020) A customizable DNA and microsphere-based, magnetically actuated microswimmer. *Journal of Microelectromechanical Systems*, 29(5):990-995. ***Notable Paper:*** *In this paper, we demonstrated a construction technique for building articulated, magnetic swimming microstructures that are linked together using flexible connectors made of DNA. The hybrid top-down/bottom-up methodology utilizes DNA-based self-assembly to complement and extend existing microscale fabrication processes. In this case, our process allows for submicron-level precision over microswimmer body construction as well as mechanics.*

8. Kumar, S., Liu, Y., & **Taylor, R. E.** (2020). Self-assembly of gamma-modified peptide nucleic acids into complex nanostructures in organic solvent mixtures. *JoVE*, e61351. doi:10.3791/61351.

9. *Kumar, S., Pearse, A., Liu, Y., & **Taylor, R. E.** (2020). Modular self-assembly of gamma-modified peptide nucleic acids in organic solvent mixtures. *Nature Communications*, 11(1):2960. ***Notable Paper:*** *This paper reports the first micron-scale self-assembling nanofilaments made from building blocks of a synthetic DNA mimic called gamma-modified peptide nucleic acid (γPNA). Peptide nucleic acids have the same nucleobases (A's,C's,G's and T's) as DNA and can bind to DNA, but they have a notably higher binding affinity. We demonstrated that unlike DNA-based nanostructures, γPNA-based structures can form and remain stable in harsh environments like aprotic organic solvent solutions. This advance broadens the range of applications for structural nucleic acid nanotechnology and demonstrates a proof of concept approach for building complex nanosystems from γPNA.*

10. *Beltrán, S. M., Slepian, M. J., & **Taylor, R. E.** (2020). Extending capabilities of molecular force sensors via DNA nanotechnology. *Critical Reviews in Biomedical Engineering*. 48(1), 1-16. ***Notable Paper:*** *Historically, the interdisciplinary field of mechanobiology has been driven by the development of technologies for measuring and manipulating cellular and molecular forces, with each new tool enabling vast new lines of inquiry. In this review, we discuss recent advances in the manufacturing and capabilities of molecular-scale force and strain sensors. We also demonstrate how DNA nanotechnology has been critical to the enhancement of existing techniques and to the development of unique capabilities for future mechanosensor assembly. DNA is a responsive and programmable building material for sensor fabrication. It enables the systematic interrogation of molecular biomechanics with forces at the 1- to 200-pN scale that are needed to elucidate the fundamental means by which cells and proteins transduce mechanical signals.*

11. Sonmez, U. M., Coyle, S., **Taylor, R. E**., & LeDuc, P. R. (2020). Polycarbonate heat molding for soft lithography. *Small*, 16(6), 2000241.

12. **Taylor, R. E.**, & Zahid, M. (2020). Cell penetrating peptides, novel vectors for gene therapy. *Pharmaceutics, 12*(3), 225.

13. *Ying, L., Kumar, S., & **Taylor, R. E**. (2018) Mix-and-match nanobiosensor design: logical and spatial programming of biosensors using self-assembled DNA nanostructures. *Wiley Interdisciplinary Reviews: Nanomedicine and Nanobiotechnology.* 10(6), e1518. ***Notable Paper:*** *DNA-based nanosensors offer tremendous utility in nanobiosensing because analytes and transduction mechanisms for detection can be fully decoupled. Unlike transitional materials for nanobiosensing which often require a fixed approach for signal detection, a "mix-and-match" approach for nanobiosensor design can be taken with DNA nanotechnology. This allows independent selection of target molecule and type of output signal. This paper therefore introduces our "mix-and-match" framework and highlights the versatility and opportunities for DNA-based nanobiosensors.*

14. Homburger, J. R., Green, E. M., Caleshu, C., Sunitha, M., **Taylor, R. E**., Ruppel, K. M., Metpally, R., Colan, S. D., Michels, M., Day, S., Olivotto, I., Bustamante, C. D., Dewey, F., Ho, C., Spudich, J. A., & Ashley, E. A. (2016). Multi-dimensional structure function relationships in human β-cardiac myosin from population scale genetic variation. *Proceedings of the National Academy of Sciences, 113*(24), 6701-6706.

15. Spudich, J. A., Aksel, T., Bartholomew, S. R., Nag, S., Kawana, M., Yu, E. C., Sarkar, S. S., Sung, J., Sommese, R. F., Sutton, S., Cho, C., Adhikari, A. S., **Taylor, R. E.**, Liu, C., Trivedi, D., & Ruppel, K. M. (2016). Effects of hypertrophic and dilated cardiomyopathy mutations on power output by human β-cardiac myosin. *Journal of Experimental Biology, 219*(2), 161–167.
16. Hariadi, R. F., Sommese, R. F., Adhikari, A. S., **Taylor, R. E**., Sutton, S., Spudich, J. A., & Sivaramakrishnan, S. (2015). Mechanical coordination in motor ensembles revealed using engineered artificial myosin filaments. *Nature Nanotechnology, 10*(8), 696–700.
17. Sim, J. Y., **Taylor, R. E**., Larsen, T., & Pruitt, B. L. (2015). Oxidation stiffening of PDMS microposts. *Extreme Mechanics Letters, 3*, 17 - 23.
18. **Taylor, R. E**., Kim, K., Sun, N., Park, S.-J., Sim, J. Y., Fajardo, G., Bernstein, D., Wu, J. C., & Pruitt, B. L. (2013). Sacrificial layer technique for axial force post assay of immature cardiomyocytes. *Biomedical Microdevices, 15*(1), 171–181.
19. **Taylor, R. E**., Boyce, C. M., Boyce, M. C., & Pruitt, B. L. (2013). Planar patterned stretchable electrode arrays based on flexible printed circuits. *Journal of Micromechanics and Microengineering, 23*(10), 105004.
20. Pang, H., Shiwalkar, A. P., Madormo, C. M., **Taylor, R. E**., Andriacchi, T. P., & Kuhl, E. (2012). Computational modeling of bone density profiles in response to gait: a subject-specific approach. *Biomechanics and Modeling in Mechanobiology, 11*(3), 379–390.
21. Kim, K., **Taylor, R. E**., Sim, J. Y., Park, S.-J., Norman, J., Fajardo, G., Bernstein, D., & Pruitt, B. L. (2011). Calibrated micropost arrays for biomechanical characterisation of cardiomyocytes. *Micro & Nano Letters, 6*(5), 317-322.
22. Wei, P., **Taylor, R. E**., Ding, Z., Chung, C., Abilez, O. J., Higgs, G., Pruitt, B. L., & Ziaie, B. (2011). Stretchable microelectrode array using room-temperature liquid alloy interconnects. *Journal of Micromechanics and Microengineering, 21*(5), 054015.
23. **Taylor, R. E**., Norman, J. J., Simmons, C., Abilez, O., Zarins, C., & Pruitt, B. L. (2009). Nano and the Future of Endovascular Medicine. *Endovascular Today*, 27-31.
24. **Taylor, R. E**., Zheng, C., Jackson, R. P., Doll, J. C., Chen, J. C., Holzbaur, K. R.S., Besier, T., & Kuhl, E. (2009). The phenomenon of twisted growth: humeral torsion in dominant arms of high-performance tennis players. *Computer Methods in Biomechanics and Biomedical Engineering, 12*(1), 83-93.

CONFERENCE PAPERS

1. Walawalkar, V., Roka-Moiia, Y., Liu, Y., Slepian, M. J. & **Taylor, R. E**. Development of DNA-based Shear Nanosensor: Human Platelets Bind DNA Origami via Chol-ssDNA. *Biomedical Engineering Society (BMES) Annual Meeting (Poster presentation), Orlando, FL*. 2021.
2. Imamura, T., Bergbreiter, S., Travers, M. J. & **Taylor, R. E**. Magnetic Field Actuation and Control of Customizable, Low Reynolds Number Magnetic Micro Swimmers. *ICRA2021 workshop on micro-nano swarm robotics (Oral presentation)*. 2021.

3. Babatunde, B., Arias, D. S., Cagan, J. & **Taylor, R. E**. A formal approach for automated generation of DNA origami designs. *Foundations of Nanoscience: Self-Assembled Architectures and Devices (FNANO Oral Presentation)*. pp. 37-38, 2021.
4. Liu, Y., Wijesekara, P., Wang, W., Ren, X. & **Taylor, R. E.** The Effects of Overhang Placement and Multivalency on Cell Labeling by DNA Origami. *Foundations of Nanoscience: Self-Assembled Architectures and Devices (FNANO Oral Presentation)*. pp. 25, 2021.
5. Liu, Y., Wijesekara, P., Ren, X. & **Taylor, R. E**. (2020) Tunable Targeted Cell Labeling with DNA Origami by Different Geometry. *Proceedings of the Biomedical Engineering Society*. (virtual)
6. Wijesekara, P., Liu, Y., Johnston, E., Ren, X. & **Taylor, R. E**. (2020) Accessing and Assessing the Cell-Surface Glycocalyx Using DNA Origami Nanotiles. *Proceedings of the Biomedical Engineering Society*. (virtual)
7. *Benjaminson, E., Travers, M. J. & **Taylor, R. E**. (2020). Steering magnetic robots in two axes with one pair of Maxwell coils. *Proceedings of the International Conference on Intelligent Robots and Systems (IROS),* Las Vegas, NV. ***Notable Paper:*** *This conference paper demonstrated the feasibility of steering a magnetic swimming robot along two axes with a single pair of Maxwell coils. By applying switching time optimization, we demonstrated the potential for simultaneous imaging and control of microrobots via the coils of a magnetic resonance imaging (MRI) machine that does not risk peripheral nerve stimulation in a patient.*
8. Beltrán, S., Wang W., McGaughey, A., LeDuc, P. R. & **Taylor, R. E.** (2020) DNA Nanostructures for Mechanosensation. *Society of Engineering Science*, Minneapolis, MN. (virtual)
9. Benjaminson, E., **Taylor, R. E**. & Travers, M. Predicting Nanorobot Shapes via Generative Models. NeurIPS: *Thirty-fourth Conference on Neural Information Processing Systems*. 2020.
10. Kumar, S., Pearse, A., Liu, Y., & **Taylor, R. E.** (2020). Self-assembly of nanotubes from distinct gamma-modified peptide nucleic acid oligomers in organic solvent mixtures. *Track on DNA Nanostructures: Semantomorphic Science at the Foundations of Nanoscience: Self-Assembled Architectures and Devices (FNANO) meeting*. *R. E. Taylor invited to give a talk corresponding to this abstract at FNANO (virtual talk available here: https://www.youtube.com/watch?v=pZEbD4wZHXs).
11. Liu, Y., Andreasen, C., & **Taylor, R. E.** (2020). Designing, simulating, and testing nano-scale DNA shear sensor. *9th Bio-Fluid Mechanics and Vascular Mechano-Biology Conference*.
12. Banga, A., Liu, M., Jain, R., Travers, M. and **Taylor, R.E.** A tool to accelerate experimentation in the field of artificial microswimmers. *Proceedings of the Biomedical Engineering Society, Philadelphia, PA*, 2019.
13. Chen, A., Travers, M., and **Taylor, R.E.** Effective cross-sectional diameters of ferro- and superparamagnetic microswimmers. *Proceedings of the Biomedical Engineering Society, Philadelphia, PA*, 2019.

14. Benjaminson, E., Basit, F., Vedova, D., Grover, J.S., Kumar, S., Liu, Y., Harmatz, M., Sneeringer, R., Travers, M., and **Taylor, R.E.** Optimizing microswimmer motion by tuning bending stiffness with DNA nanotechnology. *Proceedings of the Biomedical Engineering Society, Philadelphia, PA*, 2019.
15. Beltrán, S.M., Liu, Y., LeDuc, P.R., and **Taylor, R.E.** DNA nanostructures for mechanosensation. *Proceedings of the Biomedical Engineering Society, Philadelphia, PA*, 2019.
16. Cambre, J., Liu, Y., **R.E. Taylor**, & Kulkarni, C. (2019). Vitro: Designing a Voice Assistant for the Scientific Lab Workplace. Proceedings of the 2019 on Designing Interactive Systems Conference, pp. 1531-1542, San Diego, CA.
17. Kumar, S. and **Taylor, R.E.** (2018). Tuneable Mechanical Response of Twisted DNA Nanotubes Towards Biosensing. *AIChE Annual Meeting Proceedings, Pittsburgh, PA.*
18. Arambel, P., Riek, M., & **Taylor, R. E**.* (2017). Novel microfabrication technique of 3d silicone structures from planar substrate by tensile buckling. *Proceedings of uTAS*, pp. 1623-1624.
19. **Taylor, R. E**., Boyce, C. M., Boyce, M. C., & Pruitt, B.L. (2013). Stretchable, conformal microelectrode array fabricated with flex circuit technology. *The 7th International Conference on Microtechnologies in Medicine and Biology*.
20. **Taylor, R. E**., Ribeiro, A., Fajardo, G., Razavi, H., Bernstein, D., & Pruitt, B.L. (2011). Micropost-based Functional Assay of Adult Heart Cells: Does Mechanosensing Limit Force Production? *Proceedings of MicroTAS, Seattle, WA.*
21. **Taylor, R. E.,** Kim, K., and Pruitt, B. L. (2010) Self-assembling single cells across microposts: first axial force measurements in immature cardiomyocytes. *Proceedings of Solid State Sensors, Actuators, and Microsystems Workshop, Hilton Head, SC*, pp. 98-99 (11 percent oral presentations / 44 percent overall acceptance rate.
22. Wei, P., **Taylor, R. E**., Ding, Z., Higgs, G., Norman, J. J, Pruitt, B. L., and Ziaie, B. (2009) A stretchable cell culture platform with embedded electrode array. *Proceedings of MEMS, Sorrento, Italy*, pp. 407-410. (33 percent acceptance rate)
23. **Taylor, R. E.**, Lue, S. J., Gumerlock, K., Fajardo, G., Higgs, G., Norma, J. J., Wei, P., Ding, Z., Bernstein, D., Kuhl, E., and Pruitt, B. L. (2009) Synchronized mechanical and electrical stimulation of primary heart cells with a stretchable microelectrode array. *Proceedings of MEMS in Medicine and Biology, Quebec City, Canada.*
24. **Taylor, R. E.**, Abilez, O. J., Cao, F., Wu, J. C., Xu, C., and Pruitt, B. L. (2007) Pulsatile pressure system for cellular mechanical stimulation. *Proceedings of ASME Summer Bioengineering Conference, Keystone, CO.*

BOOK CHAPTER

1. **Taylor, R. E**., Mukundan, V., & Pruitt, B. L. (2011). Tools for Studying Biomechanical Interactions in Cells. In Wagoner Johnson, A.; Harley, A.C. Brendan (Eds.) *Mechanobiology of Cell-Cell and Cell-Matrix Interactions* (pp. 233–265). Boston, MA: Springer US.

PATENTS

1. **Taylor, R**., Pruitt, B. L., Boyce, M. C., Boyce, C. M., "IN-PLANE-STRAIN-ACTUATED OUT-OF-PLANE ACTUATOR." United States Regular Patent Application US Patent 20,160,158,933, June 9, 2016 (Issued 12-11-2018 #US10150665B2).
2. **Taylor, R**., Kumar, S., and Jayarathna, D., "Shape-Responsive All-PNA Nanostructures." Provisional Application for United States Patent, April 2, 2019.
3. **Taylor, R**., Liu, Y., Andreasen, C., Zhou, Y., " Nanoscale, fluorescent force sensor platform for 'smart' surface coatings." Provisional Applications for United States Patent, September 6, 2019.

GRANT AWARDS (on which Taylor is the **Primary** or **Sole PI)**

Award Span	**Grant Title**	**Agency**	**Co-PIs**	**Awarded**
2022-2023	DURIP: Peptide Nucleic Acid-Based Nanostructures at Biotic and Abiotic Interfaces	Air Force Office of Scientific Research, DURIP	Philip LeDuc	$198,290
2021-2024	MRI: Acquisition of an Automated X-Ray Scattering Instrument for In Situ Multiscale Studies	NSF, CMMI Major Research Instrumentation Program	St. Tristram-Nagle, R. Jayan, T. Kowalewski, M. Bockstaller	$992,182
2021-2023	Real-time mapping of membrane tension in GUVs and cultured cells using fluorescence DNA-based mechanosensors	DSF Charitable Foundation	M. Deserno	$150,000
2020-2022	Instrumenting blood platelets: nanosensors for cumulative shear and compression measurement	NIH, NHLBI	M. J. Slepian (University of Arizona)	$435,987
2020-2025	CAREER: Programmable Peptide Nucleic Acid Molecules as Building-blocks for Complex Nanostructures	NSF, CMMI: Advanced Manufacturing Division		$525,000
2018-2019	Signal enhancement of paper-based point-of-care diagnostics using DNA origami nanobiosensors	CMU Berkman Faculty Development Grant		$7,550
2018-2019	Simulation of DNA nanostructures and their behavior under external force	Pittsburgh Supercomputing Center		Standard/ GPU bridges
2018-2022	PNA-Driven Remote Actuation of DNA Nanospring Strain Sensors (3 Years YIP $450,000 + 4th Year Extension $150,000)	AFOSR-YIP		$600,000
2017	TIRF-Enabled Microscope for Imaging Dynamic Nano-Biosystems, Dean's Equipment Grant	Carnegie Institute of Technology Dean's Equipment Grant	B. Tilton, K.J. Hsia, M. Lösche, J. Zhang	$375,000

2017	Dense Decoration of Synthetic DNA-based Biosystem	Samuel and Emma Winters Foundation	C. Achim	$10,300

GRANT AWARDS (on which Taylor is a **Co-Principal Investigator)**

2021-2025	NRI: INT: Self-Assembly of Modular Robots Constructed Using DNA: Modeling and Manufacturing Nanostructures with Graph Neural Networks and DNA Origami	NSF National Robotics Institute	M. Travers	$1,220,133
2021-2024	A Shape Annuealing Approach to DNA Origami Design	NSF Engineering Design and Systems Engineering (EDSE	J. Cagan	$899,999
2017-2020	CPS: Small: Geometric Self-Propelled Articulated Micro-Scale Swimming	NSF – CPS Division	M. Travers	$449,548
2017	VirtualCellLab: Accelerating tacit knowledge in cell-culture manufacturing Grant	CMU Manufacturing Futures Initiative	C. Kulkarni	$197,390

STUDENT ADVISING

Ph.D. Advisees

1. Indranil Sihna, “Microfluidic platforms for manufacture and purification on magnetic biohybrid microactuators,” January 2022 – Present
2. Isabella Ferranti, “Real-time mapping of membrane tension in GUVs and cultured cells using fluorescent DNA-based mechanosensors,” September 2021 – Present.
3. Taryn Imamura, "Low Reynolds number location," August 2020 - Present. Co-advised with S. Bergbreiter. Awards: NSF GRFP Fellowship, GEM Fellowship
4. Bolutito Babatunde, "Self-reporting deformation of DNA nanosprings," August 2019 - Present. Co-advised with J. Cagan. Awards: NDSEG Fellowship, GEM Fellowship, and NSF GRFP Fellowship (offered but declined)
5. Sebastian Arias, "DNA sensors with position amplified-displacement sensing," August 2019 - Present. Awards: Hispanic Scholarship Fund (HSF) awardee, GEM Fellowship
6. Weitao Wang, "DNA nanotechnology for nanosurgical modulation of endocytosis in endothelial cells," July 2019 - Present. Co-advised with X. Ren
7. Susana Beltrán, “Nanoscale shear sensors made using DNA origami,” September 2018 – Present. Co-advised with P. LeDuc. Awards: NSF GRFP Fellowship, GEM Fellowship
8. Emma Benjaminson, “Hybrid top-down, bottom-up assembly of articulated microswimmers,” August 2018 – Present. Co-advised with M. Travers. Awards: NSF GRFP Fellowship, G. Sundback Graduate Fellowship
9. Sriram Kumar, "Dynamic shape-change in DNA Origami Nanosystems for Biosensor Applications," September 2017 – May 2021. co-advised with C. Achim

10. Ying Liu, "DNA origami for large area protein nanopatterning," January 2017 – August 2021. Awards: Carnegie Mellon University Dowd Fellowship 2018-2019

Master's Advisees

1. Taylor Clayton, "Microswimmers: Bottom-up Fabrication of Microswimmers Using Templated Assembly and DNA Origami," September 2017 - May 2019. co-advised with M. Travers. Awards: Mechanical Engineering Graduate Fellowship
2. Paula Arambel, "Strain-activated actuators for biosensor and microneedle applications," September 2016 – May 2018. Awards: GEM Fellow
3. Alexander Kwakye, "DNA origami for top-down meets bottom-up manufacturing," September 2016 – May 2018. Awards: Mechanical Engineering Graduate Fellowship

Undergraduate Advisees

1. Peter Sauer (student in Biological Sciences & Machine Learning), "Shape-switching DNA origami for capacitive sensing applications," September 2021 – Present
2. Aparna Nair, "Computational design of controlled-length of DNA nanostructures fabricated using a hybrid DNA origami/Single Stranded Tile method," June 2021 – Present
3. Lawrence Onyango, "Mapping the analytical design Space for 3D Compliant DNA origami mechanisms," Mechanical Engineering Department Summer Internship. June 2021 – Present
4. Caleigh Goodwin-Schoen, "Design and prototyping of 3D printed Protein and DNA models for education," Mechanical Engineering Department Summer Internship. May 2020 – Present.
5. Ethan Husted, Generating hybrid PNA-DNA nanostructure geometries with 2-domain inputs," Mechanical Engineering Department Summer Internship. May 2020 – December 2020.
6. Kayleigh Boyle, "Using 3-domain PNA building blocks and 3D visualizations to design new nanostructure geometries," Mechanical Engineering Department Summer Internship. May 2020 – August 2020.
7. Wanyi Chen, "Effective cross-sectional diameters of ferro- and superparamagnetic microswimmers," co-advised with M. Travers in RI. January 2019 – present.
8. Anika Banga (SCS), "A tool to accelerate experimentation in the field of artificial microswimmers," co-advised with M. Travers in RI, working with undergraduate student Maya Liu. January 2019 – January 2020.
9. Maya Liu (SCS), " A tool to accelerate experimentation in the field of artificial microswimmers," co-advised with M. Travers in RI, working with undergraduate student Anika Banga. January 2019 – January 2020.
10. Rishabh Jain, "Energetic simulation of helical DNA-based nanostructures," August 2018 – December 2019.
11. Charlotte Andreasen, "Nanoscale shear sensor design and shear chamber characterization," January 2018 – Spring 2021. "Course development assistant for 24-684 Special Topics: Nanoscale Manufacturing Using Structural DNA Nanotechnology," Summer 2020.

Awards: ACS Scholar, NSF GRFP Fellowship, CMU Small Undergraduate Research Grant (Spring 2018) with Y. Zhou.

12. Fatima Basit, "Nanoscribed topographies for ultrasonic self-assembly processes using template assisted selective release (TASR)," January 2018 – December 2019.
13. Yishun (Daphne) Zhou, "Comparison of molecular dynamic simulations and finite element models of DNA origami nanostructures," January 2018 – April 2020. Awards: CMU Small Undergraduate Research Grant (Spring 2018) with C. Andreasen.
14. Elizabeth McCullough, "Design of a DNA origami shear sensor," January 2018 – August 2018. Awards: CMU Summer Undergraduate Research Apprenticeship (2018)
15. Benjamin Pavlat (ChemE Undergrad), "Analysis of tractice force microscopy data," August 2018 – December 2018.
16. Rachel Sneeringer, "Nanoprinted Templates for Microswimmer Fabrication," June 2017 – May 2018. Awards: CMU Summer Undergraduate Research Fellowship (2017)
17. Mitchell Riek, "Planar designs for strain-activated actuators," 2017 - 2018. Awards: CMU Summer Undergraduate Research Fellowship (2017)
18. Ian Mitchell Harmatz, "Synthetic actin filaments made by dense-decoration of DNA origami," August 2016 – July 2020. Awards: The Phillips Medal (2018) *Highest Chemistry honor granted at UPitt*, Full-tuition fellowship to University of Pennsylvania Perelman Medical School.
19. Berk Sahin, "BME Carnegie Heart Program: A Modeling Tool for the Design of Mechanically Stiff Periodic Cardiac Nanosensors," May 2017 - August 2017.
20. William Anstett, "SURG Project," January 2017 - May 2017. Awards: CMU Small Undergraduate Research Grant (2017)
21. Shivang Chordia, "Course development for "Modern Manufacturing in Steeltown"," January 2017 - May 2017.
22. Sarah Karp, "Course development for "Modern Manufacturing in Steeltown"," January 2017 - May 2017.
23. Isabel Roscoe, "3D printed models of DNA and proteins," January 2017 - May 2017.
24. Kelly Underwood, "Course development for "Modern Manufacturing in Steeltown"," January 2017 - May 2017.

INVITED SEMINARS, CONFERENCE, AND WORKSHOP PRESENTATIONS

- *Instrumenting the vasculature: nanobeacon platforms for cellular communication and mechanobiology*, Invited speaker in the Cellular and Molecular Biomechanics: Mechanobiology session at the **Biomedical Engineering Society Meeting**, Orlando, Florida, October 6, 2021 (virtual session)
- *Building and sensing at the nanoscale*, **Mid-Career Mechanobiology Symposium** hosted by the University of Florida Mechanical Engineering Department, Gainesville, Florida, October 5, 2021 (virtual presentation).
- *Self-assembly and hybrid top-down, bottom-up manufacturing for nanobiosensing and robotics*, **The Ohio State University** Mechanical Engineering Department, March 5, 2021 (virtual seminar)

- *Self-assembly meets top-down manufacturing for nanosensing and robotics*, **Air Force Research Lab (AFRL) Biotech Community of Practice Seminar Series**, November 4, 2020 (virtual seminar).
- *Self-Assembly and Hybrid Top-Down, Bottom-Up Manufacturing for Nanobiosensing and Robotics*, **CMU MechE Departmental Seminar**, September 18, 2020 (virtual seminar).
- *Self-Assembly and Hybrid Top-Down, Bottom-Up Manufacturing for Nanobiosensing and Robotics*, **Mid-Atlantic Micro/Nano Alliance (MAMNA),** July 9, 2020 (virtual seminar).
- *CMU Covid-19 Face Shield Project* presented by Rebecca E. Taylor and Emma Benjaminson to the participants of the **CMU Covid-19 Innovation Project**, Carnegie Mellon University, Pittsburgh, PA, June 26, 2020 (virtual seminar).
- *Programmable self-assembly with DNA and PNA for nanobiosensing, robotics and manufacturing*, **Massachusett Institute of Technology**, Cambridge, MIT, March 4, 2020.
- *Programmable self-assembly with DNA and PNA for nanobiosensing, robotics and manufacturing*, Arizona State University, Biodesign Institute, Tempe, AZ, February 11, 2020.
- *DNA Nanotechnology for Fluorescent Nanosensors in Paints and Coatings*, **PPG, Pittsburgh**, PA, December 2, 2019.
- *DNA and gammaPNA in programmable nanomaterials for sensing, robotics and manufacturing*, **University of California, Irvine**, Irvine, CA, November 6, 2019.
- *DNA and gammaPNA in programmable nanomaterials for sensing, robotics and manufacturing*, **Carnegie Mellon University Robotics Institute**, Pittsburgh, PA, November 2, 2019.
- *Quick Fire Talk on 24-689 Modern Manufacturing in Steeltow*n at CMU's 4th Annual Teaching & Learning Summit, Carnegie Mellon University, Pittsburgh, PA, November 1, 2019.
- Featured on **Future Tech Podcast,** *DNA Origami: A Radical New Way to Develop Microrobots and Mechanosensors*, April 12, 2019. https://www.futuretechpodcast.com.
- *Medical Devices at the Nanoscale: Using Structural DNA Nanotechnology for Nanobiosensing and Microrobotics,* **DARE@10 Homecoming: Conference & Celebration**, Stanford, CA, November 13, 2018.
- *DNA Nanotechnology and Microstructures for Biomimetic Sensors and Actuators,* **Biomedical Engineering Materials and Applications (BEMA) Roundtable Committee Meeting***,* Woods Hole, MA, June 28, 2018.
- *Medical devices at the nanoscale: using structural DNA nanotechnology for nanobiosensing and microrobot self-assembly*, **George Washington University**, Washington, D.C., March 8, 2018.
- *Air Force Workshop (AFOSR),* **Research Acceleration Workshop**, Carnegie Mellon Univeristy, March 1, 2018.
- *Experimental biomechanics: from micro- to nanosensing*, Carnegie Mellon University / **DSN-i Series**, Carnegie Mellon University, Scott Hall 6142, September 20, 2017.
- *A DARE Fellow's First Year in Academia*, **Stanford University DARE Program** (Diversifying Academia Recruiting Excellence), Stanford University, August 11, 2017.
- *Faculty Panel on Teaching and the Academic Job Market*, **Carnegie Mellon University / Eberly Center**, Carnegie Mellon University, April 5, 2017.
- *Form and Function in Multiscale Cardiac-Inspired Sensors for Experimental Biomechanics*, **Biomedical Engineering Seminar** at Carnegie Mellon University, Pittsburgh, PA, November 17, 2016.

- *Form and Function in Multiscale Cardiac-Inspired Sensors for Experimental Biomechanics*, **Center for the Mechanics and Engineering of Cellular Systems (CMECS)** at Carnegie Mellon University, Pittsburgh, PA, October 14, 2016.
- *Panel session for students interested in graduate school and Ph.D. research*, **Mechanical Engineering**, Carnegie Mellon University, Pittsburgh, PA, October 11, 2016.
- *Form and Function in Multiscale Cardiac-Inspired Sensors for Experimental Biomechanics*, **University of Washington, Mechanical Engineering Department**, Seattle, WA, April 16, 2015.
- *Form and Function in Multiscale Cardiac-Inspired Sensors for Experimental Biomechanics*, **Carnegie Mellon University, Mechanical Engineering Department**, Pittsburgh, PA, April 8, 2015.
- *Microsystems and Nanomachines for Studying Heart Disease*, **Stanford RISE (Raising Interest in Science and Engineering)**, Stanford, June 25, 2014.
- *Microfabricated tools for cardiac micro- and nanomechanics*, **Stanford Summer Engineering Academy (SSEA),** Stanford, August 9, 2013.
- *Women and Underrepresented Minorities and the Pathways to Ph.D. in Mechanical and Electrical Engineering*, **Mechanical Engineering Graduate Research and Academic Forum (MEGRAF) Seminar Series**, Stanford, January 13, 2013.
- *An Intro to Cardiovascular Physiology*, **Bio-X course BIOE 459: Frontiers in Interdisciplinary Biosciences**, Stanford, November 15, 2010.
- *MEMS and NEMS Micro/NanoElectroMechanical Systems for Stem Cells*, **BIOE 261: Principles and Practice of Stem Cell Engineering**, Stanford, October 28, 2008.
- *Doctoral Strangelove, or How I Learned to Stop Worrying and Quit My Dream Job*, **Dim Sum of MechE**, Stanford, October 7, 2008.

Professional Societies

American Society of Mechanical Engineers (ASME) 2016-
Biophysical Society (BPS) 2016-2019
American Heart Association (AHA)
Biomedical Engineering Society (BMES) 2018-
International Society for Nanoscale Science, Computation and Engineering (ISNSCE) 2018-

Reviewing Activity

Peer Reviewer for: Nanoscale, Proceedings of the National Academy of Sciences (PNAS), Science Robotics, Science Advances, PLOS One, Journal of Micromechanics and Microengineering (JMM), Journal of Microelectromechanical Systems (JMEMS), Cellular and Molecular Bioengineering (CAMB), Transactions on Biomedical Engineering, Semiconductor Science and Technology, ACS Applied Bio Materials, Applied Sciences, Pharmaceutics

Swiss National Science Foundation (SNSF), 2020, 2021
Human Frontier Science Program Organization (HFSP), 2017
Pennsylvania Infrastructure Technology Alliance (PITA), 2018
PA Manufacturing Innovation Program (PMIP), 2019

Outreach Activities

Panelist for Workshops on Negotiation & Assertiveness, Mentoring, LGBTQ+ Research Connect and CEE Rising Stars Workshop on Work-life Balance (2020-2021)

Participant in Leonard Gelfand Center program "STEM Career Explorations and 360° Lab Tours, 2020.

Featured on Future Tech Podcast “DNA Origami: A Radical New Way to Develop Microrobots and Mechanosensors,” 2019.

Judge for the Intel International Science and Engineering Fair, Pittsburgh, 2018.

Rebecca Taylor’s graduate student advisees and Women in MechE group judged Gelfand Awards at the Pittsburgh Regional Science Fair, 2017, 2018.

Course developer and teacher for Gelfand Outreach Saturday Series Class “Nanoengineering with DNA,” a hands-on course on structural DNA nanotechnology for middle schoolers that is offered each Fall and Spring semester: 2017, 2018, 2019.

Performer at “Invisible Jazz Labs”, an improvisational science outreach performance, 2017.

Organizer for a Gelfand Center Focus Group on research outreach STEM teachers at the middle and high school levels, 2017.

UNIVERSITY SERVICE

Faculty Advisor for new CMU chapter of Out in Science, Technology, Engineering, and Mathematics (oSTEM), (2020-present)

Faculty Advisor for “Women in MechE” student group (2016-Present)

Faculty Advisor for Pi Tau Sigma honor society (2019-Present)

Mechanical Engineering Undergraduate Education Committee (2016-Present)

Mechanical Engineering Faculty Recruiting Committee, (2017-2018)

Faculty advisor for the Engineers Without Borders "PET Thatch" team (2017-2018)

Mechanical Engineering MATLAB Task Force (2017)

Judge for Rothberg Catalyzer Impact-a-thon (2019)

TEACHING

Donald L. and Rhonda Struminger Faculty Fellow, Carnegie Mellon University, 2016

Courses Taught: 24-370 Engineering Design I: Methods and Skills (F2016, F2017, F2018), 24-689 Special Topics: Making Your Product at Scale (S2018, S2019, S2020,S2021), 24-684 Special Topics: Nanoscale Manufacturing Using Structural DNA Nanotechnology (F2020,F2021).

Courses Developed: 24-689 Special Topics: Making Your Product at Scale, 24-684 Special Topics: Nanoscale Manufacturing Using Structural DNA Nanotechnology.