Morgan G. Barnes

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RESEARCH INTERESTS

Polymers, liquid crystal elastomers, shape-shifting materials, covalent organic frameworks

EDUCATION

Rice University **Houston, TX**
Ph.D., Materials Science and Nanoengineering *May 2016 - Fall 2020 (Expected)*
- Advisor: Dr. Rafael Verduzco
- Dissertation (working title): "Designing anisotropic polymers: from shape shifting elastomers to strong two-dimensional films"

Duke University **Durham, NC**
M.S. Mechanical Engineering and Materials Science *August 2013 - May 2015*
- Advisor: Dr. Piotr Marszalek
- Thesis: "Self-assembled protein-based biomaterials with tailorable physical properties"

Baylor University **Waco, TX**
B.S. Mechanical Engineering, Honors *August 2009 - May 2013*
- Advisor: Dr. David Jack
- Honors Thesis: "Modeling and Predicting the Behavior of Viscoelastic Materials"

PROFESSIONAL EXPERIENCE

Army Research Laboratory **Aberdeen, MD**
ORAU Research Internship *January 2020 - August 2020*
Worked under Dr. Emil Sandoz-Rosado to synthesize 2D covalent organic framework films with for high-strength high-toughness films

Rice University **Houston, TX**
Research Technician *January 2016 - May 2016*
Worked under Dr. Rebecca Richards-Kortum operating a high resolution microendoscope in a clinical environment and performing data analysis using Python

University of Texas **Austin, TX**
Undergraduate Research Assistant *May 2012 - August 2012*
Worked under Dr. Jorge Zornberg in the Geotechnical Engineering department studying the wetting and drying curves of soil and creating data acquisition systems

LEADERSHIP AND OUTREACH

ARO High School and Undergraduate Apprenticeship Program **Houston, TX**
Mentor *June - August 2019*
Mentored an undergraduate and high school student during the summer through the Army Research Office (ARO) Undergraduate Research Apprenticeship Program (URAP) and High School Apprenticeship Program (HSAP) grant to develop self-pumping microfluidic liquid crystal elastomer devices

NSF Nano in Schools **Houston, TX**
Guest Lecturer *January 2019*

Was a guest lecturer at local high school chemistry classroom to expose students to graduate school, research, and shape-shifting materials

NSF Research Education for Teachers (RET) **Houston, TX**
Mentor *June - August 2018*
Mentored a high school teacher in a summer research project as part of the NSF Nanosystems Engineering Research Center for Nanotechnology-Enabled Water Treatment (NEWT) RET program

CampSpark! **Houston, TX**
Activity Leader *July 2017*
Designed and taught a hands-on introductory polymer lesson for CampSpark!, a week long research camp for local refugees hosted by Rice University

Scientific Research Design (SRD) **Houston, TX**
Mentor *July 2016 - May 2017*
Mentored a local high school student in a research project for the school year as part of a SRD high school course

Rice's Institute of Biosciences and Bioengineering (IBB) Stem Engagement **Houston, TX**
Mentor *July 2016*
Mentored a high school student from the Science Academy of South Texas for a week long research experience hosted by Rice's IBB

Baylor Capstone Engineering Courses **Waco, TX**
Project Manager *January - December 2012*
Chosen by professors to act as project manager for two separate capstone Baylor engineering courses

Goodwill Adult Education **Waco, TX**
Tutor *September 2010 - May 2013*
Volunteered regularly with the local *Goodwill*'s ongoing education classes to prepare adults for the GED

TEACHING

MSNE 303: Junior Lab **Houston, TX**
Teaching Assistant *Spring 2017, 2018, 2019*
Organized, instructed and graded the labs for the departmental undergraduate junior lab

MSNE 555: Bio-Mimetic Strategies **Houston, TX**
Guest Lecturer *Spring 2019*
Guest lectured for the upper level bio-mimetics course covering soft shape-shifting materials and anti-fouling techniques

PRESENTATIONS AND POSTERS

American Chemical Society Spring Meeting **Philadelphia, PA**
Contributed Talk *March 2020*
Reactive 4D Printing of Mechanically Programmable Liquid Crystal Elastomer Actuators

American Physical Society March Meeting **Denver, CO**
Contributed Talk *March 2020*
4D Printing of Mechanically Programmable Shape-Shifting Liquid Crystal Elastomers

International Liquid Crystal Elastomer Conference **Eindhoven, Netherlands**
Contributed Talk *September 2019*
Reactive 3D-Printing of Liquid Crystal Elastomers for Non-Linear Actuation

American Physical Society March Meeting **Boston, MA**
Contributed Talk *March 2019*
Programming Complex and Arbitrary Shape Changes in Liquid Crystal Elastomers

Texas Soft Matter Meeting **Austin, TX**
Contributed Talk *August 2018*
Mechanically Programming Complex Reversible Shape Changes in Liquid Crystal Elastomers

Smalley-Curl Institute Summer Research Symposium **Houston, TX**
Selected Talk *August 2018*
Flat Sheets to 3D Images and Back: Programming Shape-Shifting Elastomers into Flowers, Faces, and More

American Chemical Society National Meeting **Washington DC**
Poster *August 2017*
Exploring the uses of a two-stage thiol-acrylate reaction for liquid crystal elastomers

Smalley-Curl Institute Transdisciplinary Symposium **Houston, TX**
Contributed Talk *February 2017*
Extrusion-Aligned Liquid Crystal Elastomer Fibers

Texas Soft Matter Meeting **Dallas, TX**
Contributed Talk *August 2016*
Step-Growth Liquid Crystal Elastomers with Low Glass Transition Temperatures

North Carolina State University Industry Symposium **Raleigh, NC**
Poster *February 2015*
Self-Assembled Biomaterials Using Streptavidin and SpyTag-SpyCatcher

Duke University Frontiers Day **Durham, NC**
Poster *May 2014*
Self-Assembled Protein-Based Soft Materials with Tailorable Viscoelastic Properties

AWARDS AND HONORS

- Best Student Lecturer award, International Liquid Crystal Elastomer Conference, Eindhoven, Netherlands, 2019
- Future Faculty Fellowship, Rice University, 2019
- NSF Future Faculty Workshop Travel Award, Princeton University, 2019
- Best Presentation award, Smalley-Curl Institute Summer Research Symposium , Rice University, 2018
- Outstanding Teacher's Assistant Award, Rice University, 2018
- Best Presentation award, Smalley-Curl Institute Trandisciplinary Symposium , Rice University, 2016
- Triangle Materials Research Science and Engineering Center (MRSEC) Fellowship, 2013
- Outstanding Engineering Senior award, Baylor University, 2013
- Who's Who Among Students in American Universities and Colleges award, Baylor University, 2013
- Presidents Gold Scholarship, Baylor University, 2009-2013

KEY SKILLS

Matlab, Python, LaTeX, DMA, DSC, TGA, AFM Spectroscopy, NMR, GPC, XRD, organic synthesis, FTIR, rheology

PUBLICATIONS

6. **M. Barnes**, S. Sajadi, S. Parekh, M. Rahman, P. Ajayan, R. Verduzco. Reactive 4D Printing of Shape Programmable Liquid Crystal Elastomers. *Submitted*. 2020.
5. S. Jung, Y. Cui, **M. Barnes**, C. Satam, S. Zhang, R. Ahmed, O. Shahin, C. Miller, S. Sajadi, M. Bennett, R. Verduzco, M. Yu, F. Merchant, J. C. Meredith, J. Youngblood, M. Rahman, P. M. Ajayan. Multifunctional Bio-nanocomposite Coatings for Perishable Fruits. *Submitted*. 2019.
4. S. Susarla, G. Chilkoor, Y. Cui, T. Arif, A. Puthirath, T. Tsafack, P. Sudeep, S. Castro-Pardo, **M. Barnes**, R. Verduzco, N. Koratkar, T. Filleter, G. Venkataramana, M. Rahman, P. Ajayan. Corrosion Resistance of Sulfur-Selenium Alloy Coatings. *Submitted*. 2019.
3. Rahman, M. M.; Puthirath, A. B.; Adumbumkulath, A.; Tsafack, T.; Robatjazi, H.; **Barnes, M.**; Wang, Z.; Kommandur, S.; Susarla, S.; Sajadi, S. M.; et al. Fiber Reinforced Layered Dielectric Nanocomposite. Advanced Functional Materials, 2019, 1900056.
2. **Barnes**, Verduzco. Direct Shape Programming of Liquid Crystal Elastomers. Soft Matter, 15 (870), 1–11, 2019.
1. B. Zhu, **M. G. Barnes**, H. Kim, M. Yuan, H. Ardebili, and R. Verduzco. Molecular engineering of step-growth liquid crystal elastomers. Sensors Actuators B Chem., vol. 244, pp. 433440, 2017.

ASSOCIATIONS

- American Chemical Society
- American Physical Society
- Pi Tau Sigma, National Mechanical Engineering Honors Society