

# Morgan G. Barnes

2349 Albans Road, Houston TX, 77005

🌐 MGBarnes.com

✉ Morgan.Barnes@rice.edu

☎ 512-466-3421

## RESEARCH INTERESTS

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

## EDUCATION

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### 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

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### 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

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### 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 (NEWTE) RET program

### **CampSpark!**

*Activity Leader*

**Houston, TX**

*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)**

*Mentor*

**Houston, TX**

*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**

*Mentor*

**Houston, TX**

*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**

*Project Manager*

**Waco, TX**

*January - December 2012*

Chosen by professors to act as project manager for two separate capstone Baylor engineering courses

### **Goodwill Adult Education**

*Tutor*

**Waco, TX**

*September 2010 - May 2013*

Volunteered regularly with the local *Goodwill's* ongoing education classes to prepare adults for the GED

## **TEACHING**

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### **MSNE 303: Junior Lab**

*Teaching Assistant*

**Houston, TX**

*Spring 2017, 2018, 2019*

Organized, instructed and graded the labs for the departmental undergraduate junior lab

### **MSNE 555: Bio-Mimetic Strategies**

*Guest Lecturer*

**Houston, TX**

*Spring 2019*

Guest lectured for the upper level bio-mimetics course covering soft shape-shifting materials and anti-fouling techniques

## **PRESENTATIONS AND POSTERS**

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### **International Liquid Crystal Elastomer Conference**

*Contributed Talk*

**Eindhoven, Netherlands**

*September 2019*

Reactive 3D-Printing of Liquid Crystal Elastomers for Non-Linear Actuation

### **American Physical Society March Meeting**

*Contributed Talk*

**Boston, MA**

*March 2019*

Programming Complex and Arbitrary Shape Changes in Liquid Crystal Elastomers

### **Texas Soft Matter Meeting**

*Contributed Talk*

**Austin, TX**

*August 2018*

Mechanically Programming Complex Reversible Shape Changes in Liquid Crystal Elastomers

### **Smalley-Curl Institute Summer Research Symposium**

*Selected Talk*

**Houston, TX**

*August 2018*

Flat Sheets to 3D Images and Back: Programming Shape-Shifting Elastomers into Flowers, Faces, and More

**American Chemical Society National Meeting***Poster*

Exploring the uses of a two-stage thiol-acrylate reaction for liquid crystal elastomers

**Washington DC***August 2017***Smalley-Curl Institute Transdisciplinary Symposium***Contributed Talk*

Extrusion-Aligned Liquid Crystal Elastomer Fibers

**Houston, TX***February 2017***Texas Soft Matter Meeting***Contributed Talk*

Step-Growth Liquid Crystal Elastomers with Low Glass Transition Temperatures

**Dallas, TX***August 2016***North Carolina State University Industry Symposium***Poster*

Self-Assembled Biomaterials Using Streptavidin and SpyTag-SpyCatcher

**Raleigh, NC***February 2015***Duke University Frontiers Day***Poster*

Self-Assembled Protein-Based Soft Materials with Tailorable Viscoelastic Properties

**Durham, NC***May 2014*

## AWARDS AND HONORS

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- Future Faculty Fellowship, Rice University, 2019
- NSF Future Faculty Workshop Travel Award, Princeton University, 2019
- Smalley-Curl Institute Summer Research Symposium Best Presentation award, Rice University, 2018
- Outstanding Teacher's Assistant Award, Rice University, 2018
- Smalley-Curl Institute Transdisciplinary Symposium travel award, 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

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Matlab, Python,  $\text{\LaTeX}$ , DMA, DSC, TGA, AFM Spectroscopy, NMR, GPC, XRD, organic synthesis, FTIR, rheology

## PUBLICATIONS

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1. Rahman, M. M.; Puthirath, A. B.; Adumbumkulath, A.; Tsafack, T.; Robotjazi, H.; **Barnes, M.**; Wang, Z.; Kommandur, S.; Susarla, S.; Sajadi, S. M.; et al. Fiber Reinforced Layered Dielectric Nanocomposite. Adv. Funct. Mater. 2019, 1900056.
2. **Barnes**, Verduzco. Direct Shape Programming of Liquid Crystal Elastomers. Soft Matter, 15 (870), 1–11, 2019.
3. 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

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