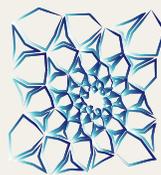


# BIOMIMICRY FELLOWSHIP PROGRAM

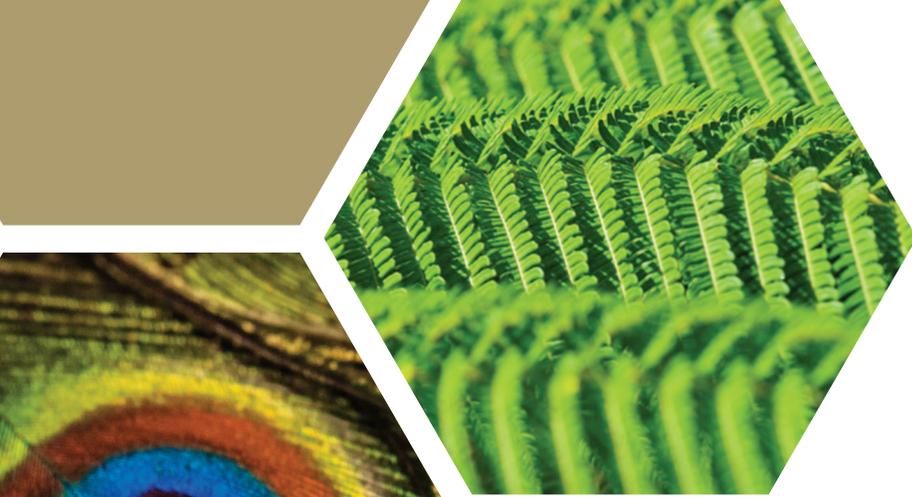
The  
University  
of Akron



GREAT LAKES  
BIOMIMICRY



BIOMIMICRY  
RESEARCH  
INNOVATION  
CENTER



## HISTORY

The Biomimicry Fellowship Program was launched in 2012 by The University of Akron's Biomimicry Research and Innovation Center (UA BRIC), in collaboration with Great Lakes Biomimicry. The mission of the program is to provide interdisciplinary training in biology, design, engineering and business to next-gen innovation leaders. The vision is for biomimicry to become a driver for economic development in Northeast Ohio and beyond. To date, The University of Akron has enrolled 19 Biomimicry Fellows. The first three Biomimicry Fellows graduated in 2017.

## ABOUT

Biomimicry Fellows are designated students in The University of Akron's doctoral Integrated Bioscience, Polymer Science and Polymer Engineering programs who are supported through industrial assistantships with organizational sponsors, rather than through teaching assistantships or research grants. Over the course of a five-year doctoral program, Biomimicry Fellows dedicate up to 20 hours per week advancing biomimicry initiatives within their sponsoring organizations, while undertaking biomimicry-focused dissertation research.

The industrial assistantship and dissertation research activities are often intertwined. Biomimicry Fellows have access to the labs and studios of 30 faculty members associated with UA BRIC (see table at end of packet). These faculty members have appointments across campus in the Colleges of Arts and Sciences, Business Administration, Engineering, and Polymer Science and Polymer Engineering.

## SPONSORSHIP

The organizational sponsor develops a recruiting profile with the assistance of UA BRIC's director of external relations and faculty members whose research interests align with the sponsor's.

Applications of prospective Biomimicry Fellows who meet the relevant program's admission requirements are reviewed in consultation with the sponsor. Interviews are arranged with short-listed candidates. When the position is filled, an advisory committee composed of faculty mentors and, often, a representative of the sponsoring organization is constructed to guide the student through research plan development and execution. Intellectual property originated, conceived, or made as part of the Biomimicry Fellow's activities with the sponsor is owned by the sponsor.

**"If you're not incorporating the most brilliant ideas from the natural world into what you sell, you're leaving money on the table."**

- FORTUNE Magazine (March 2017)

Sponsors of Biomimicry Fellows also become members of Great Lakes Biomimicry's **Corporate Innovation Council**. This collaboration between organizations is unique in the world and helps accelerate the integration of biomimicry and the Fellow in the sponsoring organization. The entire council meets semiannually to learn from subject matter experts, share best practices and network. Membership allows companies to stay on the leading edge of biomimicry and provides access to biomimicry resources, tools and leaders in the field.

## COST

The current cost to sponsor a fellow is \$178k for the typical five years. Below is an annual cost breakdown.

	Before student passes candidacy exams and proposal defense	After student passes candidacy exams and proposal defense*
<b>STUDENT STIPEND</b>	\$ 21,500	\$ 23,500
<b>FRINGE BENEFITS**</b>	\$ 1,161	\$ 1,269
<b>ADMINISTRATIVE FEE***</b>	\$ 5,892	\$ 6,440
<b>CORPORATE INNOVATION COUNCIL MEMBERSHIP</b>	<u>\$ 6,000</u>	<u>\$ 6,000</u>
<b>APPROXIMATE ANNUAL TOTAL</b>	<b>\$ 34,553</b>	<b>\$ 37,209</b>

\*When the student passes his or her candidacy exams and proposal defense it triggers a \$2,000 increase in student stipend for subsequent contract years. Typically, a student will achieve these milestones in Year 3, resulting in an increased rate for Years 4 and 5.

\*\*The fringe benefit rate for Graduate Assistants is 5.4% of the student stipend and covers the university's Medicare contributions, retirement contributions and workers' compensation policy. This rate will increase to 5.9% on July 1, 2019.

\*\*\*The administrative fee is 26% of the student stipend + fringe benefits, and covers university overhead associated with administering sponsored projects (Human Resources, Office of Research Administration, Payroll, Purchasing, Provost, Student Services, etc.).

## CURRENT FELLOW RESEARCH TOPICS

### REBECCA EAGLE-MALONE | Cleveland Zoological Society – Cleveland Metroparks Zoo

Rebecca, from Ohio, is investigating the connection between biomimicry education and conservation actions. She also studies vascular plant tolerances to determine viability for growth on Mars.

### SARAH HAN | The Goodyear Tire & Rubber Co.

Sarah, from California, is investigating arthropod tissue and structure's influence on biomechanics, especially rapid motions, assessed using high-speed videography.

### STEPHEN HOWE | Bendix Commercial Vehicle Systems, LLC

Stephen, from California, is investigating fish maneuverability. Results could be useful in simplifying the control of autonomous and remotely operated underwater vehicles.

### BANAFSHEH KHAKIPOOR | Avon Lake Regional Water; Teaching Institute for Excellence in STEM

Banafsheh, from Iran, is applying artificial neural networks for prediction of harmful algal blooms (HABs) and dead zones in Lake Erie. She is also part of a team developing a DIY Spectrometer and associated smartphone app allowing amateur scientists to measure and map phosphorous and nitrogen levels in Lake Erie. Banafsheh is also integrating biomimicry in K-12 curricula, helping students rediscover nature while learning about math, physics and programming.

### DANIEL MAKSUTA | Kimberly-Clark Corp.

Daniel, from Ohio, is using biomimicry for diaper innovation and investigating how to improve products with solutions that deviate from the typical cost-benefit curve.

### SARAH MCINERNEY | The J.M. Smucker Co.

Sarah, from Ireland, is investigating the hurdles that industry faces during the adoption and implementation of biomimicry. She is applying biomimicry thinking to packaging design and sustainable solutions for the food supply chain.

### ARIANA RUPP | Nottingham Spirk

Ariana, from Portugal, is investigating thermal systems inspired by leaf morphology and evapotranspiration to inform design of multi-scale heat transfer devices for industrial, architectural or makerspace application.

### KELLY SIMAN | Cleveland Water Alliance; Ohio Department of Natural Resources; Biohabitats

Kelly, from Ohio, is working to improve coastal ecosystem resiliency and land use impacts on Lake Erie and other nearshore waterways while boosting water innovation in the region. Her research focuses on biomimetic applications that support long-term system resilience, moving away from "random acts of restoration" to a holistic, data-driven approach to management.

## CURRENT FELLOW RESEARCH TOPICS

(CONTINUED)

**LAMALANI SIVERTS** | *Avon Lake Regional Water; Teaching Institute for Excellence in STEM*

Lamalani, from California, is tracking the biogeochemistry between phytoplankton and zebra/quagga mussels in communities that experience harmful algal blooms (HABs) to zero in on HAB-predictive signals in this complex food web which could be detected with inexpensive sensors. She is also bringing water quality awareness to the education system through STEM projects for middle and high school students.

**ELENA STACHEW** | *Biohabitats; Cleveland Water Alliance; Ohio Department of Natural Resources*

Elena, from Michigan, is using biomimicry to inform ecological design of coastal stabilization, restoration and urban stormwater management practices through prototyping, design and process integration.

**ADRIAN TWEEN** | *Eaton Corp.*

Adrian, from Mexico, is studying natural materials to gather insights that could inspire advanced structures (e.g. acoustic, adaptable, high strength, lightweight) or materials (e.g. composite, smart).

**COLLEEN UNSWORTH** | *NASA Glenn Research Center*

Colleen, from Michigan, is investigating the biomechanics of snake and myriapod locomotion to gather insights for design of mobility assistance technologies. She is also exploring the potential for biomimicry to contribute to inclusive design practices.

**MICHAEL WILSON** | *The Lubrizol Corp.*

Michael, from Tennessee, is investigating the role of functional groups in caddisfly larvae underwater adhesion.

## PAST FELLOW RESEARCH TOPICS

**EMILY KENNEDY** | *Class of 2017, GOJO Industries, Inc.*

Emily, from Massachusetts, applied biomimicry to R&D of energy-efficient soap dispensers, protective topical treatments, versatile dispenser brackets and infection control products/processes. Her dissertation made a case for biomimicry in business, providing empirical rationale for reimagining R&D.

**BOR-KAI "BILL" HSIUNG** | *Class of 2017, The Sherwin-Williams Co.*

Bill, from Taiwan, studied structural color in blue tarantulas and rainbow peacock spiders to inform design of non-iridescent electronic displays and non-toxic, non-fading colored coatings.

**DAPHNE FECHEYR-LIPPENS** | *Class of 2017, Parker Hannifin Corp.*

Daphne, from Belgium, studied UV-reflective properties of calcium carbonate-based biomaterials, like avian eggshells, to provide insights for developing industrial materials that don't degrade in sunlight, and building envelopes that reflect incident light, keeping occupants cool and reducing air conditioning expenses.

**SEBASTIAN ENGELHARDT** | *Class of 2018, Ross Environmental Services, Inc.*

Sebastian, from Germany, investigated wastewater desalination and purification inspired by biological processes, such as active trans-membrane water transport by aquaporin protein channels.

Current and past fellows have Master's and Bachelor's degrees in Aeronautics, Applied Chemistry, Biochemistry, Bioinformatics, Bio-Inspired Innovation, Biology, Biomedical Sciences, Biotechnology, Chemistry, Computer Science, Education, Engineering Physics, Entomology, Geography, Industrial Design, International Relations, Life Sciences, Materials Science & Engineering, Polymer Science & Engineering, and Zoology.

## UA BRIC FACULTY

NAME, BRIC ROLE	DEPARTMENT(S)	COLLEGE	RESEARCH INTEREST
Steve Ash, Associate	Management	Business Administration	HR, organizational behavior
Henry Astley, Core	Biology; Polymer Science	Arts & Sciences; Polymer Science & Polymer Engineering.	Biomechanics of animal locomotion, robotics
Hazel Barton, Associate	Biology, Geosciences	Arts & Sciences	Microbial ecology/evolution, biofilms, biogeochemistry
Matthew Becker, Associate	Polymer Science	Polymer Science & Polymer Engineering.	Synthesis of macromolecular materials with bio-functional species
Todd Blackledge, Associate	Biology	Arts & Sciences	Spider silk (coevolution of behavior, material, webs)
Kate Budd, Associate	Sculpture	Arts & Sciences	Sculpture inhabiting the zone between organic and functional
Alper Buldum, Associate	Mechanical Engineering.	Engineering	Computational materials science, nanomaterials, nanotechnology, nanotribology
Ali Dhinojwala, Core	Polymer Science	Polymer Science & Polymer Engineering.	Adhesion, interfacial science
Pat Gaughan, Associate	Management	Business Administration	Innovation and entrepreneurship
Petra Gruber, Core	Art, Biology	Arts & Sciences	Architecture, biodesign
John Huss, Associate	Philosophy	Arts & Sciences	Philosophy of science, ethics
Li Jia, Associate	Polymer Science	Polymer Science & Polymer Engineering.	Optical engineering, self-assembly
Abraham Joy, Associate	Polymer Science	Polymer Science & Polymer Engineering.	Bio- and photo-responsive materials, self-assembly
Hunter King, Core	Polymer Science; Biology	Polymer Science & Polymer Engineering.; Arts & Sciences	Physics of biological structures, soft matter
Matthew Kolodziej, Core	Painting, Drawing	Arts & Sciences	Paintings exploring the transitory quality of space and perception
Lingyun Liu, Associate	Chemical & Biomolecular Engineering.	Engineering	Anti-fouling materials, interfacial science, biosensors
Frank Loth, Associate	Mechanical Engineering.	Engineering	Biofluid dynamics
Chris Miller, Core	Civil Engineering.	Engineering	Water quality modeling/management, hydraulic engineering.
Chelsea Monty, Associate	Chemical & Biomolecular Engineering.	Engineering	Micro-scale biosensors
Paco Moore, Associate	Biology	Arts & Sciences	Microbial ecology and evolution, biofilms, bioinformatics
Gopal Nadkarni, Associate	Mechanical Engineering.	Engineering	Technology-based startups, leadership development
Peter Niewiarowski, Core	Biology	Arts & Sciences	Biophysical ecology, evolution, gecko adhesion
Judit Puskas, Associate	Chemical & Biomolecular Engineering.	Engineering	Green polymers, self-assembly, interfacial science
Narender Reddy, Associate	Biomedical Engineering.	Engineering	Biomechanics, neural networks
Nita Sahai, Associate	Polymer Science	Polymer Science & Polymer Engineering.	Biomaterials, biomineralization, interfacial science
Anthony Samangy, Associate	Graphic Design	Arts & Sciences	Interactive UX, informational designs, motion graphics
Marnie Saunders, Associate	Biomedical Engineering.	Engineering	Biomechanics and bone cell mechanobiology
Markus Vogl, Associate	Graphic Design	Arts & Sciences	Multiple sensory experiences and interactive installations
Steve Weeks, Associate	Biology	Arts & Sciences	Population biology, evolution of mating systems, biological control
Chrys Wesdemiotis, Associate	Chemistry	Arts & Sciences	Biopolymers, biochemistry

\*Core is BRIC principal investigator or BRIC hire



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