

All life is subject to dynamic non-equilibrium. Species thrive or fail based on their ability to adapt and evolve, and therefore innovation in design and function are the oldest strategies on Earth. Nature has provided us with 3.8 billion years of R&D from which to learn resilient and high performing function and form without useless byproducts or high energy demands. As the human species comes to realize that many of our design, process, and manufacturing strategies are causing undue harm to the biosphere and other earth systems that we depend on, we too need to adapt and evolve. The best resource for learning this approach is Nature itself. This is the discipline of Biomimicry (biomimicry.org). But do CU Boulder faculty know how to learn from nature and to teach what is becoming a leading tool for innovation?

This white paper asks for Administration and Departments to target funding for invitations to facilitate intensives for faculty and incentives to teach biomimicry methodology.

It has been two decades since biologist Janine Benyus, published her book on Biomimicry. Since then her organization has mentored and consulted companies including Boeing, Colgate-Palmolive, General Electric, General Mills, Herman Miller, HOK architects, IDEO, Kohler, Levi's, Natura, Interface, Nike and Proctor & Gamble. Biomimicry research and contributions to biomimicry have led to well over 200 products that have been biomimicry inspired, and they are out-performing their competitors, using green chemistry (non-toxic), and generating record profits for the companies using biomimicry- as profiled in the book of case studies, The Shark's Paintbrush (Harman, 2013).

Currently Arizona State University (ASU) has a Biomimicry Center that offers two graduate level programs online as well as on-campus programs (biomimicry.asu.edu). Demonstrating the popularity of the science, they projected 15 students would sign up the first year, and ended up with 171 students enrolled! ASU is promoting themselves as the #1 school in the U.S. for Innovation. They are recorded as so in US News & World Report in 2016, 2017, and 2018. We have every reason to be included in these lists, but if we fail to teach cutting edge methodologies like Biomimicry, we cannot become leaders of future innovation and will lose the competitive edge against other institutions that do.

As an example of lucrative research funding, Purdue University Professor of Lyles School of Civil Engineering, Dr. Pablo D. Zavattieri was awarded a \$350,000 grant from NSF in 2011 for research on biological and biomimetic materials (<https://engineering.purdue.edu/~zavattie/research.html>). Staying competitive in funding and achieving our strategic imperative requires that our researchers incorporate 21st century strategies.

Meanwhile, the annual student design contest, The Biomimicry Challenge with a \$100,000 prize is dominated by international teams. CU Boulder students are not prepared to compete with their peers and can't enter the competition because of the lack of education and training on the methodology.

Although CU Boulder has a 6+ year old student-run Biomimicry Club, CU does not have a dedicated class for engineers, biologists, designers or other innovators on biomimicry methodology. Workshops on the subject have produced surveys with students *very likely, or somewhat likely* to enroll in further workshops, and very likely to use biomimicry. These surveys spanned disciplines- ECEN, CEAE, MECH ENG, ENVIS ENG, COMP SCI, CVEN, MGMT, IPHY, ENVIS, EBIO, Psychology, Geology, Aerospace ENG, MENV, and CSCI. Students know this is the future and are hungry for their faculty to help them research and discover opportunities in biomimicry. As a national leader in sustainability with the strategic mission to shape tomorrow's leaders, positively impact humanity and be the top university for innovation, biomimicry is a natural fit for our campus.

In summary, Biomimicry is a critical tool to educate students and engage in cutting-edge scholarship and creative work, research and discovery. Biomimicry promises success for carrying out our strategic imperative to shape tomorrow's leaders, positively impact humanity and be the top university for innovation. Without leadership and funding support from Administration and Departments, Biomimicry will not flourish on the CU Boulder Campus, and a great opportunity will be missed. Incorporating Biomimicry into Teaching and Research is an example of a truly new initiative in line with Academic Futures.

For further reading:

<https://biomimicry.net/>
<https://synapse.bio/>

<https://biomimicry.org/>
<http://www.asknature.org>

Harman, Jay, 2013, The Shark's Paintbrush: Biomimicry and How Nature Inspires Innovation. White Cloud Press, PO Box 3400, Ashland, OR, 97520.