

Conceptualizing a Biomimetic Fablab Based on the Makerspace Concept and Biomimetics Design Research

Authors : Petra Gruber, Ariana Rupp, Peter Niewiarowski

Abstract : This paper presents a concept for a biomimetic fablab as a physical space for education, research and development of innovation inspired by nature. Biomimetics as a discipline finds increasing recognition in academia and has started to be institutionalized at universities in programs and centers. The Biomimicry Research and Innovation Center was founded in 2012 at the University of Akron as an interdisciplinary venture for the advancement of innovation inspired by nature and is part of a larger community fostering the approach of biomimicry in the Great Lakes region of the US. With 30 faculty members the center has representatives from Colleges of Arts and Sciences (e.g., biology, chemistry, geoscience, and philosophy) Engineering (e.g., mechanical, civil, and biomedical), Polymer Science, and Myers School of Arts. A platform for training PhDs in Biomimicry (17 students currently enrolled) is co-funded by educational institutions and industry partners. Research at the center touches on many areas but is also currently biased towards materials and structures, with highlights being materials based on principles found in spider silk and gecko attachment mechanisms. As biomimetics is also a novel scientific discipline, there is little standardisation in programming and the equipment of research facilities. As a field targeting innovation, design and prototyping processes are fundamental parts of the developments. For experimental design and prototyping, MIT's maker space concept seems to fit well to the requirements, but facilities need to be more specialised in terms of accessing biological systems and knowledge, specific research, production or conservation requirements. For the education and research facility BRIC we conceptualize the concept of a biomimicry fablab, that ties into the existing maker space concept and creates the setting for interdisciplinary research and development carried out in the program. The concept takes on the process of biomimetics as a guideline to define core activities that shall be enhanced by the allocation of specific spaces and tools. The limitations of such a facility and the intersections to further specialised labs housed in the classical departments are of special interest. As a preliminary proof of concept two biomimetic design courses carried out in 2016 are investigated in terms of needed tools and infrastructure. The spring course was a problem based biomimetic design challenge in collaboration with an innovation company interested in product design for assisted living and medical devices. The fall course was a solution based biomimetic design course focusing on order and hierarchy in nature with the goal of finding meaningful translations into art and technology. The paper describes the background of the BRIC center, identifies and discusses the process of biomimetics, evaluates the classical maker space concept and explores how these elements can shape the proposed research facility of a biomimetic fablab by examining two examples of design courses held in 2016.

Keywords : biomimetics, biomimicry, design, biomimetic fablab

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