Alexandria University

Faculty of Engineering

Architectural Engineering Department

NATURAL INSPIRED DESIGN: A PHENOMENOLOGICAL INTERPRETATION OF BIOMIMICRY AND ITS POTENTIAL VALUE FOR DERIVING NEW DESIGN PROCESS:

BIO-MIM-TRIZ process leading to BIO-MIMIZ buildings

Thesis Submitted to the architectural Engineering Department

Faculty of Engineering- Alexandria University

In partial fulfillment of the requirements for the degree of

Master of Science

In

Architectural Engineering

By

Pakinam Mohamed Nabil Barakat

2013

ABSTRACT

Humans face a serious threat which is the decay of nature resulting from their destroying habits. This forced architects to search for ways to protect our environment, control the decay of nature and strengthen the relationship between person and place. A new design process is needed to help solving this problem and all thoughts were oriented to inspiration from nature. Through years of evolution, nature has solved many important design problems and optimized those solutions for their respective environments. Therefore, there is a desire to deliberately leverage these optimized and robust solution strategies to develop new engineering processes or solutions.

Biomimicry is an applied science that derives inspiration for solutions to human problems through the study of natural designs, systems and processes. Unfortunately, there is a misunderstanding of Biomimicry, thinking that it is about mimicking natural form or appearance. Therefore a phenomenological approach is used to define Biomimicry and explains that it is about learning from nature ad working closely to it. Two important problems faced when using natural inspired design are a designer's limited knowledge of biology and the differences in engineering and biological terminologies. This thesis presents a new design tool that addresses these two problems. It can help designers develop candidate bio-inspired engineering products or solutions for a given design problem. This new design process is called "BIO-MIM-TRIZ" and it leads to new "BIO-MIMIZ" buildings.

After reviewing and comparing different design processes together, it is observed that TRIZ and Bio-TRIZ differ from the biomimetic design principles in two important aspects. First, the two sets of principles are obtained from different sources. Second, their presentation and method of application differ, possibly leading to different inspirations. These differences were used to form the guide lines of the new developed process and helped in creating its principles, tools, features and process steps. Finally, a chart was produced to helps architects decide the suitable process needed to solve a problem.

Keywords:

Biomimicry, Phenomenology, Biological designs, TRIZ, Bio-TRIZ., BIO-MIM-TRIZ