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BIOMIMICRY: A BOON TO ENGINEERING AND TECHNOLOGY

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ABSTRACT

Biomimicry is an ideology that imitates ideas from nature. Organisms in the natural environment have evolved and well adapted by structure and materials over geological time through natural selection. Many successful innovative ideas are harvested from the phenomenological approach to nature. Biomimicry is one of the elite approaches to challenge engineering problems in a sustainable manner. Biomimicry is currently being applied to build more efficient designs and sustainable technologies that harmonize with nature.

Keywords: Biomimicry, Engineering science, Innovation, Technology

Introduction

Biomimicry is the practice of applying nature's principles and underlying mechanisms to create innovative inventions in engineering and technology. Biomimicry is one type of bio-inspired design, but not all bio-inspired designs are biomimicry.The bio-inspired designs that visually resemble nature are referred to as Biomorphism. The use of biological material or living organisms in a design or technology is referred as bioutilization. The distinctive feature of biomimicry is the study and emulation of functional strategies to create sustainable solutions.Biomimicry is a new venture for the creation of novel ideas and the transformation of technology. Janine Benyus has defined a set of dimensions for biomimicry: nature as model, nature as measure, and nature as mentor. He argues that looking at nature and imitating its existing models, systems, and process can solve design problems sustainably (Benyus, 1997). Biomimicry is argued to serve two main purposes: innovation and sustainability. Biomimicry uses an ecological standard to judge the sustainability of our innovations" (Rao, 2014). Biomimicry will provide architects and designers with immense knowledge on a fairly new concept of designing and constructing buildings in architecture and design (Fukey and Pradeep, 2019).

The applications of biomimicry are two main approaches to the design process in biomimicry: problem-based and solution-based approaches (Figure 1). There are three levels of Biomimicry; Organism level, Behaviour level and Ecosystem level (Pedersen Zari, 2007). The contribution of the biomimicry approach is not only for environmental sustainability but also for economic sustainability (Marshall, 2010). The organism level refers to a specific organism such as a plant or animal and may involve mimicking part or whole of the organism. The behavior level refers to mimicking organism behavior and may include interpreting an aspect of how an organism behaves or relates to a larger context. The ecosystem level is the mimicking of whole ecosystems and the common principles that allows them to function successfully.

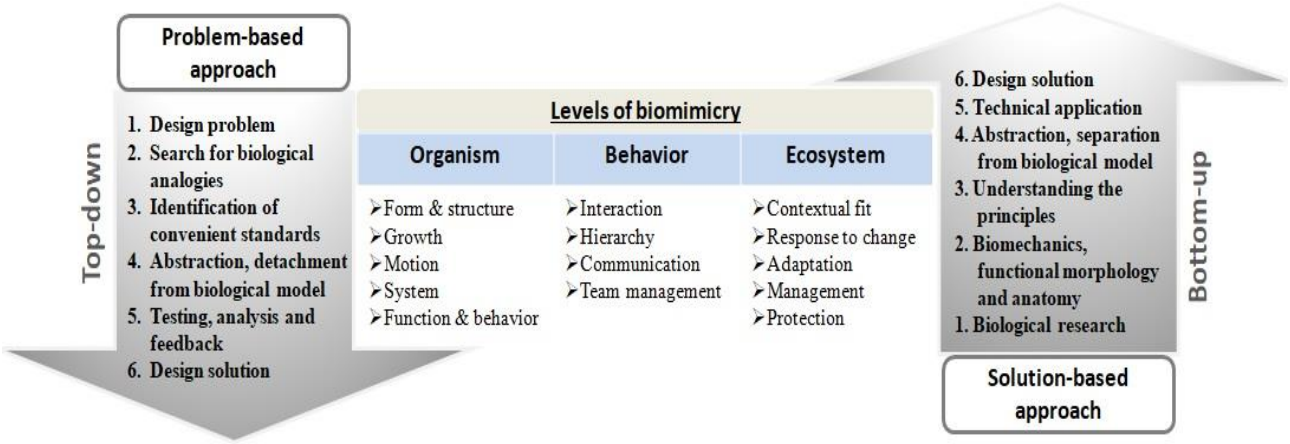

Figure 1. Approaches and levels of biomimicry

Biomimicry concept has been a part of human history ever since the evolution of man. There aremany studies on biomimicry designs and inventions have already been seen in today's world. Some of the well renounced biomimicry designs and inventions include a.) The front design of Shinkansen bullet train inspired from the beak of the kingfisher by Japanese design engineer Eiji Nakastsu. b.) The Eastgate centre building constructed based on the inspiration of termite mould by Zimbabwe architect Mick Pearce. This building has natural cooling effect by using a passive cooling system inspired from termite mould and consumes less energy for ventilation than conventional buildings. c.) Flying machine (Ornithopter) invented by Leornado da Vinci who only drew the sketches of this idea inspired from birds but failed to put it to practice himself.d.) The invention of the Velcro by Georges De Mestral from the inspiration of cockleburs caught in his clothes and his dog's fur. These examples showed the need to understand the nature behind science and design. Implementing the concepts of biomimicry in the engineering related problems can become a reality by exploring practical ways. Introducing

biomimicry as a subject in the institutes can provideimmense knowledge on a fairly new concept of sustainable designing and innovative ideas.

Conclusion:

This short communication indicates the importance of biomimicry as a sustainable approach to face challenging engineering problems. Biomimicryis a new venture for the creation of novel ideas and the transformation of sustainable technologies. Learning the concept of biomimicry will pave the way to improve creativethinking and innovative idea as well as to realize more sensitized realization of the importance of nature among the engineering students.

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