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Biomimicry as an approach for the development of sustainable technologies.

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Abstract - 200 words maximum

The biomimetic approach is about to profoundly influence our way of innovating, of designing more efficient and more environmentally friendly technological systems. Many inventions inspired by nature are around us without and we are not aware of their origin. One area of science in particular that is directly associated with this approach is biomechanics and bioengineering. Indeed, this domain characterizes the living from the point of view of structures, properties and their interactions. This characterization is the essential prerequisite for attempting a partial or total copy by biomimicry. In this article, the different levels of imitation, the fundamental principles of the approach and the advantages of biomimicry are presented. Finally, the examples illustrate the pivotal role of biomimicry and bioinspiration as a globally oriented approach towards the use of nature-inspired solutions for the development of sustainable and responsible man-made systems.

Keywords: *biomimicry, sustainable technology.*

I. INTRODUCTION

Biomimicry is increasingly popular in many fields of research and innovation. This term is widely used and it is often difficult for researchers to understand, define and differentiate bioimitation, biomimicry, biomimetics and bioinspiration.

Indeed all these different words refer to the study and imitation of movements, materials, properties and processes found in nature.

In the late 1990's, Janine M. Benyus defined Biomimicry as "a scientific tool that imitates nature's inventions ... to adapt them to serve man." [1]. She co-funded the Biomimicry institute (<https://biomimicry.org>), a non-profit organization encouraging the learning from nature to produce innovative sustainable technological solutions. Associated with the Biomimicry institute, the largest collection of comprehensive examples of technologies inspired from nature is available on the website asknature.com. A growing number of scientists, engineers, architects and designers is turning to this emerging discipline. Lessons learned from living systems that surround us enable new discoveries and technological breakthroughs. One can easily understand that all the challenges that mankind is facing now were already solved by biological entities during their evolution. Indeed, living systems constitute a tremendously rich source of inspiration because the natural selection and evolution have provoked their refinement and adaptation. However the technological exploitation of natural strategies requires some improvements and adaptations. Indeed, a biological adaptation on the small scale (molecular, cellular) is sometimes very difficult to extrapolate on a larger scale.

Learning and innovating from what nature provides can be done at different levels of imitation. For the moment the differences between biomimicry, bioimitation, biomimetics and bioinspiration are not fully defined and the trans-disciplinary character of this new field makes difficult the standardization of terms and approaches. Nevertheless, the main difference among these words can be understood on the basis of the degree of imitation, from the most superficial to the most refined.

If in the beginning the biomimetic developments were mainly based on intuition, there is now a biomimetic approach that is particularly efficient in engineering: the spiral of biomimetic innovation. In this approach, the technological problem is defined precisely to question nature methodically to finally find the species that meet the challenge.

REFERENCES

- [1] BENYUS, J., *Biomimicry: Innovation Inspired by Nature*, William Morrow Paperbacks, New York, 1997.