



Keynote Speech

Biological Laws for Engineering

Speaker Name,

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Speaker Biography:

Dr. N. Bogatyrev works in the field of biomimetics, biology and innovation, internationally certified TRIZ expert (MATRIZ). Nikolay produced 28 patents and published more than 100 scientific papers in 8 languages ranging from books, popular science papers to research articles on bio-inspired engineering, design of sustainable ecological environment and wild-life conservation.

Dr. Bogatyrev developed a set of rules for sustainable eco-engineering. From 2002 Nikolay worked at the University of Bath, using BioTRIZ as the tool for systematic transfer of principles, mechanisms and strategies from biology to technology.

Abstract/Outline

Borrowing biological principles, mechanisms and strategies for needs of technology is the main goal of biomimetic design. Physical and chemical laws are often deterministic and manifest their effects instantly and inescapably. Laws of physics and chemistry often refer to non-living matter. Biomimetic design aims to borrow ideas from Life. The advantages of this strategy are accompanied with challenges and often hidden issues. Biological solutions possess features that we urgently need: sustainability, recyclability, efficiency and high level of “self-functioning”.

The aim of this presentation is to provide engineers with biological laws suitable for implementation by engineering means. To achieve this we adapted and formulated the most general biological laws making them suitable for direct application in engineering and design.

All human inventions are driven by challenges and the solutions can be seen as analogy for adaptation in biology. Adaptation in biology is a change. Changes that lead to survival usually provide win-win effect – maximum result with minimum transformation. This reminds us an invention in technology, doesn't ?! This is the common ground to build a bridge between living nature and engineering. So, what is the definition of a LAW in science?

Scientific laws are statements, based on experiments or observations, which describe and predict a range of natural phenomena. Prediction is very important claim for engineering. If we cannot be sure that a washing machine will clean the clothes we are not buying it. So, when we apply a law of biology, we need to be sure that it provides a prediction of the result. To provide this for engineers we present each law in the following logic:

1. First, we define the boundaries and conditions of application of all laws.
2. Then we describe all options of actions that living nature provides to achieve the required result. In other words – how this law works.
3. For engineers and designers, it is important to see the area of application of a law. Range of variation of the law in biology describes what living nature achieves with the help this particular law.
4. Rules of implementation of the law are presented in the form of the rules for biomimetic design.