

Bionics - How and What Creation Teaches Us to Solve Mechanical Problems

During the last four decades a fast development of bio inspired engineering took place. The results are published under terms like Bionics, Biomechanics, Biotechnology, Biomimetics, Biomimicry, Bioengineering, Bioarchitecture. The talk presented will mainly focus on what a mechanical/structural/civil engineer can learn from these fields. Questions like: What can we learn from a frozen blanket applying the law of gravity? What can we learn from a tree – its seen and unseen parts? What can we learn from a tiger claw to design the optimal crane hook? How can we optimise structural elements learning from the human skeleton? Learning to “look” is one of the keys to grasp ideas from creation and its application in developing new constructions, identifying new mechanisms and concepts.

Thomas Schmidt first studied theology for some semesters. Then he focused on civil engineering and received a degree and a PhD in the field of earthquake engineering. After working in construction offices for several years, he has been working as professor for the last three decades. His current interest is the development of structural health monitoring systems to study the long-term behavior of civil engineering structures. He is especially interested in sensorics to improve monitoring systems. He teaches mechanics and structural dynamics at the University of Applied Sciences in Magdeburg (Germany) where he was head of the civil engineering department for several years. Alongside his working life he is an elder in a local church, preaching and teaching the word of God.

1. Introduction

- a. Bioinspired structural engineering in terms of material, construction, and maintenance
- b. Clarifying terms – Bionics, Biomimetics
- c. Introductory examples – Da Vinci

2. Personal contact and associations to bioinspired engineering and its application

- a. Reinforced concrete
- b. Construction of concrete shell structures
- c. Health monitoring

3. Foundation and Motivation to study Bionics

- a. Scientific Foundation/Motivation
- b. Spiritual Foundation/Motivation

4. Distinct goals to study Bionics

- a. In the past
- b. In the present
- c. In the future

5. How and what we can learn from nature/biology

- a. Look, detect, and realize construction principals in nature/biology.
- b. Apply the principals by developing strategies to transport the findings to structural engineering.
- c. Challenges in translating and applying the insights to real structures.

6. Examples to show how bioinspiration worked in the past and present.

- a. Roof structures
- b. Bridges
- c. Columns

7. Concepts to reach the goals

8. Outlook and Summary