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Bio-photonics

► Structural Color in Animals

Biopolymer

► Spider Silk

Bioprobes

► Biosensors

Biornametics – Architecture Defined by Natural Patterns

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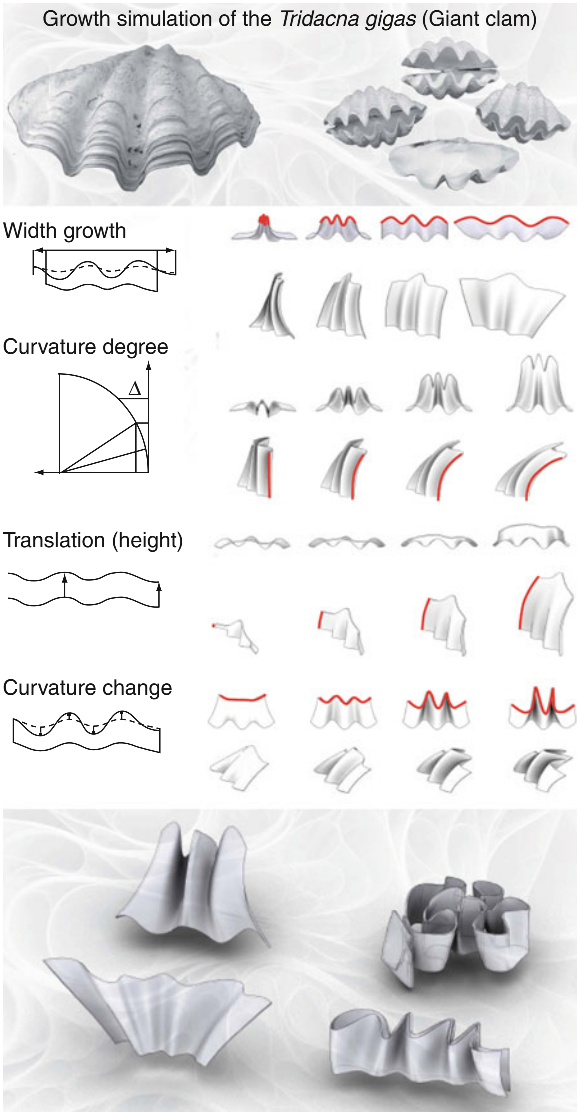
Biornametics – Architecture defined by Natural Patterns – is an emerging contemporary design practice that explores a new methodology to interconnect scientific evidence with creative design in the field of architecture. The word biornametics is generated from “ornament,” referring to the famous Austrian architect Adolf Loos, and “biomimetics” (► Biomimetics).

Role models from nature, static and dynamic patterns (e.g., nanostructured surfaces or materials with functional hierarchy from the nano- to the macroscale) are investigated and the findings are applied to design strategies. The emergence of patterns in nature at all scales of existence of organisms as one of the most important signs of life – order – is not arbitrary, but highly interconnected with boundary conditions, functional requirements, systems requirements, material, and structure. The three main areas of investigation for role models in biornametics are, firstly, surface patterns, nanosurfaces, and nanostructured materials, secondly, shape, growth, and deployable structures, and thirdly, adaptation and reorganization. Biological building strategies rely basically on repetition, variation, and self-similarity. Often simple building blocks are arranged with molecular-precision and thus achieve diverse and highly specialized material properties.

The research performed in biornametics aims at understanding the functionality of these natural patterns by extracting the principles found in current nanotechnology research, and transferring these principles to an architectural interpretation. Colors are just one very important example. In contrast to pigment colors, structural colors that are found on some butterfly wings, beetles, and even plants (“► Nanostructures

in: Springer Encyclopedia of Nanotechnology, Eds. Bhushan B. and Nosonovsky M., doi: 10.1007/978-90-481-9751-4, 328-329.



Biornametics – Architecture Defined by Natural Patterns, Fig. 1 Ornaments for architecture inspired by a growth simulation of the giant clam, starting from the initial nanocrystalline composite, followed by the formation of a two-dimensional disc protrusion and the formation of crystalline curls

for Coloration (Organisms other than Animals)") are primarily determined by the geometry of the underlying material. Interesting is also the generation of these surfaces and materials, as well as multifunctional properties such as durability, degradation, or self-repair. Further examples include plant–environment interactions such as the pitcher plant that lures animals onto a super-sliding surface, or lotus leaf self-cleaning properties and nanostructured composite materials with high toughness such as the abalone shell. The patterns found do not only fulfill their purpose but are surprisingly elegant and appeal to the aesthetic dimension of the human perception (see Fig. 1). The transfer of surface patterning to architectural elements may deliver added or integrated functionality or reinterpret specific functions on another scale.

Cross-References

- ▶ Biomimetics
- ▶ Nanostructures for Coloration (Organisms other than Animals)

Biosensing

- ▶ Biosensors

Biosensors

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Synonyms

Bioprobes; Biosensing; Nanobiosensors

Definition

A biosensor is a system or device which incorporates a biologically active material in intimate contact with an appropriate transduction element for the purpose of detecting the concentration or activity of chemical species in any type of sample.

Overview

The important components of a biosensor are (1) a bioreceptor (e.g., enzymes, antibody, microorganism, or cells); (2) a transducer of the

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