

# Preface



From the foreword to the 1st edition:

It should be stated in advance: This is not a book that directly enables one to build and construct. It is a book that broadens the horizon.

Building biomimetics is a field of biomimetics. The classical definition states:

Biomimetics as scientific discipline concerns itself systematically with the technical implementation and application of structural systems, processes, and development principles of biological systems.

Building biomimetics would then be correspondingly classified under the subject area of “structural biomimetics,” or also possibly under “process biomimetics.” There are, however, some points to consider.

First, one must be cautious when translating inspirations from the living world to the world of technology and should not expect the impossible; a direct copy never leads to the goal. However, when the architect or engineer grasps a *fundamental idea* from nature—for example, the environmentally neutral, thermoregulating

ventilation systems using solar effects, as practiced by termites, for example—these inspirations can contribute to bolder technological–biological adaptations of these aspects and their biomimetic applications in the engineering sciences. No more, but certainly no less. One must understand that nature presents no blueprints for its structures, and its processes are not always simple to appreciate, let alone to implement. Nonetheless, they are available for our observation.

Second, this book would like making inroads into *analog research*. The previously mentioned ventilation systems of termites and those systems of technology are analogous systems. Such systems can always be principally developed in two manners. Either nature actually provides the driving stimulus for the development of a certain technology, in which case the technical structures develop further under the umbrella of the engineering science disciplines. Or the development of the technology occurs without the knowledge of the biological nature to such structures. In this case, one establishes *a posteriori* a functional similarity, establishes *analogous structures*. On this basis of comparison, nature can be better reconstructed and more subtly observed.

With the application of technical know-how, natural structures can often be much better understood than without such cutting-edge sciences.

The final consideration was an essential reason for the composing of this book. It would not have been written in vain, even if it merely inspires awe in the structures of nature. This inspiration keeps the technological spirit alive for the linking of technology and nature, a link which could be much stronger than is customary today. And without nature always being at the forefront, alone from the understanding that nature and technology must not necessarily be alien to one another.

### Foreword to the 2nd edition

The first edition, published only in the German language, was well received and quickly out of stock. It contained the perspective of Werner Nachtigall as subject biologist with a major interest and a certain fundamental knowledge of the concerns of building and design. As a structural biology-oriented text, the first edition contained an illustrated collection of biological precedents.

In the meantime, the extensive book by N. W., “Biological Design—Systematic Catalogue for Biomimetic Design” appeared with Springer Publishers, which integrated this collection of illustrations. The newly freed pages allowed the possibility of a completely new orientation for the 2nd edition: Alongside the biological fundamentals, which a biologist can describe, the book would now also contain illustrations for practical applications of building and design, a task for which an architect is better suited. Both of the composers endeavored to develop a sound and encompassing work, without raising the claim to comprehensiveness. A series of technological analogs, which had been only briefly covered in the biological sections, were grasped once again in the technological chapters and more extensively represented with structural physics and architectural aspects.

The authors coordinated closely on this book and intensively discussed how a new edition could be structured using the basis of the 1st edition. It appeared important to intensify the viewpoint of the architect Göran Pohl and incorporate current examples of biomimetics for buildings in particular. Furthermore, important

changes in relation to definitions and standards in biomimetics had occurred during the contributions of G.P. with the VDI. In this regard, this present work is a—hopefully perceived as successful by the reader—coproduction of the biologist W.N. with the architect G.P.

The following chapters are the writings by the individual authors: Sections authored by W.N. are Sect. 1.2 Historical and Functional Analogies to Sect. 2.1.5 Panel Structures; Chap. 4 Natural Functions and Processes as Prototypes for Buildings; Chap. 5 Biological Support and Envelope Structures and their Counterparts in Buildings; Chap. 7 Brief Information to Biological Structures. Sections authored by G.P. are Sect. 1.1 The Term “Biomimetics”; Sect. 2.1.6 Structures of Folds; Chap. 3 Biomimetics for Buildings; Sect. 4.5.4 Example for Ventilation and Air Conditioning: Incorporation of Biomimetic Inspirations in the Structural-Architectural Planning Process; Sect. 5.6.4 Tensegrity—Connecting the Systems of Tensegrity and Pneu; Sect. 5.8 Moving Structures, Chap. 6 Products and Architecture—Examples of Biomimetics for Buildings.

This new edition should offer reliable information to architects, engineers, designers, and urban planners, as well as to teachers and students in all of the stated subject areas, and—possibly—also offer a certain reading enjoyment.

The architectural and engineering aspects of biomimetics have been far more distinctly developed in recent times than the biological aspects. That will certainly be strengthened in the future, and is good so. Biology serves as the initial basis for comparison and understanding of biomimetic principles; biomimetics for the built environment will then work its way into the actual practice and realization of future architectural and urban designs. Therefore, it only appears sensible to place the further development of this book primarily in the hands of professionals and practitioners of the architecture field. For this reason, we have changed the order of authors from the previous German edition of this book.



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Nature - Analogies - Technology

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