

Book Review

Architecture Follows Nature— Biomimetic Principles for Innovative Design

By Ilaria Mazzoleni, CRC Press, Taylor & Francis Group
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“Animal skins are one of the major systems for which architecture can draw inspiration from biology.” Ilaria Mazzoleni, in the Preface

Motivation. Architecture is a design and development domain that can benefit in a broad range of ways from consideration and application of the design principles of nature. Just as nature’s systems interface with their environments, so do as-built architectures. Architectural enclosures have envelopes—essentially “building skins”—that serve as interfaces to the buildings’ various environments. The “skins” of nature’s systems, be they feathers, scales, hides, shells, or other types of covering, can provide inspiration for effective and resource efficient building envelopes. These envelopes share many of the same basic functions as the skins of nature’s systems. This book takes an in-depth, analytic look at what architecture can learn from nature in the design of building envelopes.



The Author. Ms. **Ilaria Mazzoleni** is an architect, scholar, educator, innovator, and entrepreneur. She was educated in Italy and the US. She holds a Masters in Building Science from the University of Southern California. She is on the faculty of the Southern California Institute of Architecture. She is the founder of IM Studio Milano/Los Angeles. She presents her academic and professional work at international design and sustainability conferences. She has built work in the US, Italy and Ghana.

Reviews of several of her projects are on the [IM Studio](http://IMStudio.com) web site. Ms. **Shauna Price**, an evolutionary biologist, collaborates in the writing.

The Target Audience includes architects, designers, engineers, and biologists—all of whom can benefit from systematic examination and consideration of the way nature’s systems interface and interact with their environments, and all of whom can cooperate in development of bio-inspired architectural designs. The book is the second title in the CRC Press Series in Biomimetics.

Structure and Content. Part I (43 pages) reviews the ‘Theoretical Framework’ for applying nature’s concepts and characteristics to architecture. The discussion is eclectic: sometimes biological, sometimes environmental, sometimes historical, and sometimes deeply scientific and analytical. (This reminded me of the multiple perspectives approach of the famous [Zachman Framework](#) concepts.) Part II begins with a chapter on methodology: How can we look to nature for

inspiration for architectural designs? How do architects, engineers, and biologists work together? How do we analyze natural systems’ functions—and apply and adapt this knowledge to elements of system designs? The remainder of the book systematically discusses 12 architecture project case studies. Each relates a building envelope concept to a specific animal (polar bear, moth, sea slug, hippopotamus, and others)—drawing inspiration from the skin characteristics of the animal). Four selected functions of skin—and building envelope—are the foci of discussion: Communication, Thermal Regulation, Water Balance, and Protection. The author devotes a chapter to each of these four functions.

Each of these chapters begins with discussion of the function (e.g., heat dissipation and conservation in the case of Thermal Regulation), describes the diverse approaches used by different animals, and then proceeds to discuss in detail two to four architecture projects where the building envelope design is inspired by a specific animal’s skin characteristics. Numerous photos and diagrams (nearly 550 of them in all) are used to support the discussion and illustrate the concepts. The discussions are readable, understandable, and inspiring.

Availability and Additional Information.

CRCPress.com lists this 264-page book at USD80 (eBook: USD70). It is also available from Amazon. The front matter and the first third of Part I are accessible CRC. See also the [IM Studio](#) site. An e-Interview with Ms. Mazzoleni is posted on the [INCOSE Natural System Working Group \(NSWG\) site](#). A related May 2014 webinar presentation by Ms. Mazzoleni is also on the NSWG site.

Should You Buy This Book? I believe that Mazzoleni is a systems engineer at heart! She is analytical; she is deeply concerned about understanding function and functional relationships; she is thoroughly sensitive to the context in which a system must perform; she advocates an integration perspective and approach; she is resource and environmental impact sensitive, she advocates systematic methods, and she recognized the importance of interdisciplinary collaboration. The INCOSE community will, in my opinion, resonate with her thinking and approaches. This book will be useful for anyone who anticipates increasing collaboration among biologists and engineers in defining and developing future systems—and who, thus, seeks to understand practical approaches to such collaboration.

“The skin is an ideal organ to use as inspiration in architecture because of its multifaceted functions. It performs multiple, complex tasks, yet is one definable and visible system of the body.” Ilaria Mazzoleni

