Book Review

Architecture Follows Nature—
Biomimetic Principles for Innovative Design

By Ilaria Mazzoleni, CRC Press, Taylor & Francis Group
Reviewed By Dr. Lawrence D. Pohlmann, Strategics, pohlmann@incose.org

“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 and 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 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
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
USD$80 (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 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 environ-
mental 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