

Biomimicry: A Tool for Innovation



Innovators from all walks of life—engineers, managers, designers, architects, business leaders, and more--can use biomimicry as a tool to create more sustainable designs. The Biomimicry process of consulting life's genius, described in the Design Spiral, can serve as a guide to help innovators use biomimicry to biologize a challenge, query the natural world for inspiration, then evaluate to ensure that the final design mimics nature at all levels—form, process, and ecosystem.

Our methodology brings nature's wisdom not just to the physical design, but also to the manufacturing process, the packaging, and all the way through to shipping, distribution, and take-back decisions. We use a spiral to emphasize the reiterative nature of the process—that is, after solving one challenge, then evaluating how well it meets life's principles, another challenge often arises, and the design process begins anew. For instance, an innovator might design a wind turbine that mimics life's streamlining principles, but then ask how will it be manufactured? Will the energy use and chemical processing mimic nature too? It can, with another cycle through the design method.

The Challenge to Biology Design Spiral



ABSTRACT

DESIGN PRINCIPLES

Identify

Develop a Design Brief of the human need:

- Develop a Design Brief with specifics about the problem to be resolved
- Break down the Design Brief to identify the core of the problems and the design specifications
- Identify the function you want your design to accomplish: What do you want your design to do? (not “what do you want to design?”). Continue to ask why until you get to the bottom of the problem.
- Define the specifics of the problem:
 - Target Market: who is involved with the problem and who will be involved with the solution?
 - Location: where is the problem, where will the solution be applied?

Interpret

Biologize the question; ask the Design Brief from Nature's perspective:

- Translate the design function into functions carried out in nature. Ask “How does Nature do this function?” “How does Nature NOT do this function?”
- Reframe questions with additional key words.
- Define the Habitat/Location
 - Climate conditions
 - Nutrient conditions
 - Social conditions
 - Temporal conditions

Discover

Look for the champions in nature who answer/resolve your challenges

- Find the best Natural Models to answer your questions.
- Consider Literal and Metaphorical
- Find champion adapters by asking “whose survival depends on this?”
- Find organisms that are most challenged by the problem you are trying to solve, but are unfazed by it.
- Look to the extremes of the habitat
- Turn the problem inside out and on its head
- Open discussions with Biologists and specialists in the field

Abstract

Find the repeating patterns and processes within nature that achieve success

- Create taxonomy of life’s strategies
- Select the champions with the most relevant strategies to your particular design challenge.
- Abstract from this list the repeating successes and principles that achieve this success.

Emulate

Develop ideas and solutions based on the natural models

- Develop concepts and ideas that apply the lessons from your Natural teachers.
- Look into applying these lessons as deep as possible in your designs:
 - Mimicking Form:
 - Find out details of the morphology
 - Understand scale effects
 - Consider influencing factors on the effectiveness of the form for the organism
 - Consider ways in which you might deepen the conversation to also mimic process and/or ecosystem
 - Mimicking Function:
 - find out details of the biological process
 - Understand scale effects
 - Consider influencing factors on the effectiveness of the process for the organism
 - Consider ways in which you might deepen the conversation to also mimic the ecosystem
 - Mimicking Ecosystem:
 - Find out details of the biological process
 - Understand scale effects
 - Consider influencing factors on the effectiveness of the process for the organism

Evaluate

How do your ideas compare to **Life's Principles**, the successful principles of nature?



- Evaluate your design solution against Life's Principles
- Develop appropriate questions from Life's Principles and continue to question your solution
- Identify further ways to improve your design and develop new questions to explore. Questions may now be about the refinement of the concept:
 - Packaging, Manufacture, Marketing, Transport
 - New Products - additions, refinement
 - etc...

Identify

Develop and refine design briefs based on lessons learned from evaluation of Life's Principles

Nature works with small feedback loops, constantly learning, adapting and evolving. We can also benefit from this thinking, evolving our designs in repeated steps of observation and development, unearthing new lessons and applying these constantly throughout our own design exploration.

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