Biomimicry

TRAILS Summer Institute

Biomimicry, Bio-inspired Technology

What is Biomimicry?

"The term biomimicry is from Greek bios, life and mimesis, imitation. It represents the new focus on mimicking natural processes to find innovative solutions to complex problems; instead of focusing on what can be extracted from nature, biomimics pay attention to what they can learn from nature"

McGregor, 2013, p. 58.

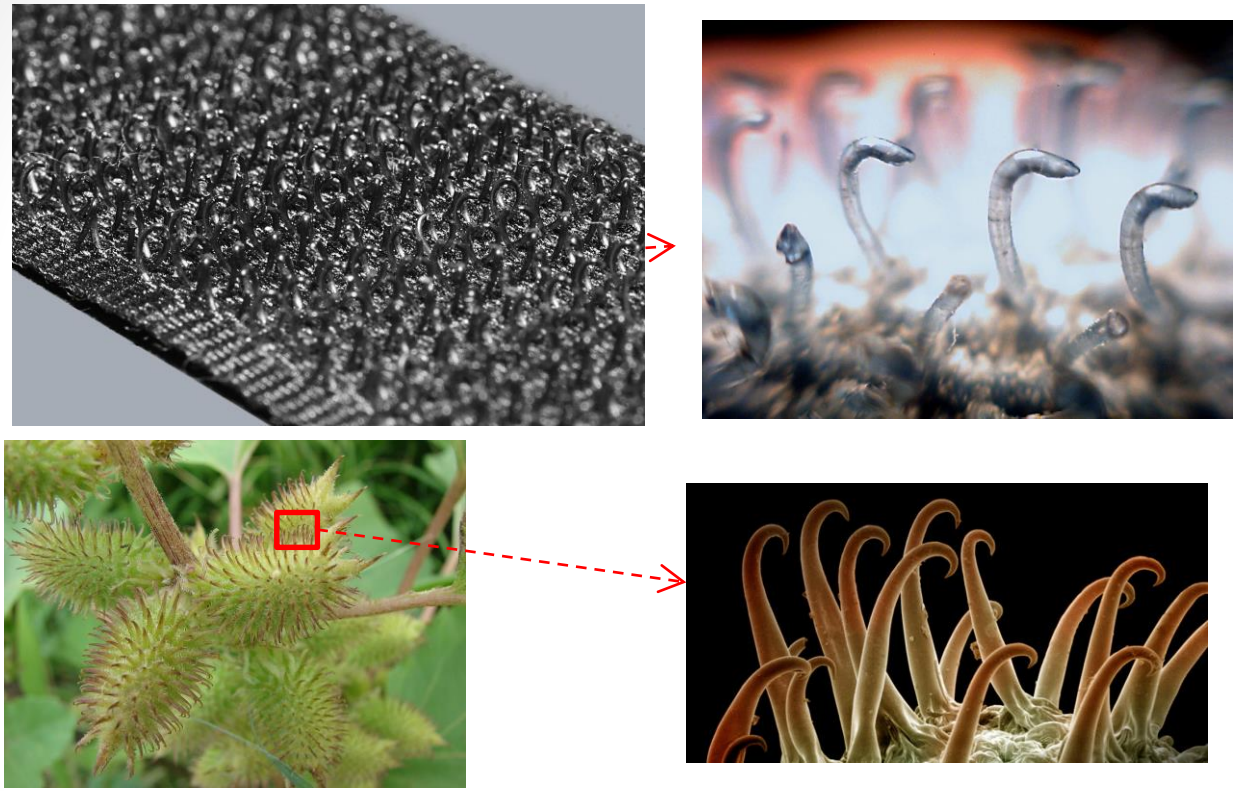
Misconceptions Regarding Biomimicry

- Many mistake biomorphism (when something looks like nature) for biomimicry.

- Biomimicry occurs when something designed is inspired by HOW something in nature WORKS. Biomimicry begins with identifying the function that a design needs to perform and finding analogs for that function in nature (biological strategies) from which useful design ideas can be drawn.

(Gretchen Hooker, personal communication)

Biomimicry Example: Velcro



- George de Mestral's 1941 hunting trip in Switzerland - while walking his dog in the mountains, he accidentally brushed up against some cocklebur plants.
- He quickly figured out why the seeds were so sticky by examining them under a microscope

Biomimicry Example: Gears

Planthoppers hop with a modified wheel: the gear.

Planthopper nymph

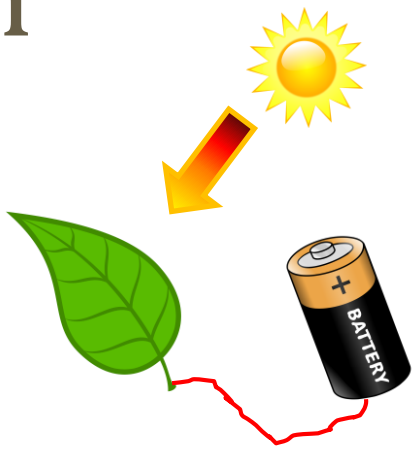
http://www.youtube.com/watch?v=cq0Mf2pt2XA

http://www.npr.org/2013/09/13/219739500/living-gears-help-this-bug-jump

Biomimicry in Design

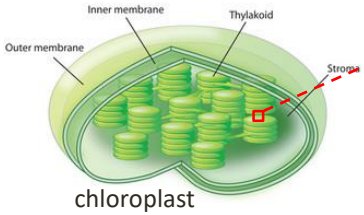
Nature has solutions,

how do we harness them?

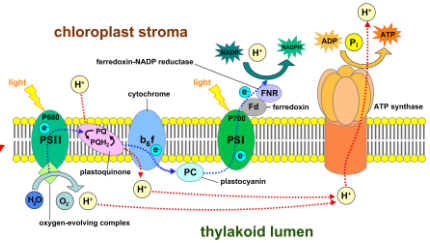


- 1. Define the function to be designed for

- 2. Find ways function is done in nature



chloroplast



- 3. Design, test, reiterate

artificial leaf v.2

1. Define Process

What is the key process and outcome that are needed?

-Do not focus on it looks like

- biomorphism a separate design aspect

-Reduce to the core processes

Example:

A very large building in a hot climate needs to have cooling and air circulation

1. Define Process

- Circulate air
- Cool the air

Don’t think of how to modify existing commonly-used HVAC systems

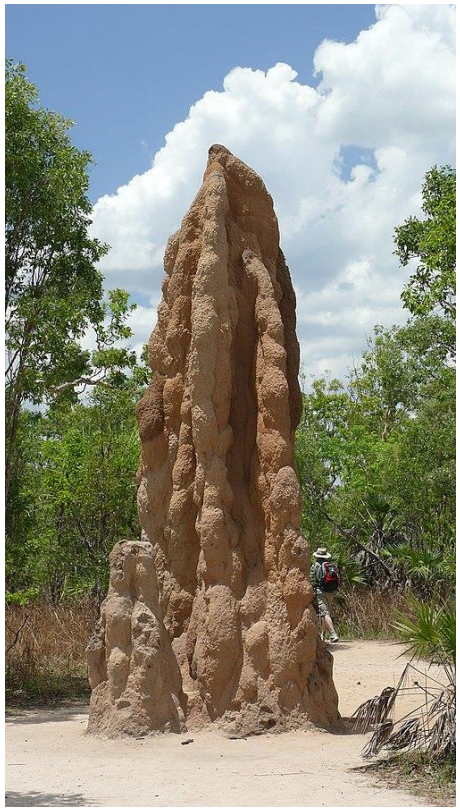
(Traditional approaches are often fine, but we are in the innovation business)

2. Find Solutions in Nature

- Termites build nests that are passively cooled

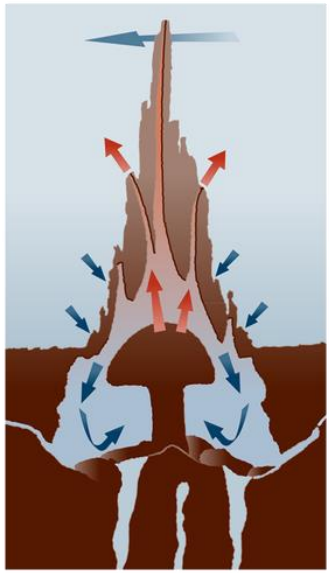
- Warm air rises and leaves the nest, drawing in cooler air from tunnels that run deeper into cool moist earth

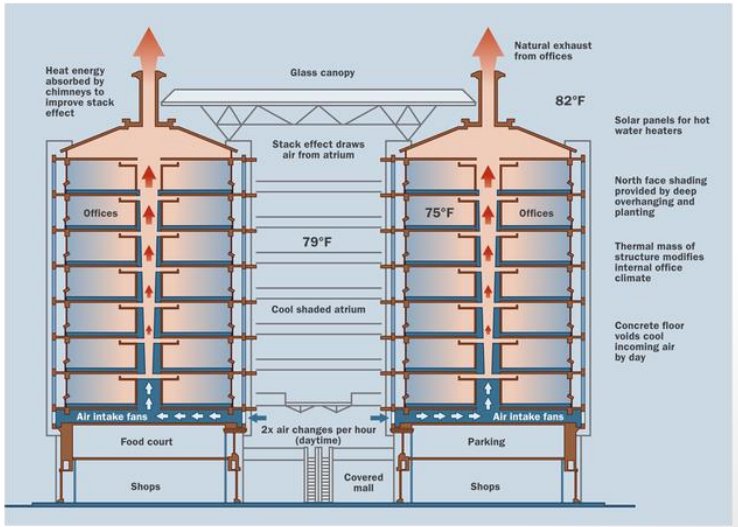
- Alter flow of air and cooling by constantly capping and opening structures



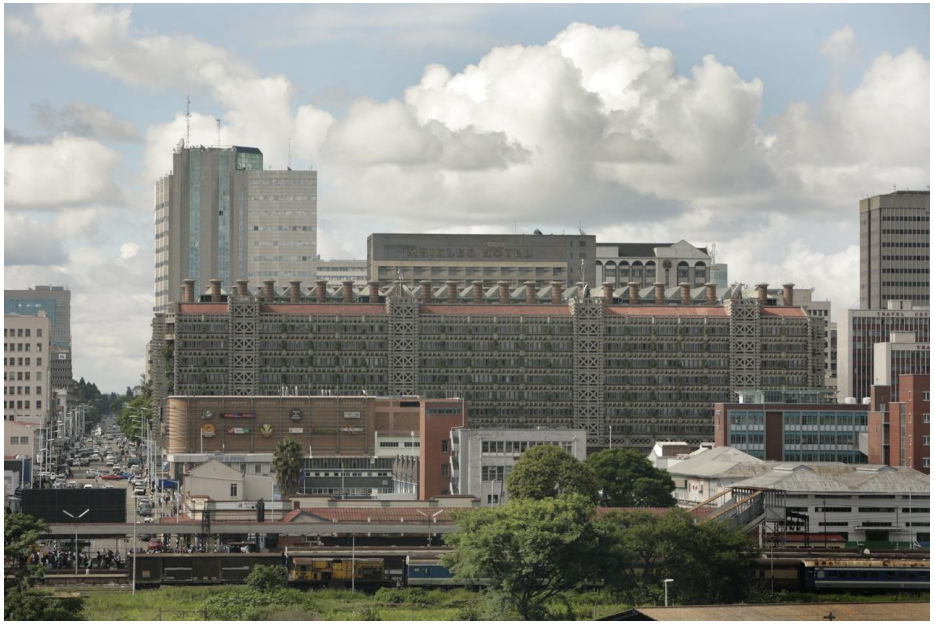
3. Design, Test, Reiterate

- Just kidding about the bees
- Building was designed to have passive air flow that mimics the air flow in a termite mound
- In the building, fans are needed to boost the movement of air. This is an example of scaling; the relative influence of different forces in nature changes with the scale you're working at.





3. Design, Test, Reiterate



Green building in Zimbabwe modeled after termite mounds

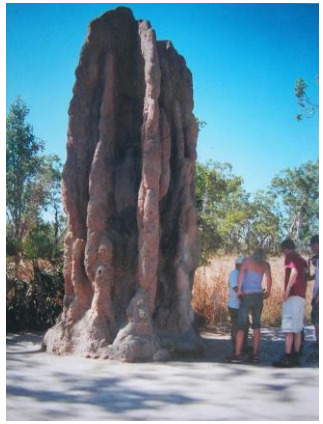
Biomimicry in Design

Nature has solutions,

how do we harness them?

- **1.** Define the function

- **2.** Find ways done in nature



- **3.** Design, test, reiterate

Biomimicry: A Tool for Innovation

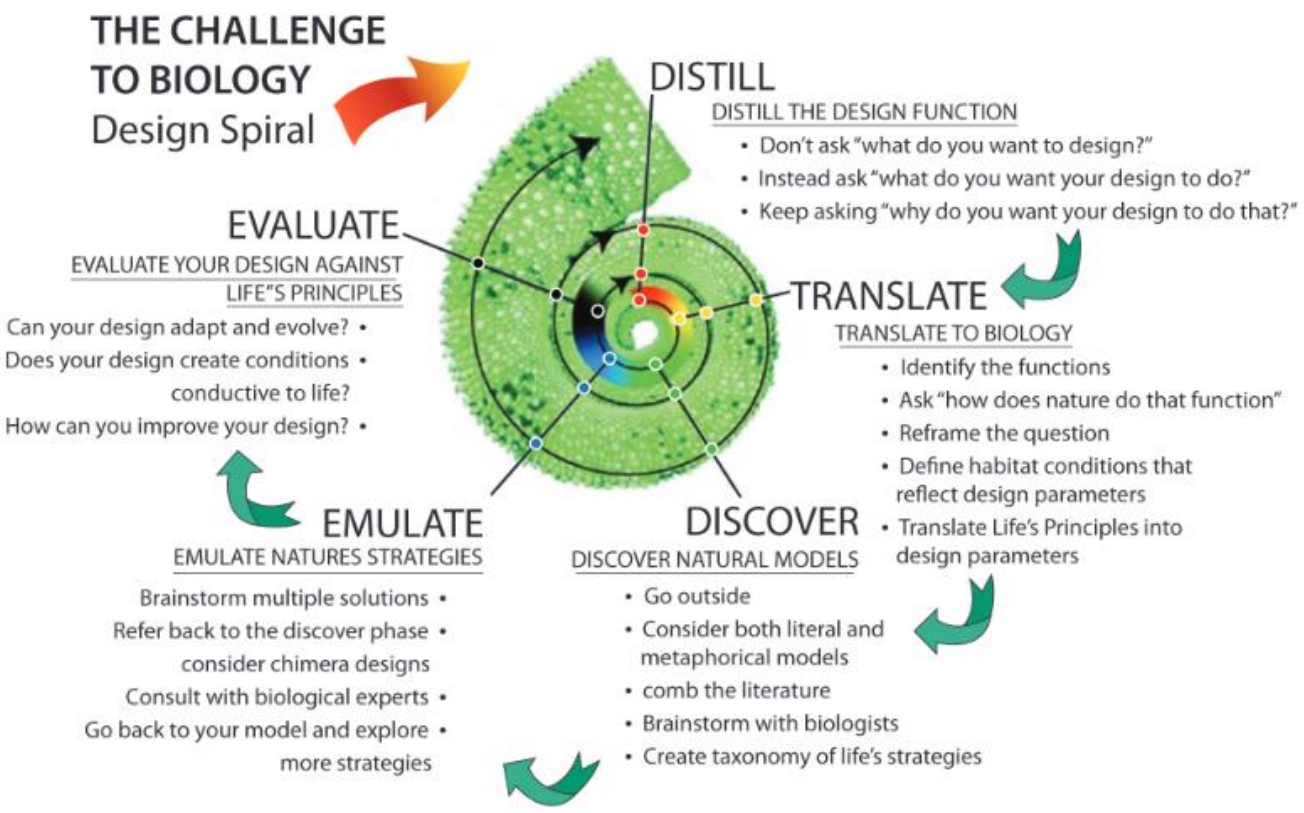
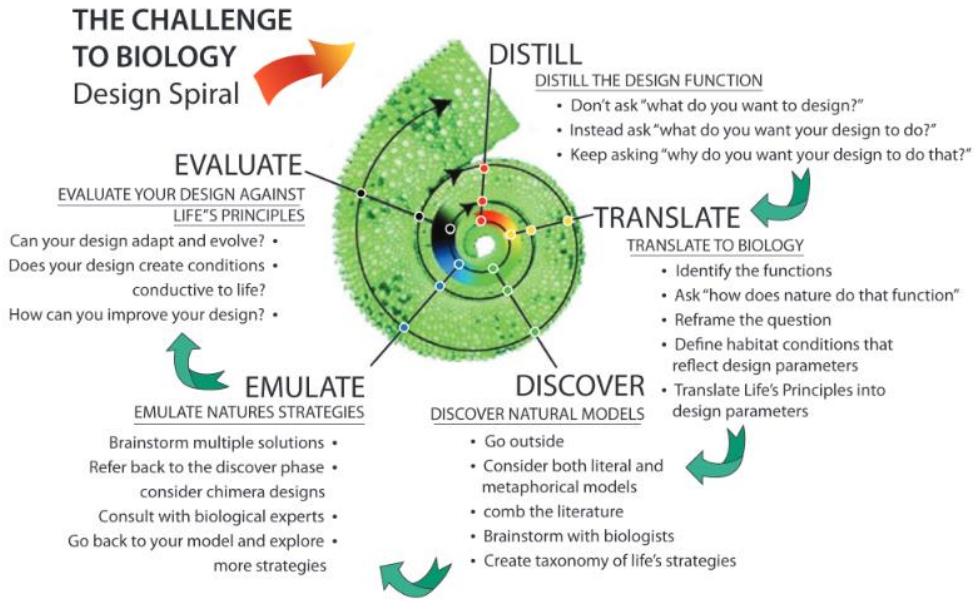


Figure 3: Design Spiral Methodology (used with Permission).

Questions?



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