

CHALLENGE SUPPORT WEBINARS



Today's webinar

From Inspiration to Application

With

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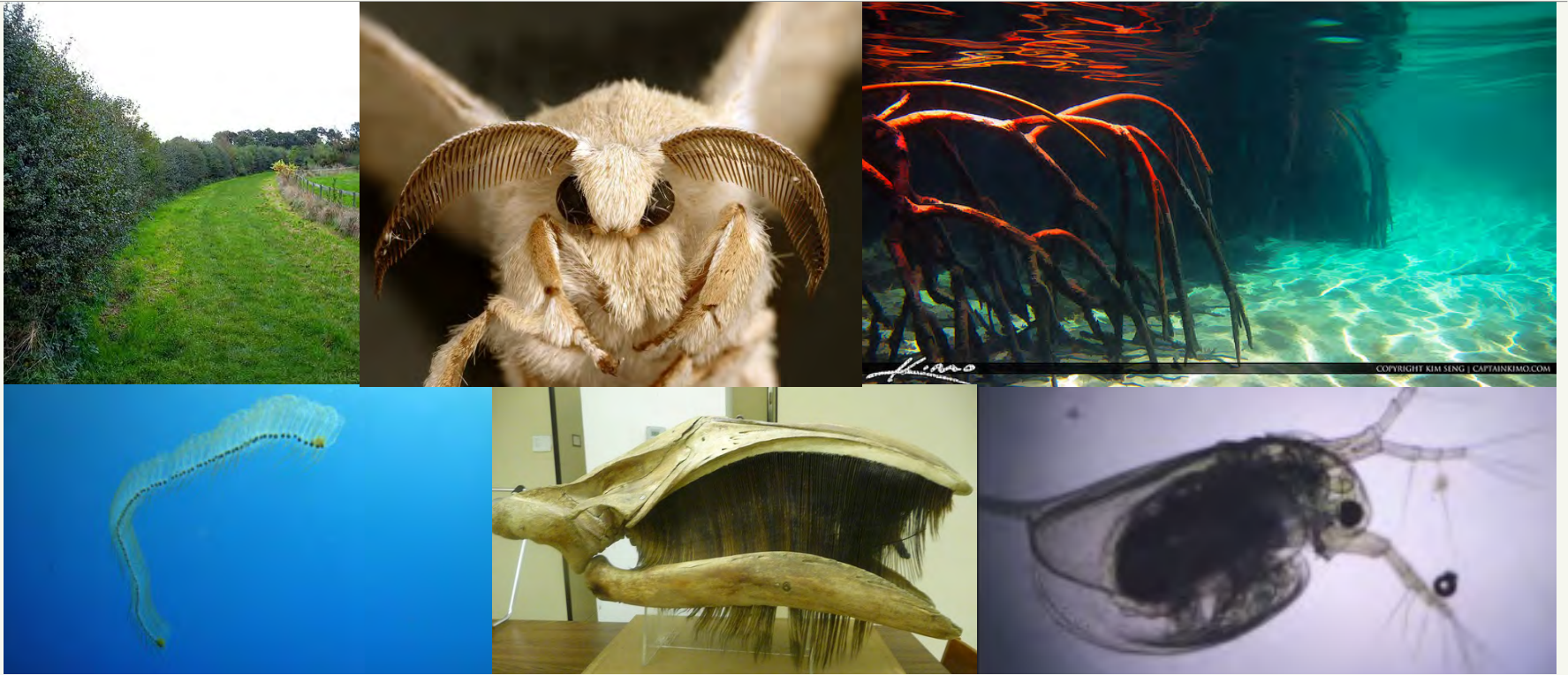
FROM INSPIRATION TO APPLICATION

CRAFTING DESIGN STRATEGIES FROM BIOLOGICAL STRATEGIES

IMPORTANCE OF FUNCTION

Function (and strategies) are what biology and design have in common.

	FUNCTION	STRATEGY
NATURE (Biology)	Something an organism or living system must do in order to survive/thrive.	How an organism or living system meets a functional need.
DESIGN	What you want your design to do.	How a designed element meets a function.



After you have found a number of biological strategies that match your target functions, you need to decide which ones are of most value.

These strategies will go forward into the ideation stage.



Don't jump to the solution space.

DESIGN STRATEGIES

BIOLOGICAL STRATEGY:

How an organism or living system meets a functional need.



DESIGN STRATEGY:

How a designed element meets a function.

Biomimetic Design Strategies:

- Translate the biological strategy to make it useful for innovators
- Take the key, relevant information from biology
- Are appropriate to the context and proposed use

LET'S TRY IT

What are the functions of a house's roof?

(type your answers into Chat)



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LET'S TRY IT

What are the functions of a house's roof?

FUNCTION:

Keep rainwater out.



LET'S TRY IT

What are the functions of a house's roof?

FUNCTION:

Keep water out.

DESIGN STRATEGY:

A roof keeps rainwater out by having a slanted structure made up of waterproof shingles overlapping top-to-bottom and side-to-side so that water doesn't seep into spaces between the shingles.



TRANSLATING STRATEGIES FROM BIOLOGY

BIOLOGICAL STRATEGY → DESIGN STRATEGY

- Summarize the biological strategy.
- Identify and highlight key words and phrases that are relevant to the strategy and how it meets the function, and are relevant to the audience and challenge.
- Isolate the key words and phrases.
- Use those key elements to help write a summary statement that describes the strategy without using biology.

JACKRABBIT

Biological Strategy: The desert-dwelling jackrabbit can overheat when its body temperature exceeds the ambient temperature. The flat surface of the jackrabbit's ears is important for heat convection, but heat release isn't entirely passive. The ears are full of blood vessels that dilate, or open up, in order to dissipate heat generated by the body. This reduces the need for evaporative cooling mechanisms (like panting or sweating), and so is an important water-conservation technique in arid climates. At air temperatures around 30° C, convection from the ears can shed all of the animal's excess metabolic heat. However, if it gets cold and ambient temperatures are below body temperature, the jackrabbit can constrict blood flow to the ears.



Function: Regulate temperature

JACKRABBIT

Biological Strategy: The desert-dwelling jackrabbit can overheat when its body temperature exceeds the ambient temperature. The flat surface of the jackrabbit's ears is important for heat convection, but heat release isn't entirely passive. The ears are full of **blood vessels that dilate**, or open up, in order to **dissipate heat** generated by the body. This reduces the need for evaporative cooling mechanisms (like panting or sweating), and so is an important water-conservation technique in arid climates. At air temperatures around 30° C, **convection** from the ears can shed all of the animal's **excess metabolic heat**. However, if it gets **cold** and ambient temperatures are below body temperatures, the jackrabbit can **constrict blood flow** to the ears.



Function: Regulate temperature

IDENTIFYING THE LESSON

Biological Strategy Key Words

- Blood vessels dilate
- Dissipate heat
- Convection sheds excess metabolic heat
- Cold
- Constrict blood flow



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Function: Regulate temperature

IDENTIFYING THE LESSON

Biological Strategy Key Words

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- Cold
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Design Strategy

To regulate temperature, when an object is hot, a system of small tubes transports warm liquid through a thin membrane where the heat dissipates into the cooler air. When an object is cold, these tubes constrict to prevent heat loss to the air.



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BEAVER

Beavers alter stream and upland habitats by cutting down trees and building dams across rushing streams, modifying streams into series of stair-stepped ponds that descend down landscapes and drainages. The backing up of water into ponds creates wetlands that slow water long enough for much of it to spread out, drop sediment and organic matter, infiltrate into the soil, and raise the water table. When located in upper drainages, these ponds reduce flooding in lower drainages. Beaver dams are leaky, slowly releasing water into the stream and reducing the kinetic energy of stream flow, especially farther up in drainages where water gradients are higher.



Function: Manage Water Flows



BEAVER

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Function: Manage Water Flows

BEAVER

Beavers alter stream and upland habitats by cutting down trees and building dams across rushing streams, modifying streams into **series of stair-stepped ponds** that descend down landscapes and drainages. The **backing up of water into ponds** creates wetlands that **slow water long enough for much of it to spread out, drop sediment and organic matter, infiltrate into the soil, and raise the water table.** When located in upper drainages, these ponds **reduce flooding** in lower drainages. Beaver dams are **leaky, slowly releasing water** into the stream and **reducing the kinetic energy of stream flow**, especially farther up in drainages where water gradients are higher.



Function: Manage Water Flows

IDENTIFYING THE LESSON

Biological Strategy Key Words:

- Series of stair-stepped ponds
- Back up water
- Slow water
- Drop sediment and organic water
- Infiltrate water into soil
- Reduce flooding
- Leaky
- Reduce kinetic energy



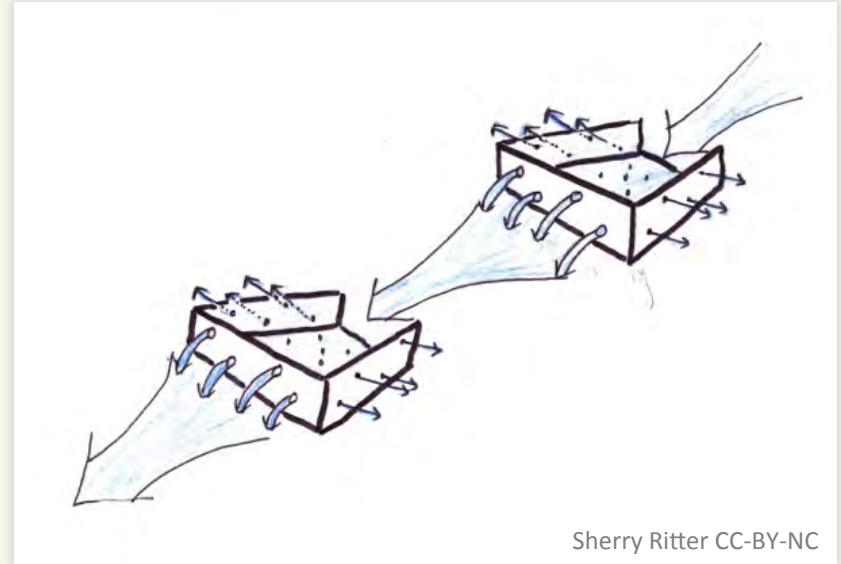
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Function: Manage Water Flows

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Design Strategy: *To manage water flows, a series of leaky barriers reduces kinetic energy and increases infiltration but does not completely stop the flow of water. Multiple spillways are produced, leaking at both high and low flow. Storing water allows for infiltration into surrounding areas, further slowing flow.*

TIPS

Guidelines for writing a good biomimicry design strategy

- State the function right in the design strategy
- Use no more than 3 sentences
- Consider the context
- Consider literal and metaphorical design strategies
- Avoid biological terms
- Use precise wording that won't be misunderstood
- Stay true to the biology
- Keep the description as a design strategy, not a design solution

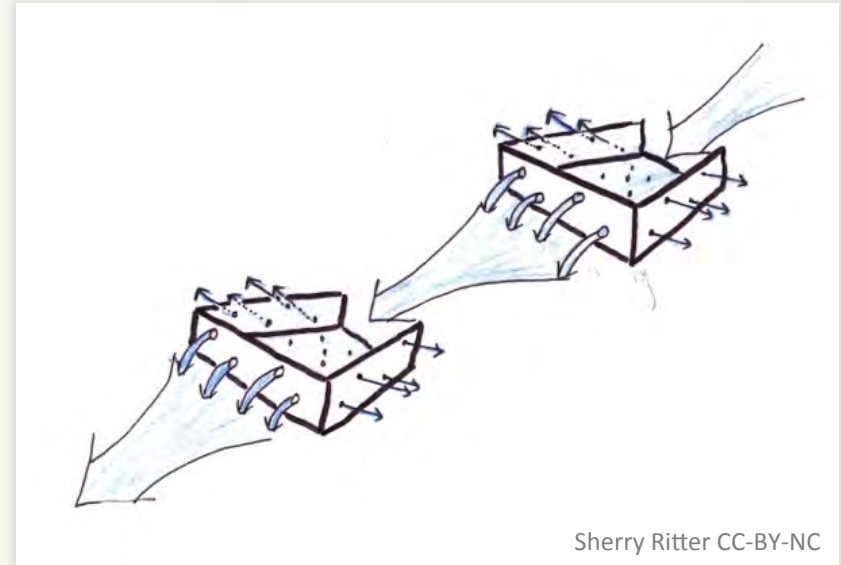
TIPS

Some other things to consider:

- One biological strategy can result in multiple design strategies
- There are various levels of detail—too little detail may result in a design strategy that doesn't learn anything from nature.

What can really help:

- A well-written biological strategy
- A sketch of the biological strategy
- A sketch of the design strategy



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MORE EXAMPLES



You can find additional examples of biological strategies and design strategies here:

Biomimicry Toolbox

METHODS >> Crafting Design Strategies

Access the Toolbox from challenge.biomimicry.org



HOK Genius of Biome report

<http://www.hok.com/thought-leadership/genius-of-biome/>



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