FUNCTION JUNCTION

What makes biomimicry possible is that both biology and human design have a concept in common—that concept is function. For example, a tree must manage to stay upright and so does a skyscraper. This is a simple, hands-on activity that gives students practice in identifying function in the biological world and relating it to human design challenges. This activity can be done with almost any age group irrespective of their level of biological knowledge. The activity builds on the "Seeing" Function lesson plan.

***Biomimicry** is learning from and then adapting nature's best ideas to solve human challenges, in order to create a healthier more sustainable planet.*

Background Information

In biomimicry a bridge that links biology to human technological challenges is function. The reason is simple: function is what biology and design have in common. For example, a bear must climb trees without its claws breaking. Likewise, a bulldozer must move earth without damaging its scoop. In order for students to be able to understand and apply biomimicry, they need to grasp the concept of function as it relates both to biology and design and how the idea of function joins biology and design together. Once a student can begin to identify functions being served by biological elements (e.g., insulation by polar bear fur), they can begin to relate biological solutions to human technological challenges (e.g., insulation in buildings).

Goals

- Students will begin to view nature as a warehouse of solutions to achieving diverse functions both in biology and human design.
- Students will practice identifying function in the biological world.
- Students will practice relating the functional solutions they discover in nature to human technological challenges.

Objectives

- Students can identify biological functions evident in different organisms.
- Students can relate the biological functions they've identified to human challenges in design and technology.

Materials

- Slips of paper and a hat.
- An outdoor area with some natural elements.

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Activity

DURATION: 10—45 minutes

PROCEDURE

1. Write a number of functions on individual pieces of paper and put them into a hat. There is a list of examples on the next page and many more functions could be used. Create your own! For other ideas, see the Biomimicry Taxonomy at AskNature.org. Consider what functions your students will relate to, and how to translate functions into terms your students will understand (e.g., "sticks" instead of "adhesion").

2. Go outside and form a circle sitting down with a group of students. Any outdoor area with some natural elements will do, the more diverse the better. Explain the activity to the students and read to your students all or some of the list of functions that are in the hat, along with a short description of why that function is important in human technologies.

3. The students will pick pieces of paper out of the hat, each slip containing a single function that must be solved both in the biological and human technological world. After they get a piece of paper, students will search outdoors (in an area prescribed in advance by the instructor) for examples in nature that achieve this function.

4. The students will return to the circle after a prescribed period of time with a sample of the identified organism, if possible, and share with the rest of the group what the function was they were trying to match, the organism they discovered which matched the function, and how the organism achieves the featured function.

CONCLUSION AND DISCUSSION

This exercise is a foundational one for exploring the concept of function in biomimicry. It builds upon the "Seeing" Function activity.

This activity doesn't presuppose biological knowledge. In fact, students may be limited by what biological knowledge they think they possess. More important than getting the biology right is honing the students' observational, analytical, and communicative skills.

EXTENSION

Link to other activities on function.

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Vocabulary

Function: In biology, functions describe what a characteristic or process does or how it performs, within the context of natural selection and the imperative to survive and reproduce. Discussions of function seek to explain why an object or process occurs in an organism or system and is closely related to the term "adaptation," which is a functional characteristic of an organism. More generally, function refers to the purpose or operational result of any mechanism, so that we can speak of parallel functions that exist in both the natural and human-built worlds, for example, adhesion both in geckos and in human-made products like medical bandages.

Sample Functions

- **Moving water**: Water is pumped to the tops of skyscrapers, between fields and cities, and everywhere in between. Moving water efficiently is an important area of research in engineering.
- **Adhesion** (sticking things together): From your tennis shoes to your desk at school, adhesives or glues are a major part of our world. Finding non-toxic and high performance solutions would have wide value in human technologies.
- **Filter**: Lots of organisms filter and human technologies (e.g., air ducts) require effective filtering as well.
- **Clean**: Nature doesn't use detergents to clean. What are some other ways nature does it?
- **Transform waste**: In nature, there really is no such thing as waste. In contrast, humans produce about 96% waste for every 4% product. Could we learn a better way to make what we make?
- **Store carbon**: Removing and storing carbon is a critical issue given climate change. Models in the natural world have been managing carbon for millions of years.
- **Communicate**: Information plays a major role in human technologies, from cell phones to computer systems. What could nature teach us?

How does an earthworm's skin help keep it so clean?

Ants search efficiently for food, but without anyone telling them how to organize. What human challenges might similarly involve the need to organize without any central control?

Spirals like the one in a snail's shell are common throughout the natural world, and perform a surprising number of different functions. Can you think of some?