SECOND NATURE

The Biomimicry Evolution

Set in the wilds of South Africa, *Second Nature: The Biomimicry Evolution* follows biologist, author, and *Time* magazine "Hero of the Environment" Janine Benyus and her team as they illustrate how organisms in the natural world can teach us how to be more efficient and sustainable engineers, chemists, architects, and business leaders.

After 3.8 billion years, life has discovered not only how to survive but also how to thrive as a system. Benyus brings a deep affection and admiration for the natural world as she guides the viewer toward a vision of a planet in balance between continued human progress and ecosystem survival.

DISCUSSION GUIDE | Upper Elementary and Middle School

BIOMIMICRY 3.8

Second Nature: The Biomimicry Evolution
is a project of the Biomimicry 3.8 Institute

Introducing Biomimicry:

A Discussion and Activity Guide to Accompany *Second Nature: The Biomimicry Evolution*

1 | What is biomimicry? How would you explain it to a friend? To a younger student? To someone older, like your parents or guardian? Examples can really help people understand what biomimicry is. Which examples of biomimicry from the film stood out the most to you?

2 | In the film, Janine Benyus says biomimicry is about "borrowing the recipe" from other organisms, and learning from organisms as "models." How does this compare to farming organisms, or to genetic engineering of organisms for human purposes?

3 | The rest of nature has thrived on this planet for 3.8 billion years without destroying the environment. Humans have been around for roughly 200,000 years, and in the last couple centuries have been struggling to live in harmony with the rest of nature. How has living on Earth for 3.8 billion years helped the natural world around us survive and thrive?

4 | Were you surprised to learn that ideas from nature have inspired people to create new technologies? As Janine puts it: organisms have done everything we want to do. What are the examples Janine cited of things organisms do well? Can you think of a few examples of organisms that do these things?

- build something that is strong but light
- make something that can repair itself
- create materials at low temperatures
- generate energy without pollution

5 | Consider the setting of the film (African grassland). How did the setting make you feel? Did it enhance or take away from your understanding of biomimicry? How would changing the setting of the movie influence your understanding of biomimicry? For example, what if the film were made in your local area? What organisms in your local area might have something to teach the people who make our world?

6 | Janine Benyus is a passionate and articulate speaker. Here are a few quotations to consider closely:

a | *"Chemistry should be safe for living tissues."*
Not all chemicals made by other organisms are in fact safe for living tissues. Can you think of some toxins made by other organisms? How are the toxic chemicals created by humans different from toxins created by other organisms? If it were a requirement that all chemistry be safe for living tissues, how might this new standard change our impact on the environment? Do you think this would be a good standard? Why or why not?

[One key difference between the toxic chemicals created by people and the toxins created by other organisms is that man-made chemicals are often unintentional by-products of manufacturing processes. Toxins created by other organisms, in contrast, usually have an adaptive function (e.g., a spider's venom). Another key difference is that toxic chemicals that humans create often linger in the environment, whereas toxins created by other organisms serve their purpose and then break down into non-toxic constituents. In other words, non-human toxins are generally limited in space and time, whereas man-made toxic chemicals often spread out in space and across time, lingering in the environment.]

b | *"…people who make our world…"*
Who is Janine talking about? What are some occupations related to "making our world?" What does it mean to be a "designer?" Choose an object in the room. Who was involved in making it? Think back as far as you can in its design and production through its eventual arrival in your classroom.

c | "Life creates conditions conducive to life." What does this mean? What are some examples of "life creating conditions conducive to life" in the ecosystem where you live? What ecosystem(s) do you live in? What types of conditions are *not* conducive to life?

[Janine points out that organisms don't just exist, they improve the habitats in which they live in such a way as to make these habitats more livable.]

7 | Janine says, "The wellspring of good ideas are these habitats." What does she mean? What is happening to many of the world's biodiverse habitats? How might seeing them as a "source of good ideas" change this?

8 | Claire Janisch, director of Biomimicry South Africa, says, "What's exciting about biomimicry is that it approaches nature with a sense that people need to be humble." What does she mean by this? What impact does a person's attitude have in approaching and learning about nature?

9 | The film features a clip of Janine giving a TED talk about biomimicry. Have you heard of TED talks before? They are meant to disseminate "ideas worth sharing," and speakers are given just 18 minutes for their presentations. What would you talk about if you gave a TED talk?

10 | When was the last time you were outdoors for more than an hour? Where were you? What organisms were around you?

11 | Think about the concept of people as "students of nature." What does it mean to be "nature's apprentice"? The next time you are outdoors, do you think you will see nature differently? How so?

VOCABULARY

Abundance
Adaptation
Apprentice
Biodiversity
Biomimicry
Circular economy
Conservation
Designer
Ecosystem
Farming organisms
Function
Genetic engineering
Organism
Scarcity

ACTIVITIES
AND EXTENSIONS

1 | Janine related several aspects of car design to adaptations in nature — tires gripping as well as a tree frog's toe pads; windshields that remain clean like lotus leaves. What other functions must a car perform? Make a list (safety of passengers, acceleration, tight turning, etc.) then make a matching list of adaptations in nature that might be relevant to the particular function of the car.

2 | Describe the theory about zebras' stripes related to temperature management. Draw a picture that illustrates the theory. How could you devise an experiment to test this theory?

3 | The film showed an apartment building designed to regulate temperature by using ideas learned from termite mounds. Make a list of different "houses" that organisms build in your area (e.g. spider webs, beaver dams, birds' nests, etc.). If you were going to build a house, which of those organisms would inspire your design? Draw a house that is inspired by an organism in your local environment.

"The conscious emulation of life's genius is a survival strategy for the human race, a path to a sustainable future. The more our world functions like the natural world, the more likely we are to endure on this home that is ours, but not ours alone."

- Janine Benyus

QUOTABLES

Janine Benyus is a passionate and articulate speaker. Many of her statements are quite remarkable. Here are a few quotations to consider closely:

A | "Conservation begins with affection."

B | "They've (organisms have) done everything we want to do."

C | "Chemistry should be safe for living tissues."

D | "People who make our world."

E | "Life creates conditions conducive to life."

A | Do you agree? Are there alternative views to this statement? How does this relate to the conservation movement in the US currently? What about economics? Does biomimicry result in greater affection for the rest of the natural world? Why, or why not?

B | What are the examples Janine Benyus cited of "things organisms do consummately well?" Thinking about the examples, do you think her statement – that they've done everything we want to do—is true? Can you think of examples of human needs (or activities) that do not seem to have a correlation in nature?

C | If this were true of human chemical processing, how might this change equipment needed in a lab? How might this impact our industrial processes? How might this change the world? How are the toxic chemicals that humans create and use different from toxins created/used by other organisms?

D | Who is Janine talking about? What is a "designer?" What are some occupations related to "making our world?" Choose an object in your current space. Who was involved in making it? Think back as far as you can in its design and production through its eventual arrival in your classroom. Which objects or items passed through the most/fewest hands on their way to your classroom?

E | What does this mean? What types of conditions are not conducive to life? What are some examples of "life creating conditions conducive to life" in the ecosystem where you live? (What ecosystem(s) do you live in?)