



#### Faith Connection

By faith we understand that the universe was formed at God's command, so that what is seen was not made out of what was visible. (Hebrews 11:3, NIV)

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Leader's Signature  
(Tenderheart Level)

\_\_\_\_\_  
Date

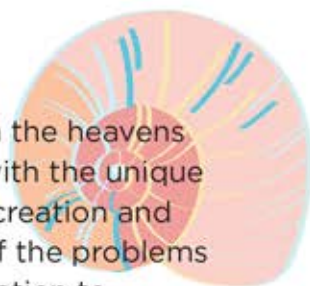
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Leader's Signature  
(Explorer Level)

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Date

# BIOMIMICRY

The Bible teaches us that God created everything in the heavens and on Earth. He also created us in His image and with the unique ability to be creative on our own. By observing His creation and using our own abilities, we are able to solve many of the problems we encounter in our world. God made a way for creation to inspire design and engineering.

**As you earn this badge, please be respectful and reverent to each girl's faith tradition during group discussions.**



## TENDERHEART Complete All

- 1. The Bible states that humans and all of nature are created by God. Read Job 12:7-10. What do you think you can learn from the plants, animals, and nature all around you? Research the definition of biomimicry and find two examples of biomimicry you encounter every day. Discuss your ideas with your Unit or family.
- 2. What can we learn from nature about using shape and structure to create energy-saving designs? Research an animal's home and how its structure has provided shelter for the animal. Would a human benefit from a similarly-structured home? What elements of your home are similar to your selected animal? Create a small home model using the unique features of the animal's home and your need for shelter. Share with your Troop, Unit, or family.
- 3. Discover who created hook and loop fasteners and what the inspiration was for his creation. What qualities do hook and loop fasteners and the scientist's natural inspiration have in common? Identify five items that use hook and loop fasteners. Discuss with your friends the benefits and/or disadvantages of hook and loop fasteners versus other attachment mechanisms.
- 4. With proper adult supervision, go on a hike in the woods. Identify and record your favorite plant and its unique characteristics. Look for man-made structures that mimic the structure of your favorite plant. Write or sketch ideas on how this plant's design could be used to improve a different man-made structure.

## TENDERHEART Complete One

- 5. Innovations are new ideas or inventions that solve a problem. God's creation has inspired many man-made innovations. Below are 10 modern inventions which were inspired by designs found in nature. Using photos or drawings create a matching card game and investigate how God's natural creation inspired the man-made invention—you'll need 20 index cards.
  - Fly-hearing aid
  - Wasp-paper
  - Whale-submarine
  - Bat-sonar systems
  - Rubber tree-tires
  - Octopus-robotics






## TENDERHEART Complete One *continued*

- Termite mounds-air-conditioning systems
  - Kingfisher-bullet train
  - Fava bean-valve
  - Bees-camera
6. Using your observation skills and senses, head outside and take note of what you experience while enjoying the wonders of God's created world. Record your observations by sketching or taking a photo. Did you observe an animal or plant using resources in nature to solve a problem?
7. Nature inspires scientists, writers, and artists. Go to an art museum or research a specific artist's works and record how many art objects you can find that have been inspired by a scene or object found in nature. Select an element from the natural world as inspiration and create your own masterpiece.

## EXPLORER Complete All

1. If you did not earn this badge as a Tenderheart, research the definition of biomimicry. God as our Creator has blessed us with the privilege of being creative. Read Psalm 148. How can we use God's creation to bring Him glory? Why is it important for creation to praise God? Discuss your thoughts with your Unit or family.
2. Scientists carefully observe, track, and record observations and patterns. In nature, these are called wildlife surveys. Develop this habit of observation by observing birds outside your own window for 10 days. Identify and record the birds you observe, the time of day you make your observations, and the number of each bird you see daily.
3. In 1995, Japanese scientists were determined to launch 200-foot solar panels into space to collect solar power, but they faced the problem of fitting these panels inside a small Japanese Space Flyer Unit. They were inspired by the folding pattern of the beechnut leaf which God places into a tight bud before it leafs out every spring to collect sunlight! Find and practice the origami Miura fold these scientists used to send their panels into space before deploying them to collect energy.
4. Some organisms must adapt their lifestyles due to natural and manmade changes in their habitats. Identify some habitat changes that have occurred in your area. Find organisms that have successfully adapted to these changes. What adaptations have they made that ensures their survival? What strategies did they use to adapt? Record ways these adaptations and strategies could contribute to solving a human problem.



## EXPLORER Complete Two

5. With proper adult supervision, go on a hike in the woods. Pick three different plants or animals that are common in this ecosystem. Tally how many of each you saw. Make observations of the plants and/or animals to compare the diversity of life in different habitats in this ecosystem.
6. God can use His creation as inspiration in our lives. Take time to sketch God's creation on 10 different occasions! Look closely. Note the patterns, symmetry, and colors found in nature.
7. There are mentions of God's creatures throughout Scripture. Find and copy a Bible verse for each of the following creatures: lion, bear, fox, sheep, donkey, hawk, owl, rabbit, ant, and locust. Learn more about three of these animals. Are there any lessons we can learn from the behavior of these animals? Do you recognize any of the habitats of these animals being mimicked in human habitats?
8. Nature can inspire musical compositions and music can mimic nature. Listen to a recording of a musical piece that sounds like nature or inspires thoughts about nature. Share your observations with your Unit or family.





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## PIONEER & PATRIOT complete all

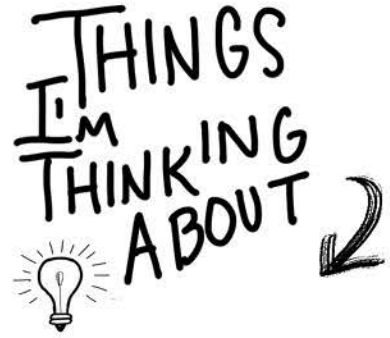
- 1. Read Romans 1:20 and Hebrews 11:3. What is the ultimate reason God created the world around us? Learn the definitions of *biomimicry* and *creator*. He has created all things and given you dominion over them. He has also given you a mind of reason and the skills to look at His creation to imitate His handiwork in order to discover solutions for human challenges. With the knowledge that God is the ultimate Creator, how can you use biomimicry to glorify God? Reflect on this in your journal and share your thoughts with your Unit or family.
- 2. Make a list of five fields of science that apply biomimicry towards solving human challenges. Find at least three examples of biomimicry applications for each field.
- 3. Nature has inspired the invention of many man-made things. Learn what was invented from milkweed during World War II. Who was involved in the process of the invention? Find a plant in a local ecosystem. Create your own invention or a way to use the plant as a tool. Share with your Unit or family.
- 4. Brainstorm a list of challenges faced by animals or plants which may be a challenge to humans. How does nature solve the challenge? What can be used in the same way to solve the human challenge? Write down specified criteria needed for success in overcoming the challenge and the constraints faced on materials, time, and cost. Share your research and discoveries with your Unit or family.
- 5. Using the information you discovered in requirement #4, follow the listed steps for the design process of biomimicry to solve the challenge:
  - Find a problem
  - Generate ideas
  - Select a possible solution that mimics nature
  - Test the solution by designing a structure model or process
  - Evaluate your creation

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Leader's Signature  
(Pioneer and Patriot Levels)

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Date

PIONEER & PATRIOT complete three

- 6. Identify salamanders that are common in your area. Observe the movements of salamanders in their natural habitat or in captivity. Research its local migration season and, if possible, participate in observing their migration. Learn ways scientists are using this observation information in scientific discovery.
- 7. Nature blogs use online journal entries and photography to inform others of natural wonders in their area. Create your own nature blog recording some of the sights and sounds that capture your imagination as you make careful outdoor observations.
- 8. Define citizen scientist. A bioblitz is when a group of professional scientists, citizen scientists, and volunteers gather for a designated period of time to record a biological inventory of all species of animals, plants, fungi, etc., living in a specific ecosystem. Create or participate in a bioblitz event with a younger Unit from your Troop or family and friends in a local park or natural habitat.
- 9. Take a kayak or canoe trip during your local lily pad bloom. Take pictures and describe what you see. Find how scientists have copied the chemical and molecular structure of the lily to create a superhydrophobic surface that repels water.
- 10. What degrees or careers can be pursued with biomimicry?



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