

# Discovering Patterns & Dimension

## in the Sonoran Desert *pre-activity*



Frank Lloyd Wright was inspired by the Sonoran Desert's long, low sweeping lines, upward-tilting planes, surface patterns in plants and animals, and abstraction in line and color. He found color, pattern, and dimension in the rattlesnake, Gila monster, the cholla, and the saguaro cactus.

His greatest inspiration came from the saguaro, with its natural masonry rising from the desert floor. With its reinforced construction and interior vertical rods that have held its columnar mass for centuries, the saguaro cactus is a true skyscraper!

Your students will be using two techniques, biomimicry and reverse engineering, to make observations about an organism that lives in the desert, understanding how the designs of organisms have a relationship to pattern, dimension, form, and function. The students will be using biomimicry—which is the science that studies nature to find solutions to human challenges and reverse engineering—the process of discovering the technological principles of an object by taking it apart and carefully studying its different parts to help understand the form and function of a saguaro cactus.

As a pre-activity to your field trip experience to Frank Lloyd's Wright's Taliesin West, let your students explore different methods of research tools/media to explore the functions of reverse engineering and how science uses biomimicry to solve human challenges when doing research on an organism.

### **PART 1**

Have the students research and make observations from the images of the cross-section picture of the saguaro cactus attached and use them as their guides through their observations. After the students make their observations, have them sketch the saguaro's different components.

### **PART 2**

Please have students consider some of the following questions in their groups while they research and make their observations.

- Describe the color and texture of the cactus.
- How can the cactus grow with these materials?
- What do you think are the functions of each material?
- Describe the overall shape and structure of the saguaro cactus.
- What environmental challenges might the saguaro be solving by having this shape and structure?
- What are some threats to the saguaro cactus that could change its structure?
- Do environmental changes impact the saguaro cactus?

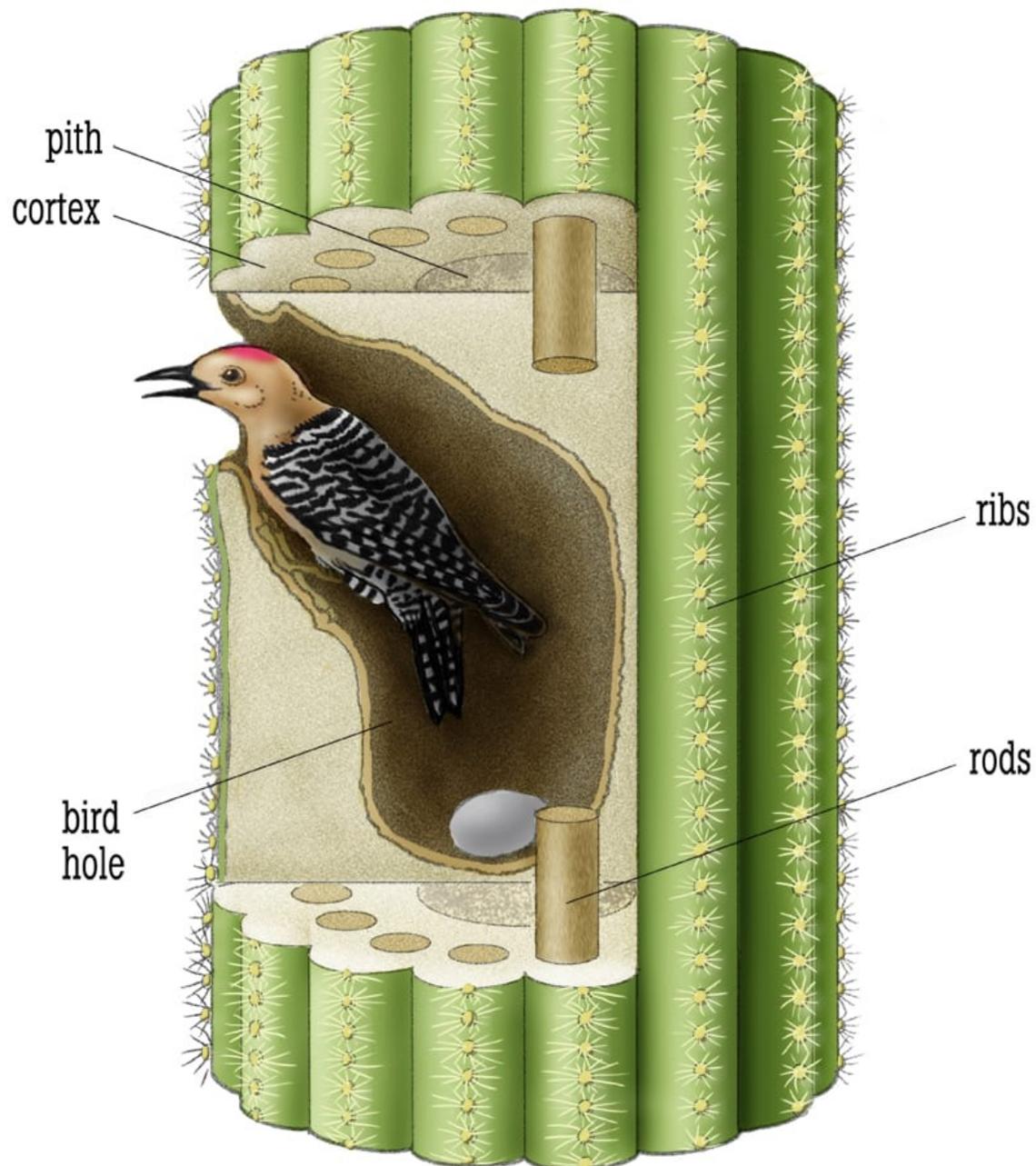
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### PART 3

In conclusion of this activity, have the students share their observations and findings of the cross section with the class. This will help prepare your students for the field trip experience at Taliesin West.

### REFERENCE PHOTO



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## AZ STANDARDS

Kindergarten: K.L1U1.6; K.L1U1.7; ET-S1-C4-01; ET-S2-C1-01;

First Grade: ET1-S1-C1-01; ET1-S1-C3-01; ET1-S2-C1-01;

Second Grade: ET2-S1-C1-01; ET2-S1-C3-01,02; ET2-S2-C1-01;

Third Grade: 3.L1U1.5; ET3-S1-C1-01; ET3-S1-C4-01,02;

Fourth Grade: 4.L4U1.1; ET4-S1-C1-01; ET4-S1-C2-01,02;

Fifth Grade: ET5-S1-C1-01; ET5-S1-C4-01,02; ET5-S3-CO2-01;

Sixth Grade: ET6-S1-CO1-01; ET6-S1-CO3-01,02; ET6-S2-CO-01;

Seventh Grade: ET7-S1-CO1-01; ET7-S1-CO3-02; ET7-S1-CO3-02;

Eighth Grade: ET8-S1-CO1-01; ET8-S1-CO3-02; ET8-S1-CO3-02

High School: ETHS-S1-CO1-01; ETHS-S1-CO3-01,02; ETHS-S1-CO4-01,02; ETHS-S2C2-PO1; ETHS-S4C2-PO2

## NGSS STANDARDS

Kindergarten: K-LS1-1; K-2-ETS1-1; K-2-ETS1-2

First Grade: 1-LS1-1; 1-LS3-1

Second Grade: 2-PS1-1; 2-PS1-2

Third Grade: 3-LS4-2; 3-LS4-3; 3-5-ETS1-1; 3-5-ETS1-2

Fourth Grade: 4-LS1-1

Sixth-Eighth Grade: MS-LS2-5; MS-ESS3-3; MS-ETS1-4