

Shapes In Nature



Marjorie Merriweather Post, who once lived at Hillwood, surrounded herself with art, even outdoors in her gardens. Nature is full of shapes and patterns and is often reflected in the art here at Hillwood. Explore the gardens and look carefully at nature to discover the shapes and patterns around you.

How to Earn Your *Shapes in Nature* Badge:

- Complete all five “Try This!” activities in this booklet.
- Use a Hillwood map to find the locations mentioned.
- Mark the checkbox next to activities you’ve completed.
- Show your troop leader your completed packet. Your troop leader can purchase Shapes in Nature badges from the Girl Scout Council of the Nation’s Capital.

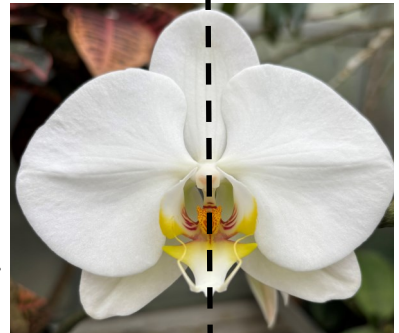
Step 1 — Identify symmetry in nature: Draw symmetry made by nature

Try This!

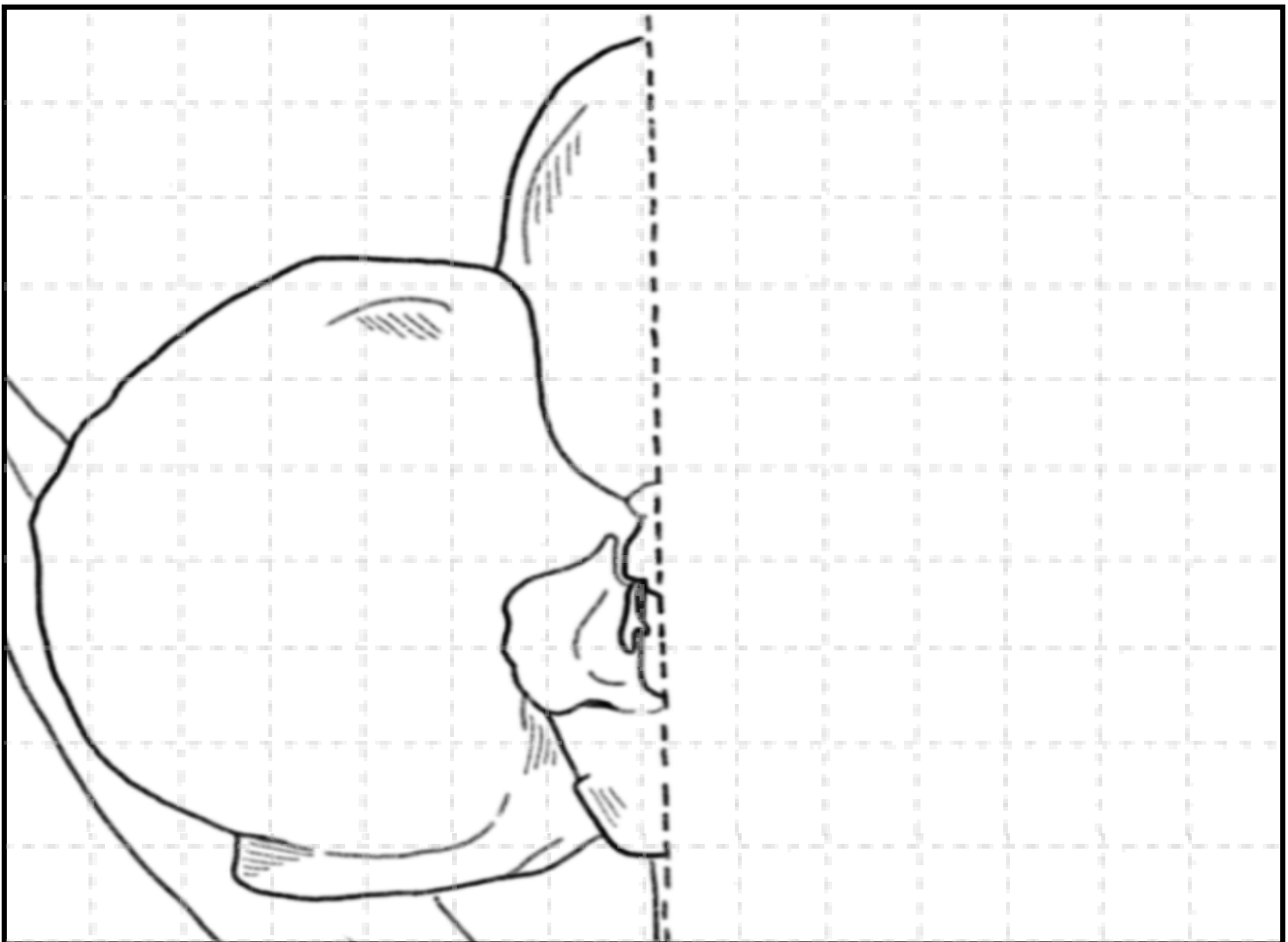
Check here when you
complete this step.



Visit the **GREENHOUSE** to see orchids. Orchids have symmetry. That means if you draw a line down the center of an orchid the halves on each side of the line are a mirror image of each other.



Complete the unfinished half of the orchid drawing below. The orchid is divided by a line of symmetry. Draw a mirror image of the half of the orchid you can see on the other side. Use the gridlines to help you match up the two sides.



Orchid drawing by Emma GrosPierre

Step 2 — Explore bilateral symmetry in nature: Make art with leaf symmetry

Try This!

Check here when you
complete this step.



Visit Hillwood's **CUTTING GARDEN** to see the leaves on the ginkgo tree starting to bud in early spring.

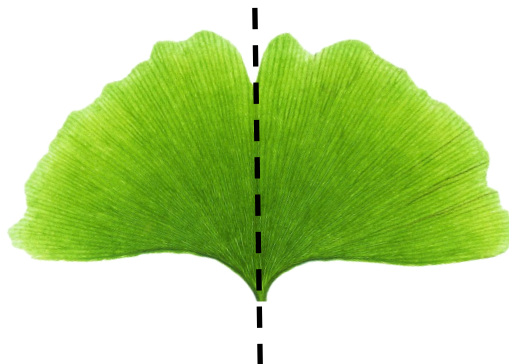
Ginkgo leaves have a distinct fan-like shape. They are bright green in summer and turn golden yellow in fall.

Look closely at a ginkgo leaf and you will see a pattern of thin lines extending outward from the leaf's base. These lines are the leaf's veins that move water and nutrients around the plant.



A ginkgo leaf often has a deep groove or notch at the top of the leaf, dividing the leaf into two distinct lobes. If you were to draw a line down the center of a ginkgo leaf from the notch at the top to the base you would cut the leaf in half into two almost symmetrical sides. This is called a line of symmetry.

When an object has only one line of symmetry, like a leaf or an orchid, that is called **bilateral symmetry**. "Bi-" means "two" and "lateral" means "side."



Visit the **ART PROJECT** to make symmetrical designs with ginkgo leaves.

Decorate a placemat with paper cutouts of fan-shaped ginkgo leaves. Try arranging the leaf shapes in different symmetrical designs and patterns.

Step 3 — Create nature-inspired art with circular symmetry: Draw a spider web to make radial art

Try This!

Check here when you complete this step.



Hillwood's gardens are home to wildlife of many kinds, including spiders. Photographer Erik Kvalsvik captured this picture of a spiderweb in Hillwood's gardens.

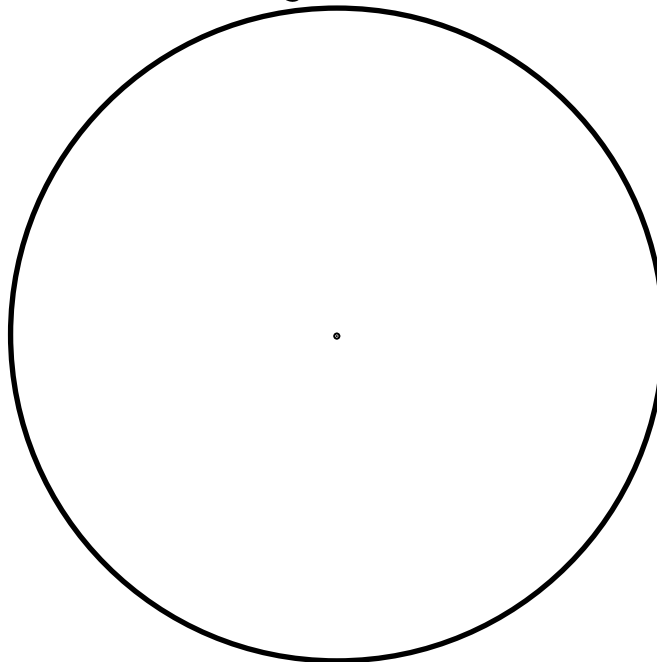
Orb-weaver spiders make circular webs like this one. **Orb** means something that is round or ball-shaped. Circular webs have radials. **Radials** are lines that extend from a center point. The web's radials are connected by a spiral that circles from the center of the web.



Some spiderwebs have **circular symmetry**. Unlike bilateral symmetry, which only has one line of symmetry, circular symmetry has infinite lines of symmetry. Any straight line that passes through the center of a circle is a line of symmetry.

The symmetrical spacing of the spiderweb's radials may help make the web stronger by distributing force evenly through the web when an insect flies into it.

Draw a spiderweb on the circle below. First draw radials that go out from the center point of the circle. Then, starting at the center, draw a spiral that touches each radial.



Step 4 — Find fractals in nature: Sculpt tree fractals by making a wire tree sculpture

Try This!

Check here when you complete this step.



Take a look at some of the trees growing at Hillwood and notice the pattern of their branches.



Dawn Redwood
(Location: Motor Court)



American Elm
(Location: Lunar Lawn)



Ginkgo
(Location: Cutting Garden)

Trees are an example of fractal branching. A large branch grows out of the trunk of a tree. That large branch then divides into smaller branches, which divide into smaller branches again, and so on, over and over in a repeating pattern.

A fractal is a never-ending pattern that repeats over and over again in different sizes and scales, like branches on a tree.

Visit the **ART PROJECT** to make a wire tree sculpture. Create a fractal branching pattern as you start with all your wire grouped together to form the large tree trunk and then branch out into smaller and smaller branches.

Step 5 — Search for the Fibonacci sequence: Find the Fibonacci sequence in plants

Try This!

Check here when you complete this step.



Look at this photo of a fern growing in Hillwood's gardens in early spring. Notice the fern's spiral shape.

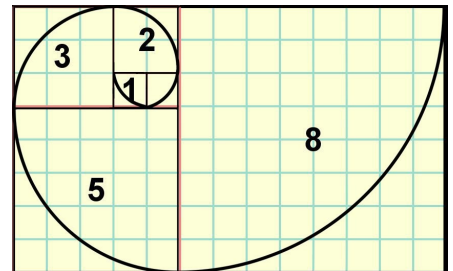
A **spiral** is a shape that curls around a center point. The tight spiral of a sprouting fern helps it push through the soil before it unfurls.

A long time ago a mathematician name Fibonacci noticed that spirals in nature follow a mathematical pattern. This pattern is now called the **Fibonacci sequence**.

The pattern that Fibonacci found is a list of numbers (1, 1, 2, 3, 5, 8, 13, 21,...) in which each number in the list is equal to the sum of the two numbers before it ($1+1=2$, $1+2=3$, $2+3=5$, $3+5=8$, $5+8=13$, $8+13=21$,...).

When you plot the Fibonacci sequence on graph paper it forms a spiral.

In the space below draw a spiral fern using the photograph as a model.



Bonus Step! — Meet a birding expert and learn to identify birds by their shapes, colors, and patterns

Try This!

Check here when you complete this step.



Visit the **C.W. POST TENT** to meet Sam Krause—a birding guide, photographer, and conservationist—to learn about birds and how to keep a scientific log.

Try these activities with her:

- ☐ Identify and name local birds
- ☐ Use binoculars to see what birds you can find in Hillwood's gardens
- ☐ Collect and record data on birds that live at Hillwood

Meet Sam Krause, a birding guide, photographer, and activist.

Sam was first introduced to birding when she was nine years old. As a young girl, she wanted to work as a veterinarian to help injured animals and to photograph animals from around the world.

She now leads birding walks in parks across the DC area, where she educates people about birds and their ecosystems. She has traveled the world to study birds and to teach people about their importance and beauty.

Her mission in life is to advocate for the protection of birds and their many habitats.

