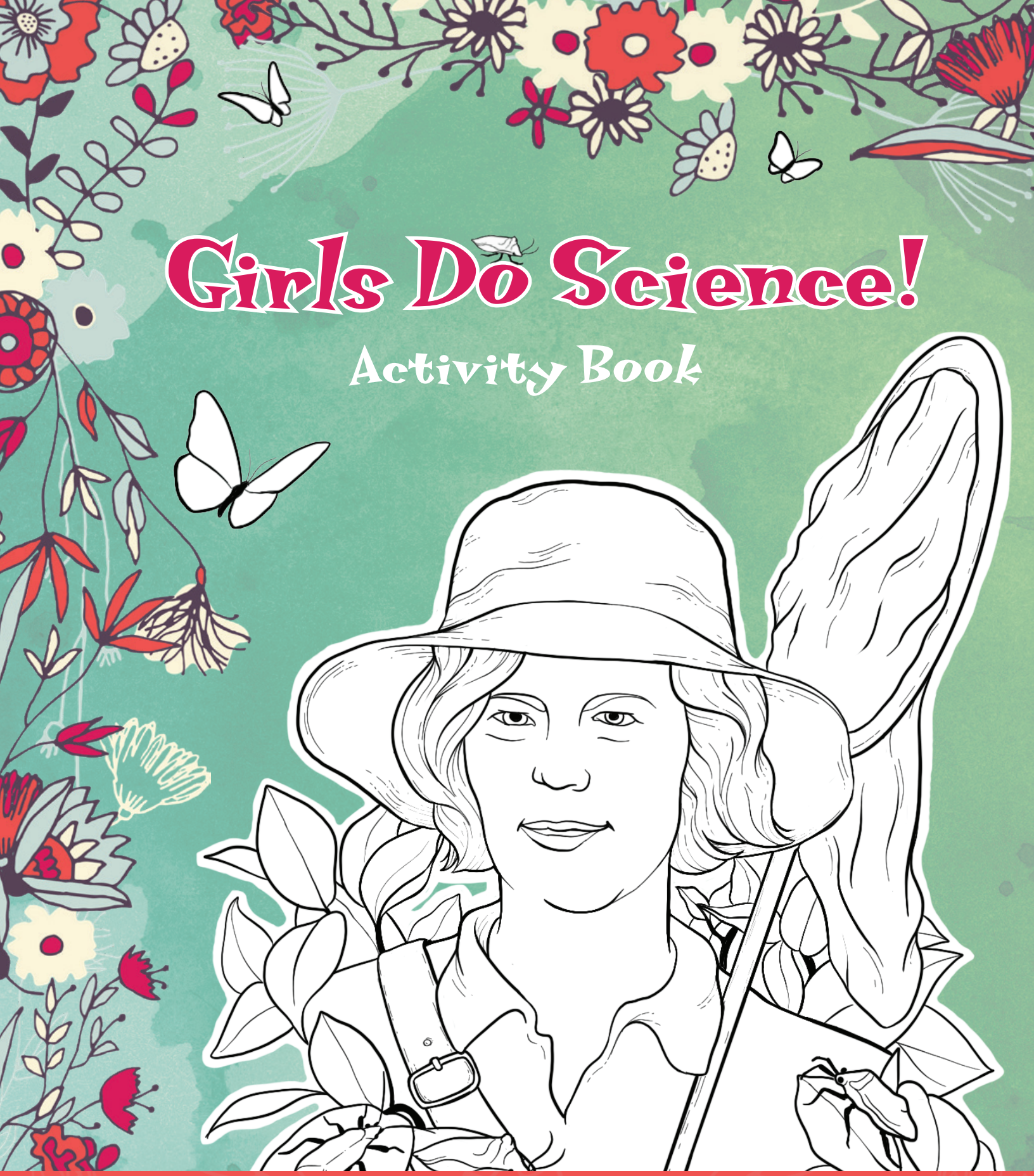
Girls Do Science!

Activity Book



Created by Current Scientists
for Future Scientists

Table of Contents

Welcome to the Girls Do Science Activity Book! Each activity within these pages was designed by a current scientist in hopes of inspiring YOU to be a more curious observer, experimenter and creative thinker. Each section is divided into targeted age groups, but feel free to check out the other sections, you might be surprised by what interests you. Now, go do some science!

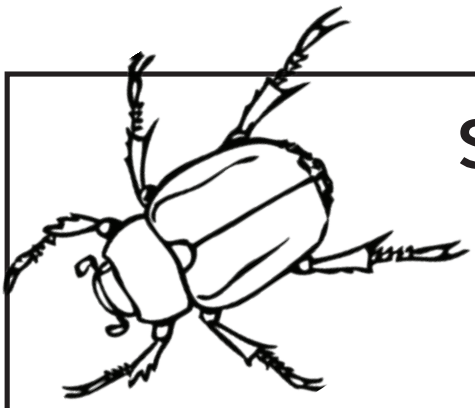
All Ages

Grades K-5

Grades 6-8

Grades 8-12

YOUR NAME HERE:



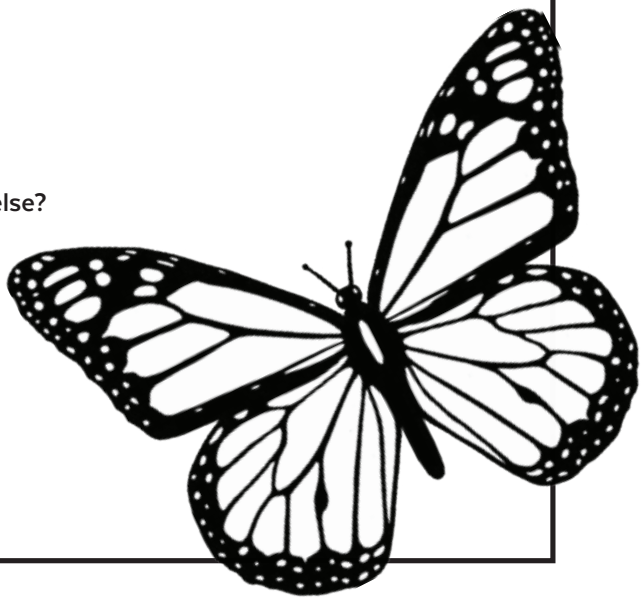
Scientist Trading Card

DRAW A SELF-PORTRAIT HERE:

INTERESTS:

What do you like to learn about?

Insects? Fossils? Math? Art? Engineering? Something else?



FUN FACT:

What is something you've done that is exciting!

Mary Anning

Title of Activity: Brain Hat

Created by: Society for Neuroscience - North Central Florida Chapter

Target Age Group: All Ages

Target Setting: Individual or with a Partner

Time: 20 minutes

Objective: Identify different areas of the brain and their functions

Materials:

- Scissors
- Clear tape or white glue

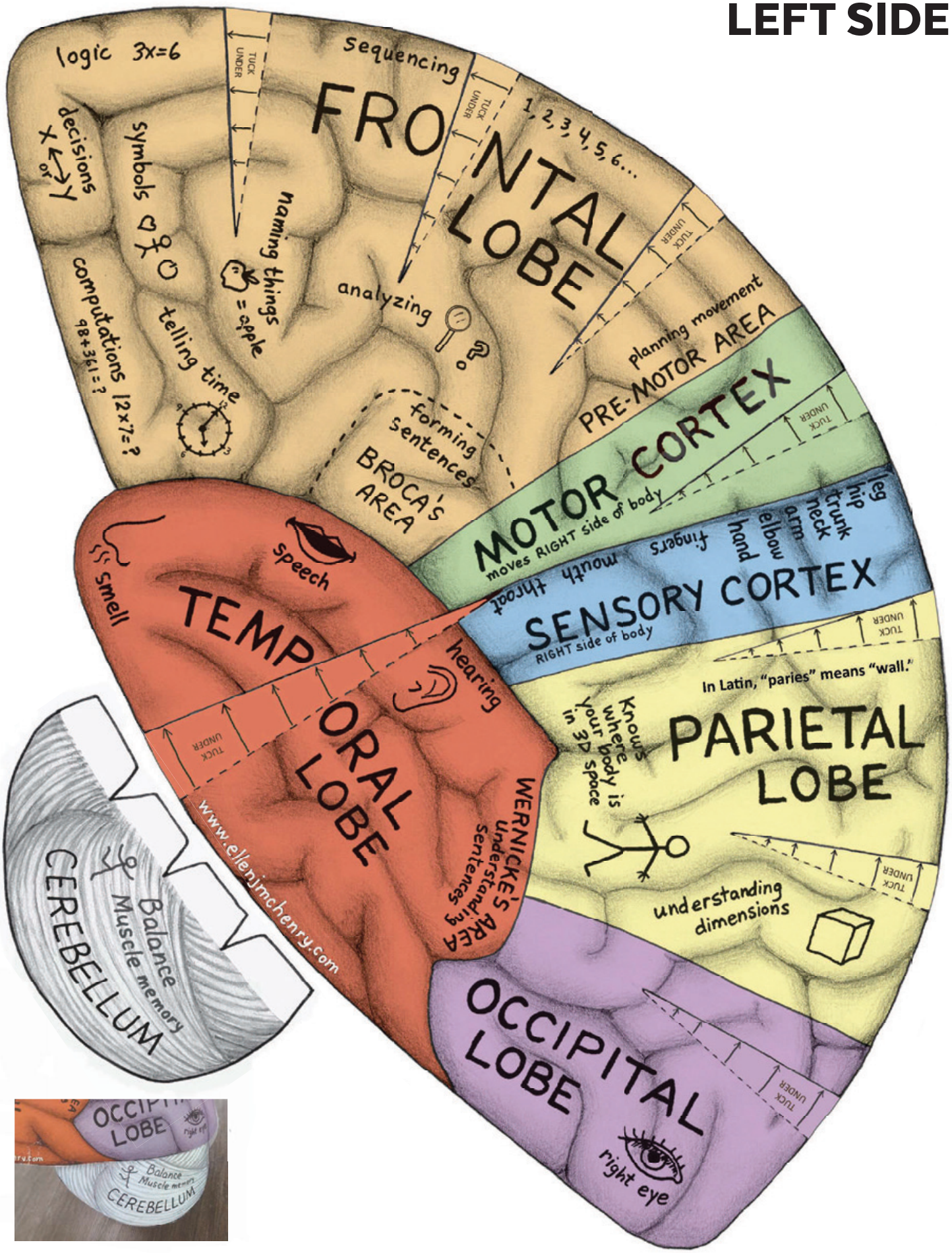
Directions:

1. Cut out both hemispheres. Then snip the solid "V" lines. Do not snip on the dashed lines, just the solid lines.
2. Pull the "flaps" you have created over to their dashed lines and secure with glue or tape.
3. After you have pulled all the flaps over to their dashed lines, it should then take on a half-round shape.
4. To put these two halves together, turn them over and work on the inside seam. Start at one end and match the sides. Secure with tape. (Don't worry that the rest of the seam is gaping open.)
5. Work your way along that inside seam, inch by inch, matching and taping each little section as you go. (This is similar to sewing a curved seam on a sewing machine.)
6. When you get to the last part of the seam, the hat will finally be taking on its final shape.
7. Optional: If you would like to add a cerebellum, cut it out and tape it to the inside of the back of the hat.

Extra Resources:

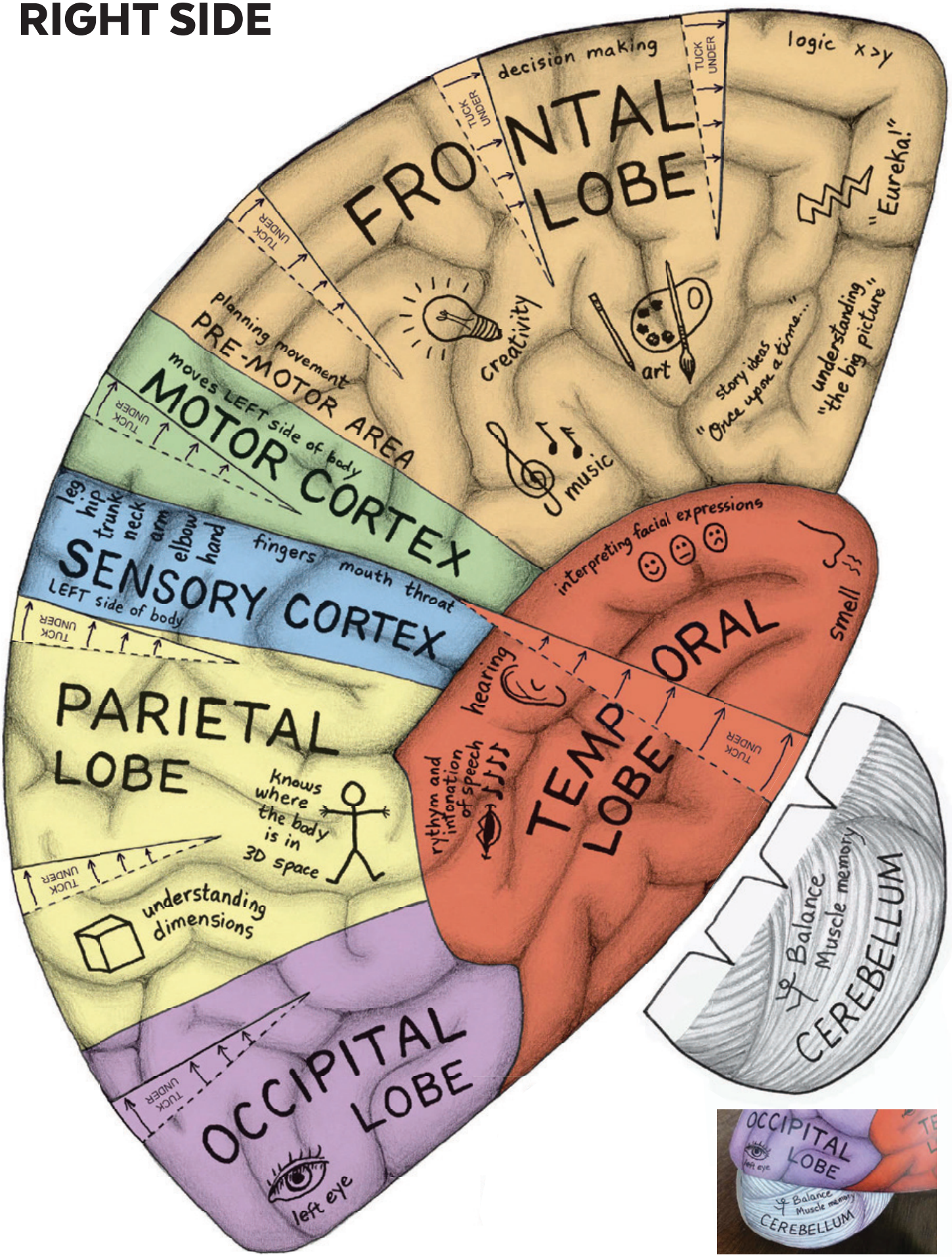
Other cool activities can be found at https://ellenjmchenry.com.
Video instructions: www.youtube.com/watch?v=GYEXywsYYQY

LEFT SIDE


logic 3x=6
TUCK UNDER
sequencing
FRONTAL LOBE
1, 2, 3, 4, 5, 6...
decisions
X
Y
or
symbols
naming things
= apple
analyzing
computations 12x7=?
98+361=?
telling time
forming sentences
BROCA'S AREA
planning movement
PRE-MOTOR AREA
MOTOR CORTEX
moves RIGHT side of body
leg
hip
trunk
neck
arm
elbow
hand
fingers
mouth
throat
SENSORY CORTEX
RIGHT side of body
In Latin, "paries" means "wall."
PARIETAL LOBE
Knows where your body is in 3D space
understanding dimensions
smell
speech
TEMPORAL LOBE
hearing
WERNICKE'S AREA
Understanding Sentences
www.elenimchenry.com
Balance
Muscle memory
CEREBELLUM
OCCIPITAL LOBE
right eye

OCCIPITAL LOBE
right eye
Balance
Muscle memory
CEREBELLUM

RIGHT SIDE


FRONTAL LOBE
decision making
TUCK UNDER
logic x>y
"Eureka!"
creativity
art
story ideas "Once upon a time..."
understanding "the big picture"
planning movement
PRE-MOTOR AREA
moves LEFT side of body
MOTOR CORTEX
MUSIC
leg
hip
trunk
neck
arm
elbow
hand
fingers
mouth
throat
SENSORY CORTEX
LEFT side of body
interpreting facial expressions
smell
hearing
rythym and intonation of speech
TEMPORAL LOBE
PARIETAL LOBE
knows where the body is in 3D space
understanding dimensions
Balance
Muscle memory
CEREBELLUM
OCCIPITAL LOBE
left eye

OCCIPITAL LOBE
left eye
Balance
Muscle memory
CEREBELLUM

Title of Activity: Plants on the Move!

Created by: University of Florida Department of Biology's Sessa Lab

Target Age Group: All Ages

Target Setting: Individual or Small Group

Time: 15 minute set-up and daily observations

Objective: Inside each seed is an immature plant (**embryo**), hibernating until cues such as water, light and temperature wake it up and **germination** begins! Germination is the process of a plant growing from a seed. In this activity, you will learn the parts of a plant as you witness seed germination and plant growth. By extending the activity beyond germination, you will learn that even though they appear motionless, plants are always on the move! How does a plant know up from down? Plants can sense gravity with their above-ground parts (stems and leaves) moving away from the seed and the below-ground parts (roots) moving towards the pull of gravity, a trait known as ***gravitropism***.

Materials:

- Vegetable seeds - green beans, peas and sunflowers grow quickly
- Or use dried beans from your pantry such as kidney, pinto or mung
- Glass jar
- Paper towels
- Window with sun
- Ruler (optional)

Directions:

Part 1 - Seed Germination:

1. Loosely pack paper towels in the jar, filled to the top - these will be the "soil" for the germinating seeds.
2. Moisten paper towels with water, enough so they are wet, but still hold their shape.
3. Place seeds between the glass wall of the jar and the paper towels, about 2/3 to the top (so there are more paper towels below than above the height of the seed). Evenly space 5-10 seeds at the same height around the glass wall of the jar, making sure you can clearly see the seeds.
    a. If using dried beans from the pantry, soak the beans in water for up to 24 hours. This will soften the hard seed coat, allowing the seeds to sprout sooner.
4. Place your jar of seeds near a window and observe changes daily. Answer these questions as you go along:
    a. What is the first plant part to push through the seed?
    b. What is the last plant part to break through the seed coat?

c. What direction is the root growing? Is this the same for all seeds?
d. What direction are the leaves growing? Is this the same for all the seeds?
e. Are the paper towels still moist? If not, be sure to give your plants a little water!

5. *Optional variation:* Use a variety of seeds and compare growth rates (measure length from root tip to leaf and divide by the number of days for each kind of seed.)
   a. Which seeds grow the fastest?
   b. Do the seeds that germinated first also have the fastest growth rate?

Part 2 - Gravitropism Experiment:
Once your plants are tall enough (growing above the top of the jar), it's time to test their ability to know up from down.

1. Move your jar from an upright position to a horizontal position by laying the jar on its side near a window and make daily observations:
   a. What direction are the root tips pointing? Is this different than yesterday?
   b. Have the stems and leaves changed position? How can you tell?
   c. Are the paper towels still damp? You may need to moisten the paper towels more often now that the plants are bigger and taking up more water as they grow! Mark the side of the jar facing up so you can return your jar to the same position after watering.

2. Did your plants figure out up from down?
   a. How long did it take for your plants to "move?"
   b. Thinking back to when your plants were seeds, did they have an "up" and a "down" side when you placed them in the jar?
   c. Why is the ability of plants to sense and move in response to gravity (***gravitropism***) important?

Extra Resources:

Plants can use other "senses" to direct their movement. One example is a plant's ability to sense and move towards or away from sunlight - a type of movement known as ***phototropism***. In fact, plants can navigate a maze in search of light! This video (https://youtu.be/qJlcy5UI8aM) demonstrates how you can set up a phototropism experiment at home and test your plant's ability to find the light.

Plants can also sense chemicals - in the air and in the soil - and direct their movement based on these chemical cues, a type of movement known as ***chemotropism***. One example of chemotropism in plants that some might find creepy is the ***parasitic*** plant, dodder (known by the Latin name, *Cuscuta*.) Parasitic plants feed on other plants, and in this video (https://youtu.be/yb_9X3I38N0) you can watch a dodder plant circle the air, "smelling" for a host plant to feed on!

You can learn more about the different ***tropisms*** of plants including gravitropism, phototropism and chemotropism here: www.thoughtco.com/plant-tropisms-4159843

Title of Activity: Moths Under Attack!

Created by: Florida Museum of Natural History's Kawahara Lab

Target Age Group: All Ages

Target Setting: Individual or Group

Time: 25 minutes

Objective: Some moths, like the Luna moth (*Actias luna*) have long hindwing tails that stream behind them as they fly around at night. These tails can play an important role for the moth – fooling bat predators! When a bat tries to grab a Luna moth it will often attack the moth's tails, instead of its body, allowing the moth to get away. Now, researchers are interested in how these tails function in the light of day. Since moths fly around at night, they have to rest during the day, which can make them an easy meal for birds and other **diurnal** (active during the day) predators. Do the tails make the moths more visible to diurnal predators than moths without tails? You will be taking part in this research by creating moth "models" with and without tails and determining which predators attacked, and whether the moth survived to fly another night.

Materials:

- Scissors
- Green marker
- Playdoh (or other clay – non-hardening is best!)
- Elmer's glue (optional)
- Ruler

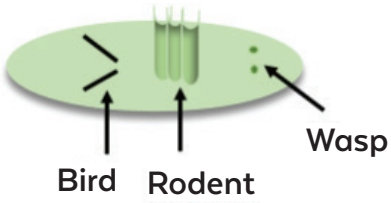
Directions:

1. Cut out the wings on the next page and color them in with your green marker.
2. Roll the clay to make 6 moth bodies. Use the ruler to make them about 1 inch long and ¼ inch wide.
3. Make 2 slits in the sides of your clay bodies and stick the yellow tabs into it. Pinch the clay around the wings to seal them in. Try to make sure the moth bodies are smooth.
4. Place your moths on different tree branches (you can use a little bit of non-toxic Elmer's glue to help them stick if you need, but the clay should stick by itself.)
5. Check on the models every few hours to see if they have any predator marks (see below for description). Are the markings different between moths with tails versus those without?
6. If you want to test **camouflage**, you can move your moth models to leaves (where the green coloring should blend in better) and see if predator attacks decrease!

Extra Resources:

You can read more and watch a neat, 2-minute video about bats and luna moths at www.sciencemag.org/news/2018/07/watch-how-battles-bats-give-moths-their-flashy-tails; video at www.youtube.com/watch?v=KSjDAP2pWwk.

Markings:



Title of Activity: Mint Play Dough!

Created by: Florida Museum of Natural History's Soltis Lab

Target Age Group: All Ages (with help from an adult)

Target Setting: Individual or Small Group

Time: 15-20 minutes

Objective: The Mint Family (*Lamiaceae*) is an incredibly diverse group of over 7,000 different species found around the world. One thing the mints have in common is they make fragrant oils that can attract a pollinator or deter an herbivore. While these oils and chemicals may be gross to some herbivores, we humans LOVE them. We've used them for thousands of years in cooking, perfumes, and even in mummification in ancient Egypt.

Today, you will be making Mint Play Dough! By tearing and rubbing the leaves of your favorite mint plant and adding them to homemade play dough, we are mimicking the biting and chewing of an herbivore, causing the leaves to produce and release more oils. When we add them to our play dough, those oils will make the play dough smell AMAZING!

Materials: (enough for three balls of play dough)

- A cooking pot or sauce pan and a stove top (note: if no stove is available to you, boiling water in an electric water heater can be used instead, though it takes some extra time!)
- 1 cup Flour
- 1/2 cup Salt
- 1 cup Water
- 2 Tbsp Oil
- 2 Tsp Cream of Tartar (or Lemon Juice)
- Food Coloring (optional)
- 1/2 cup of leaves from your favorite mint plant (some good examples are spearmint, lavender, rosemary, and thyme!)
- A few drops of your favorite mint essential oil (optional, if the mint plants are not available to you.)

Directions:

1. Add your water, oil, salt and cream of tartar (or lemon juice) into a large pot and heat until your salt is dissolved. This can sometimes take some time, so be patient!
2. Remove mixture from heat, add your flour, and knead your ingredients. Separate the dough into three balls and knead in your food coloring, as desired.
3. Take your leaves and rub and rip them with your hands. Add them to your dough and knead them in to make sure you get as much of those good-smelling oils in as possible.
4. Store in an air-tight container for up to 4 months! Happy sniffing!

Extra Resources:

To find out some great examples of the mint family and some of the cool chemicals they create, check out our Meet the Mints page at:
http://mints.plantbiology.msu.edu/Meet_the_Mints.pdf

For more recipes and activities, check the Mint Genome Project's activity book at:
http://mints.plantbiology.msu.edu/Recipes_and_Activities.pdf

Title of Activity: In a Pickle – How Museums Preserve Wet Specimen

Created by: University of Florida College of the Arts, UF Department of Biology and Florida Museum of Natural History

Target Age Group: All Ages (with help from an adult)

Target Setting: Small Group

Time: 15-20 minutes

Objective: In museums, the fluid or wet collections preserve specimens in alcohol to keep them for long periods of time. In alcohol?? Yes! In this activity, you will learn how ichthyologists (fish scientists) preserve fishes in a jar, but instead of fishes, we are going to use cucumbers to make pickles!

Materials:

- 1 or more recycled glass jar(s) with a lid, such as a sauce jar or mason jar
- 1 pound of cucumbers (it's up to you on the quantity desired)
- 2 cloves of garlic per jar
- 1 tsp dill seed per jar
- ¼ tsp red pepper flakes per jar
- 1 ½ tbsp salt
- 1 cup of cider vinegar
- 1 cup of water

Directions:

1. Bring a large pot of water to a boil and sterilize your jars and lids, if you are planning to can your cucumbers for long-term storage
2. Trim the cucumbers' blossom ends
3. Cut longways, or into coins
4. Add smashed garlic cloves, dill seed, red pepper flakes and your cucumbers in the jar
5. Make the brine: cider vinegar, water and salt. Bring the pickling brine to a boil
6. Fill your jar with the brine
7. Let the jar(s) cool to room temperature, tap jar on counter to remove any air bubbles, put the lid on and refrigerate for at least 48 hours
8. The pickles will improve with flavor as they age
9. In order to ensure you and/or your family know what is in the jar, label your pickles as we do in the collections:
    a. Name- Family name (create a name for your pickles, perhaps your family name)
    b. Collector (pickler)- Your name
    c. Date- dd/mm/yy
    d. Preparation type- brine
    e. Number of preparations- how many pickles?

10. Add a label to the outside of your jar with these details

11. After at least 48 hours, try your pickles! (Scientists don't normally snack on their specimen, but we'll make an exception this time.)

Reflective Activity:

Great job pickling your cucumbers. Now let's think about what this would look like if it were fish.

1. Why might scientists pickle fish and store them in a museum collection?
2. Who uses these pickled fish?

Let us think through these question using libraries (they are just like museums, but preserve books):

1. **Why do libraries store books?** Books in libraries document our history, understanding of different aspects of the world or stories that we pass on. Similarly, fishes pickled in collections store information we can use to understand the biogeography of a place. We can get information about how fish are distributed in our oceans and lakes. We can get life history details from the pickled fish, for example, what they eat, their age, when they reproduce and how big they get. These might be aspects that help us understand what we should or should not do in the fresh and saltwater around us. Additionally, much like you have a name, we can also use the defining characteristics of fish to name them. This is how we discover new species as scientists. Do you think you can make a new species of pickles? What might you add to the recipe?

2. **Who uses library books?** Anyone who needs information. Keep in mind, because of new technology, library books can also be accessed online.

3. **How many books does a person need to do proper research?** In a library, you must read a lot of different books, but you have to choose books that fit your interest, correct? Similarly, we do not constantly collect fish! We care about our ecosystem, so prior to taking a fish from a certain area, we study the region and its environment. If we discover that a fish's population is threatened or declining in numbers, we look for alternative species to study . Could you create another recipe for your pickles using other ingredients or even other vegetables? Also, consider different types of cucumbers.

Extra Resources:

To learn more about how we preserve fishes in jars, check out this video:
www.youtube.com/watch?v=WnP_uxDKMHE
Take a virtual tour of our collection:
www.theasys.io/viewer/A9YeofmQRyXumwUnICZSnx3Ds1kmsL
See some images of the fishes in our gallery:
www.floridamuseum.ufl.edu/discover-fish/florida-fishes-gallery

References:

Christensen, Emma. (2020, August 19). *How to make dill pickles.* Kitchen.
www.thekitchn.com/how-to-make-dill-pickles-cooking-lessons-from-the-kitchn-193350

Title of Activity: Go Batty Trading Cards

Created by: Florida Museum of Natural History's Reed Lab

Target Age Group: All Ages

Target Setting: Individual or 2 People

Time: 20-30 minutes

Objective: In this activity, learn about different bats in the Bahamas and some fun facts related to them. You can do this activity by yourself or you can meet up virtually with another person and discuss, which bat is your favorite one!

Materials:

- Printed cards on next page

Directions:

1. Print out the cards and observe each bat carefully. Do they look different?
2. Arrange them carefully, and if you are playing this with a friend, pick one card and see who gets the highest statistics. For example, you can compare length or size.
3. After placing the cards face down, pick one card and compare diet. Do all the bats have the same diet?
4. Pick your favorite bat card. Why did you choose it? What do you like about this bat?
5. What are some interesting features for each bat? You can compare this across different bats.
6. There are maps of the Bahamas where these bats are found at the bottom of the card. Are they different for each bat? Can you find these places on a map? Why do you think their diets may vary depending on where they live?
7. Now that you've learned about these four bats, do some research and create your own trading cards to add to the collection. Start by researching bats that may live close to your residence and design cards that include diet, habitat, size and location.

Waterhouse's Leaf-nosed Bat | *Macrotus waterhousii*

Weight: 0.56 oz **Length:** 2.3 in **Size:** Medium

Found in: Caves

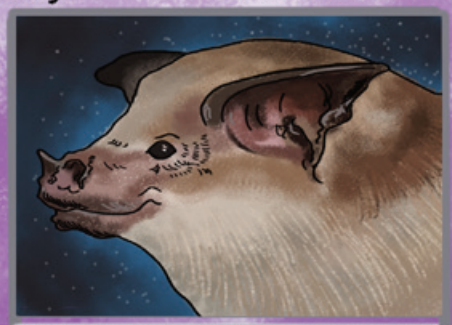
Diet: Cockroaches, crickets, katydids, moths

Features: Long ears, fleshy protrusion at the tip of snout (nose leaf)

Fun facts: Most common bat in the Bahamas

Distribution

Buffy Flower Bat | *Erophylla sezekorni*



Weight: 0.56 oz **Length:** 2.56 in **Size:** medium

Found in: Caves, abandoned buildings

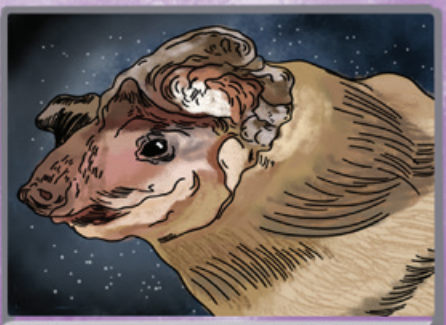
Diet: Flowers, plants, beetles, hard insects

Features: Long tongue covered in hair-like papillae

Fun fact: Pollinate native plants and crops, such as bananas

Distribution

Mexican Free-tailed Bat | *Tadarida brasiliensis*



Weight: 0.44 oz **Length:** 1.6 in **Size:** small

Found in: Abandoned buildings, caves, houses

Diet: Moths, insects

Features: Long "free tail" extends between legs

Fun fact: Fly very fast and high

Distribution

Big Brown Bat | *Eptesicus fuscus*

Weight: 0.62 oz **Length:** 4.3 in **Size:** large

Found in: Caves

Diet: Insects

Features: Strong teeth used to crush beetles

Fun fact: Roost in groups of hundreds, but sometimes a single bat roosts

Distribution

Evelyn Cheesman

Title of Activity: Kitchen Science: Rainbow Rubber Eggs

Created by: Alachua County Library District

Target Age Group: Grades K-5

Target Setting: Individual or Small Group

Time: Set-up time: 15 minutes | Waiting time: A few days

Objective: A chemical reaction occurs when one or more chemical substances are transformed into another. Eggshells are made of calcium carbonate. This is what makes them hard. Vinegar is made of acetic acid and water. When you put an egg in vinegar, the acetic acid (vinegar) reacts with the calcium carbonate (eggshell) and causes the calcium carbonate to split up. The calcium dissolves into the water, and the carbonate reacts with the acid to make carbon dioxide, which are the bubbles that form on the outside of the eggshell.

Materials:

- Eggs
- Clear cup or jar for each egg
- Distilled white vinegar
- Food coloring
- Bowl of water

Directions:

1. Carefully place a raw egg in a clear jar or cup.
2. Pour enough vinegar in the cup to completely cover the egg.
3. Add a few big drops of food coloring and gently stir. Create a rainbow of eggs by including drops for each color of the rainbow.
4. Now wait. Check on the eggs each day to see if the eggshell has completely dissolved.
5. Once fully dissolved, rinse the eggshell residue away under the tap or in a bowl of water.
6. The eggs will now be rubbery and bouncy. Play with the egg. Press and bounce it, but not too hard, because it is still raw on the inside and can break.

Extra Resources:

Check out more easy science experiments online using the link below:
https://bit.ly/3oPOLKY

Title of Activity: Build Your Own Plant Press!

Created by: Florida Museum of Natural History Soltis Lab

Target Age Group: Grades K-5

Target Setting: Individual

Time: 5 minutes

Objective: Pressing plants is important for botanists to study plants over time and over a large area. It can be a fun way to learn more about plants or create interesting and natural art pieces! Build a mini plant press using items you might have at home to start your own herbarium, or plant collection.

Materials:

- Two pieces of cardboard cut to 5" x 8"
- Rubber bands to hold your press together
- Index cards sized 5" x 8"
- Clippers or scissors
- A local plant guide or identification app like Seek or iNaturalist (optional, but recommended!)

Directions:

1. When collecting, make sure you are always aware of your surroundings to protect yourself from biting and stinging insects, reptiles and poisonous plants.
2. Find a plant that you want to collect! Go for a walk in your neighborhood, park or hiking trail and select the plant you want to collect. Make sure it's in an area that is okay to collect plants in. Do not clip plants from your neighbor's garden without permission, and only collect a plant if the park or hiking trail says it is okay.
3. Clip your plant so it takes up as much of the index card as possible. Try and get many leaves as well as flowers or seeds, if they're available.
4. Place an index card on one piece of cardboard, and the plant on the index card, spreading the leaves out nicely! Position the plant however you want.
5. Put a second index card on top of the plant, and add the second piece of cardboard on top. Secure your mini plant press with two rubber bands.
6. Continue this process until you have as many plants as you want in the mini plant press!
7. (**Optional**) Using a guide or app, write down what species of plant you found on your index card. Write out the date, the weather and any special notes like if there are insects or other plants nearby.
8. Once you're done exploring and collecting, find a nice, cool, dry spot at home to store your plant press. You may want to add something heavy on top to press it better like heavy books or bricks. Let your plants dry out for at least a week.

Extra Resources:

Florida Museum of Natural History's Herbarium Specimen Preparation Guide can be found at: www.floridamuseum.ufl.edu/herbarium/methods/mountingguide.htm

Title of Activity: Pottery Decoration with Trash?!

Created by: Florida Museum of Natural History Ceramic Technology Lab

Target Age Group: Grades K-5

Target Setting: Individual or Group

Time: 30 minutes

Objective: Florida's early Native people decorated pottery with tools they found or made from nature. Sometimes they used what was left over after cooking, like clam shells, animal bones and corncobs. Archaeologists use the ancient pottery that they find to learn more about what people who made it ate. What is left over after you've eaten a meal? Can it be used as a pottery tool, to draw lines, make shapes or a pattern in clay as a record of what you eat?

Materials:

- Modeling clay or dough
- Decorating tools: Almost anything! Clean, dry food leftovers like corncobs, chicken bones, nut shells, bottle caps, twist ties, packaging, straws, toothpicks

Directions:

1. Take a ball of clay or dough about the size of your fist and poke a hole in it with your thumb.
2. With your thumb on the inside and fingers on the outside, gently pinch around until you've made a bowl shape.
3. Pick your tool or tools and start decorating! Which tools work best to draw, to poke or to press a design?
4. Set your pot aside to dry if you wish to keep it.
5. Think about what an archaeologist could say about your food if they found your pot hundreds of years from now.

Extra Resources:

For examples of pottery found in Florida, visit:
www.floridamuseum.ufl.edu/ceramiclab/pottery-types-gallery

To read more about and see pictures of how people made pottery in the past, check out:
www.floridamuseum.ufl.edu/ceramiclab/blog/category/clay-chronicles

Title of Activity: Nectar Foraging Race

Created by: UF/IFAS Honey Bee Research and Extension Laboratory

Target Age Group: Grades K-5

Target Setting: Ideal for 6 or more youths in a large outdoor setting

Time: 10 minutes to set up and 15-20 minutes to play

Objective: All summer long honeybees collect nectar from flowers, which they take back to their hive, a behavior we call "foraging." There in the hive, worker bees turn that nectar into honey to be stored as a food source for winter. Honeybees are very good at communicating with one another. When they find a high-quality source of nectar, they tell all the other foraging honeybees where to go so they can help collect and bring it back to the hive. Why do bees need so much honey, you might ask? Well, bees don't just make honey as a delicious treat for humans. They need honey so they don't starve in the winter. It takes a lot of bees to produce that much honey. In fact, one honeybee will only make 1/12 of a teaspoon in its entire life! In this activity, you will experience how honeybees search for nectar sources and communicate the location of those sources to one another.

Materials:

- 12 or more disposable cups
- Three or more disposable bowls
- Water
- Food coloring
- Multiple plastic syringes, small sponges or medicine droppers
- Markers

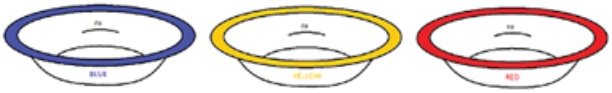
**The number of bowls and cups to use will depend on the number of teams playing the game. These specific instructions are for a race of three teams.*

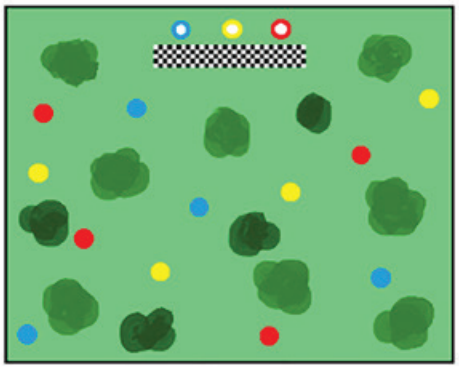
Directions:

1. Fill at least four cups with water for each team. So, twelve total cups of water. Be sure to fill them to different levels, such as a cup that is almost empty and a cup that is almost full. There are different amounts of "nectar" in different flowers.

2. Use the food coloring to change the water in the cups to the team's color. For example, there can be four dyed blue, four dyed yellow and four dyed red.

3. Each team will have one bowl at the starting line marked with their team color. It will also be marked with a water fill line.





4. Take the cups of colored water and spread them out around the area. These will be your nectar sources. Some can be close to the starting line and some can be far away.
5. Split the group into three teams. One person from each team will be given a "nectar collector," such as a plastic syringe, sponge or medicine dropper.
6. While one person runs out to collect nectar from the cups, the rest of the team is waiting at the starting line with their backs to the field so that they cannot see where the nectar is coming from.
7. Once the person returns to the starting line and squeezes the water into the bowl, they must whisper to the next person where to find the best nectar sources and pass the collector onto them.

8. The goal is to fill the bowl with your team color's water to the fill line before any of the other teams.

Extra Resources:

Check your local library for this book, **Are You a Bee?** by Judy Allen and Tudor Humphries, or other books, to learn more about the incredible honeybee!

Title of Activity: The Great Blacktip Shark Migration!

Created by: Florida Museum of Natural History's Florida Program for Shark Research

Target Age Group: Grades K-5

Target Setting: Small Group or Family

Time: 20-30 minutes

Objective: Gain a deeper understanding of the challenges that sharks face for survival and the threats to shark conservation from humans.

Materials:

- Game Map
- Paper and pencil
- Dice
- Cut out game pieces on the following pages

Directions:

1. Patchy the Blacktip shark has to migrate for the winter from North Carolina to Florida. Help him navigate the coast.
2. In groups of 4, take turns helping Patchy migrate. Each player will move Patchy down one stop and roll the die to find out what conditions are at each new location.
3. Start with 20 health points (HP), and keep track of your health points on a piece of paper.
4. If you lose all your HP, Patchy won't be able to make the trip.

Extra Resources:

www.floridamuseum.ufl.edu/discover-fish/species-profiles/carcharhinus-limbatus

Site 1:

- Roll a 1-3: Meet up with other Blacktip friends and increase your hunting party size. **+2 HP**
- Roll a 4-6: Oh no! There's a shark fin fishing boat. Better get out of here so Patchy isn't made into shark fin soup! **-2 HP**

Site 2:

- Roll a 1-3: You found shelter in a beautiful reef. Rest for the night. **+1 HP**
- Roll a 4-6: Oh no! A large Tiger shark is trying to eat Patchy, you must run away from this area or end up lunch. **-2 HP and go back one site**.

Site 3:

- Roll a 1-3: You found an ocean cleaning station! Let these special fish and shrimp remove all your dead skin and parasites. **+ 1 HP**
- Roll a 4-6: The reef you remembered is gone! Bottom trawl fishing destroyed the entire area. Guess there's no dinner tonight. **-3 HP, do not progress to site 4. Must attempt to progress again next turn.**

Site 4:

- Roll a 1-3: Patchy got into a fight and hurt his fin. You will have to slow down for him to heal up. **-2 HP, do not progress to site 5. Must attempt to progress again next turn.**
- Roll a 4-6: You found a school of squid! Enjoy some calamari for dinner. **+2 HP**

Site 5:

- Roll a 1-3: You found a large school of herring! Enjoy a big dinner. **+2 HP**
- Roll a 4-6: You got here too late! Other sharks have already eaten all the good fish. **-2 HP and go back to site 4**.

Site 6:

- Roll a 1-3: You showed up too late and missed the mullet migration. No dinner tonight. **-3 HP, do not progress to site 7. Must attempt to progress again next turn**.
- Roll a 4-6: Wow there are so many mullet to eat here! Have a full dinner. **+2 HP**

Site 7:

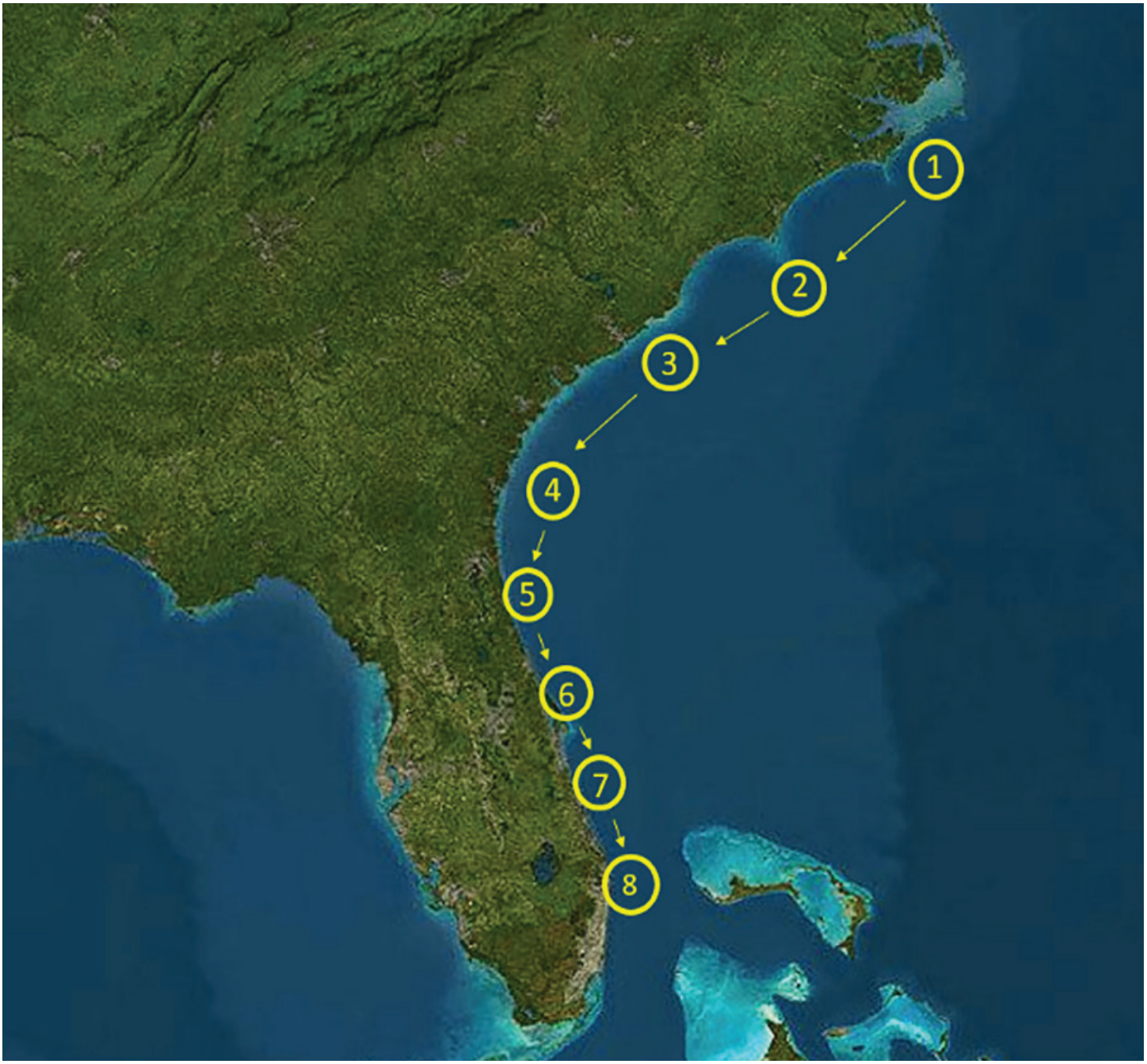
- Roll a 1-3: You found a school of anchovies! Enjoy a big dinner. **+2 HP**
- Roll a 4-6: Oh no! A Great Hammerhead shark is trying to eat Patchy, you must run away from this area or end up lunch. **-2 HP, go back to site 6**.

Site 8:

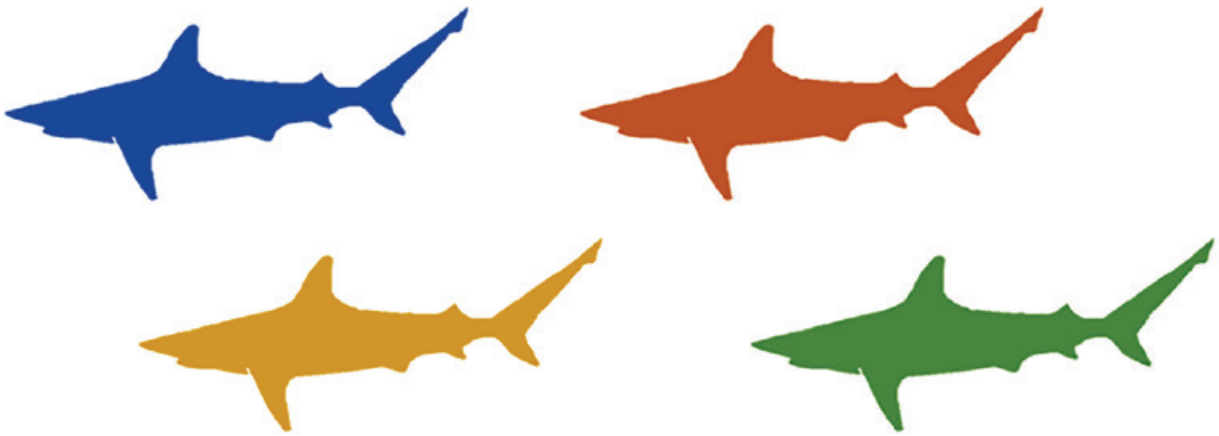
- Roll a 1-3: You are feeling itchy. Oh no Patchy has copepod parasites. Take the day to clean them off. **-3 HP**
- Roll a 4-6: You found a mangrove swamp to rest in! **+1 HP**

Finish!

- Congratulations! Patchy and his blacktip friends made it to Southern Florida where they can spend the winter in warm waters with plenty of food.



Game pieces to cut out



Eugenie Clark

Title of Activity: Sharks of the World

Created by: Florida Museum of Natural History's Florida Program for Shark Research

Target Age Group: Grades 6-8

Target Setting: Individual

Time: 30 minutes

Objective: Gain a deeper understanding of the differences between shark species habitats, diets, behaviors and conservation.

Materials:

- Access to a computer

Directions:

- Pick a species of shark at: www.floridamuseum.ufl.edu/discover-fish/sharks/species-profiles
- Look at the species' bio profile of the shark you chose and learn about its basic biology by answering the questions below.

1. Where does your shark live in the world? What type of habitat does it like? (Coral reefs, deep oceans, open water, etc.)
2. What does your shark eat?
3. What is your shark's conservation status? (Endangered?) If threatened, what is lowering the number of sharks?
4. How can you tell your shark from other shark species?
5. What are fun facts about your shark?
6. Draw your shark species, on the back of the page or a separate sheet of paper.
7. Can you find people who have similar looking sharks to yours?
8. Why might they look similar?

Title of Activity: Strawberry DNA Extraction

Created by: American Society for Microbiology University of Florida Student Chapter

Target Age Group: Grades 6-8

Target Setting: Individual or Group

Time: 5-10 Minutes

Objective: All living organisms are made up of the basic units of life, called cells. Contained within each cell is **DNA**, which is the genetic information that codes for the way each living thing looks and functions. Just like you have DNA, strawberries do too! In this activity, you will isolate the genetic information from a strawberry to look at large clusters of its DNA. Though DNA is not typically visible to the naked eye, strawberries have lots of DNA, so it is much easier to see when it is extracted as a group.

Materials:

- 2 Strawberries
- 1 Re-sealable Plastic Sandwich Bag
- 1 Coffee Filter
- 2 Paper Cups
- 1 Stirring Rod (Such as a Coffee Stirrer)
- ½ Cup of Water
- 1 Teaspoon of Salt
- 2 Teaspoons of Dish Detergent (Alternate Options: Hand Soap or Shampoo)
- ½ Cup of Cold Rubbing Alcohol

Directions:

1. Remove the green leaf tops of the strawberries.
2. Put the strawberries into the plastic bag, seal the bag with no extra air inside, and gently smash the strawberries until they are fully crushed.
3. Mix the dish detergent, salt and water together in a cup to make DNA extraction liquid.
4. Pour 2 teaspoons of the DNA extraction liquid into the strawberry bag, reseal the bag with no extra air inside, and gently smash for another minute.
5. Place the coffee filter lightly at the top of the other cup.
6. Carefully, pour the strawberry-DNA extraction liquid mix into the newly filtered cup. Gently tap the filter to pass all liquid through without allowing any non-liquid strawberry material to reach the bottom of the cup.
7. Remove the soiled coffee filter and add the cold rubbing alcohol to the strawberry liquid at the bottom of the cup. Do not mix or stir.
8. Watch as a white layer forms at the top of the pink liquid. This is the strawberry's DNA! After a few seconds, stick the stirring rod into the mixture to lift out the white DNA.

Extra Resources:

For a demonstration and more information about this experiment, check out www.youtube.com/watch?v=hOpu4iN5Bh4.

Title of Activity: Shrinking Polymers!

Created by: American Chemical Society's Division of Polymer Chemistry (POLY) and the Division of Polymeric Materials Science and Engineering (PMSE) University of Florida Student Chapter

Target Age Group: Grades 6-8

Target Setting: Individual or Small Group

Time: 20-30 minutes

Objective: Polymers are very large molecules that are made up of connected smaller molecules, known as monomers. An analogy to this is a bead necklace. The necklace is the polymer chain and the beads that make up the necklace are the monomers. Polymers are all around you and can have many material properties! Consider the stretchy, flexible material behavior of plastic wrap verse the hard and stiff behavior of your remote control.

The polymers you interact with every day like food containers found in the grocery store have been manufactured and molded specifically for their intended purpose. Polystyrene (PS), label #6, is most common. These containers are made by heating up the raw polystyrene material that changes from a random, disordered state into an aligned and ordered one.

Think of the necklace, if dropped, it would have a random, coiled shape. Once heated, it is stretched into the desired shape and rapidly cooled so that the chains and shape are locked into place Think of how the necklace straightens out if you were to pull it on either end. The polymer chains have a "memory" for the disordered order they prefer. Once they are heated again the polymer chains will return to their random, disorderly arrangement that shrinks back to the original shape.

Materials:

- Disposable plastic food container (look for the recycling symbol with the #6, and the letters PS)
- Sandpaper - medium grit (optional)
- Permanent marker or colored pencils
- Either: A oven, cookie sheet and margarine/shortening **OR** a hair dryer
- Scissors
- Paper

Directions:

1. Find a plastic container that has the recycling label #6 on the back (usually clear plastic)
2. Clean the container and cut out the flat sections
3. Optional: Scratch one side of the plastic with medium grit sandpaper. Scratch a large enough area to draw on. The rough texture will allow your drawing to stay on the plastic better.
4. Color a design onto the rough texture or use permanent marker if you did not scratch the plastic. Draw your designs big, because they will shrink.

5. Cut the plastic around your design.

6. Trace the shape of your design on a piece of paper.

7. **If using an oven** (recommended):
    a. Preheat the oven to 350 degrees (Fahrenheit)
    b. Grease a cookie sheet with margarine or shortening to prevent sticking
    c. Place your plastic shape onto the sheet with the colored side up
    d. Place the sheet, with your plastic shapes, into the oven for 1 minute
    e. If you have an oven light, you can watch through the window to observe the polymer shrink
    f. Remove the cookie sheet from the oven after 1 minute

   If using a hair dryer:
    g. Turn the hair dryer onto the medium setting
    h. Hold the hair dryer about 8-10 inches from the plastic shape and bring it closer to the shape if you do not observe shrinking after a minute
    i. If the plastic moves while heating, use a spatula or tongs to hold it in place **(DO NOT USE YOUR HANDS – IT IS HOT)**
    j. If the plastic begins to curl, flip it over to heat the other side (It should flatten out)
    k. Heat the plastic for 5 minutes to see how much it will shrink

8. Allow the plastic shapes to cool.

9. Trace the shape of your shrunken plastic. Compare how the size changed.

Observations:

1. If you watch the plastic shrink, you will notice the edges may wrinkle at first, but then flatten out.

2. The plastic shape should change size before and after heating. They will be about a third of their original size, but much thicker.

Extra Resources:

For more information on this experiment, you can view the article from the Smithsonian Magazine on The Science of Shrinky Dinks:
www.smithsonianmag.com/science-nature/the-science-of-shrinky-dinks-36715644

Visit our organization's webpage at:
https://cmse.chem.ufl.edu/news/poly-pmse-chapter.php.

More science demos can be found on Molecular Mania TV at:
https://www.youtube.com/channel/UCCEf2wvDmtQCBpSF2pKqk0g.

Specific Polymer Demos Include:
- Polyurethane Foam Experiment
- Nylon Rope
- Alien Blood

Title of Activity: Florida Flora Mini Activity Booklet

Created by: Florida Museum of Natural History's Soltis Lab

Target Age Group: Grades 6-8

Target Setting: Individual or Small Group

Time: 30 minutes per activity (4 activities in the booklet.) Activities can be revisited throughout the year and can be done separately.

Objective: Florida has such amazing plant diversity, and many cool examples can be seen right outside! Become a botanist by learning to observe the plants around you with your five senses and learn about the wild adaptations of some of our favorite Florida natives. Get creative while honing your botanist skills with fun activities, like coloring, designing your own carnivorous plant, tie dyeing and plant hunting.

Materials:

- Florida Flora Mini Activity Booklet (available for download on the Florida Museum's website)
- Your favorite coloring instruments (crayons, colored pencils, markers, watercolors)
- Extra paper or your own field journal (optional)
- An identification app, such as Seek or iNaturalist (optional, but recommended)
- A book on local plants (optional)
- Online resources, such as Wikipedia (optional)

Directions:

1. First, explore the amazing Florida Flora on the next page by coloring in the plants you see. Use a book or the internet to see the colors you might want to use, if desired. This page includes a Florida landscape containing American Beautyberry, Southern Magnolia, Spanish Moss and the Yellow Pitcher plant.

2. Use the Florida Flora Mini Activity Booklet page 1 to learn more on the Southern Magnolia page and, if desired, in your neighborhood throughout the year! Color in the flowers and learn different flower parts and their functions.

3. Learn all about the Spanish moss we see hanging from trees all over town on page 2. Discover the closely related fruit that you might enjoy eating and find other bromeliads you might see.

4. Did you know we have many different carnivorous plants in Florida? Get creative and design your own carnivorous plant after learning about some cool adaptations seen in these plants on page 3.

5. American Beautyberry is a popular member of the mint family planted throughout town. Learn to perform leaf rubbings like scientists do, try your hand at tie dyeing using the bright purple berries, and sniff around your spice cabinet or your grocery store for more members of the mint family!

6. **Optional**: We have provided a template for starting your own field journal on page 5 for plants. Feel free to print out many copies of the final few pages in this bundle or use it as a guide to design your own field notebook by hand!

Extra Resources:

If you want to find more information about the Soltis Lab or contact the organizers of this activity, visit www.floridamuseum.ufl.edu/soltis-lab.

Also, you may want to visit the website https://wedigbio.org to find opportunities to engage in citizen science.

You can visit the following links for more information on:

- Carnivorous plants: https://gardeningsolutions.ifas.ufl.edu/plants/ornamentals/carnivorous-plants.html
- Spanish moss: https://youtu.be/usuX9lXLwn4
- American beautyberry: https://youtu.be/Vbvo14UdT8g, https://youtu.be/z4zhv0IG1W8

Title of Activity: Track that Shark!

Created by: Florida Museum of Natural History's Florida Program for Shark Research

Target Age Group: Grades 6-8

Target Setting: Individual

Time: 10 minutes a day for a week or longer

Objective: Large shark species movement patterns.

Materials:

- Access to a computer with internet
- Paper or another way to take notes

Directions:

1. Visit www.ocearch.org/tracker and choose a shark you would like to track by clicking on the "Filter" option on the right-hand side of the screen. Record its name, gender, size, age, weight and total miles (mi.) traveled while tracked.

2. You can use the "Filter" option to find your shark again. You can also save it as a favorite by clicking the heart icon above its name and sort the amount of data with the "Filter track option."

3. Once a day, check to see if your shark has "pinged." The tag attached to the shark needs to break the surface of the water to send a signal to the satellite. Each day, record the following:
    a. Check if your shark has pinged or not.
    b. If it has, then check how far it has traveled since it last was recorded.
    c. Did it stay in the same area or is it on the move?
    d. Is it close to land or out at sea?
    e. Is it traveling a relatively straight path or more random?
    f. Are there any other sharks being tracked nearby your shark?
    g. Do you have any thoughts on what it might be doing?

4. At the end of your set observation period (1 week +) answer the following question in your record.
    a. Why do you think your shark traveled this way? Was there a place it looks like it would be going?
    b. What questions do you still have?
    c. How far has your shark traveled since you started watching? (Hint take the total miles traveled now minus the total miles traveled you recorded on day 1.)

Extra Resources:

Check out more information on some of the most tagged shark species. Shark tagging:
www.floridamuseum.ufl.edu/science/record-number-of-endangered-sawfish-tagged
www.floridamuseum.ufl.edu/science/researchers-given-glimpse-into-bull-sharks-movement
www.floridamuseum.ufl.edu/science/scientists-tag-shark-from-submersible

Maria Mitchell

Title of Activity: Sleuthing Species Identities

Created by: U.S. Geological Survey's Wetland and Aquatic Research Center

Target Age Group: Grades 9-12

Target Setting: Individual

Time: 20-30 minutes

Objective: Learn different ways that scientists identify non-native and invasive species, get hands-on experience using scientific and publicly accessible databases, and synthesize information from multiple sources to arrive at a conclusion.

Oftentimes, we can use physical attributes (e.g., color, size) or their behavior and habitat preferences to differentiate between two species. However, closely related species can resemble each other so much that it's nearly impossible to tell the difference using solely observable characteristics. One example of this are applesnails. In Florida, there are multiple applesnail species; one is a native species and is an important food source for animals like the endangered snail kite (Florida applesnail), while the others (such as the giant applesnail) are non-native, meaning they have been introduced from somewhere outside of Florida and have the potential to cause harm to native species and ecosystems.

Materials:

- Computer
- Internet access
- Images found here: www.usgs.gov/media/galleries/applesnail-id-education

Directions:

1. You've just discovered two individual applesnails near a wetland park near your residence. Each was found with a clutch of eggs nearby. Using the provided images from the link above, note any observable differences, between the two snails. Based solely on the physical attributes visible in the provided images, do you think these are the same species or different species?

2. Let's explore apple snail species' ecology to see if we gain any more insight. The USGS Nonindigenous Aquatic Species (NAS) program tracks non-native aquatic species across the United States, keeping informational pages for each species, called species profiles.
    a. Go to https://nas.er.usgs.gov and click "Database & Queries," "NAS Database," "Text Queries," and then "Simple."
    b. Type in the common name in the appropriate query box. For our example, you can type in "Florida applesnail" into the "Common Name" search box. Hit "Submit." Under "More Info," select "Species Profile."
    c. Repeat with "giant applesnail."

d. Review the information provided on the "Species Profiles," especially under "Identification" and "Ecology." Based on the information provided, can you assign species identities to the apple snails you discovered?

3. Some species look and behave so similar that scientists must rely on genetic analyses to differentiate between them. All living things are made up of DNA, which is in turn made up of chemical building blocks called nucleotides. There are four nucleotides of DNA: adenine (A), thymine (T), cytosine (C) and guanine (G). These bind together in different combinations, making a nucleotide sequence. This genetic sequence helps define a species' identity. To help determine if the two applesnails are the same or different species, we will use a common and publicly accessible database:
    a. From your personal computer, access the National Center for Biotechnology Information's (NCBI) Basic Local Alignment Search Tool (BLAST) webpage: https://blast.ncbi.nlm.nih.gov/Blast.cgi.
    b. Scroll down the webpage to the "Web BLAST" section header. Click "Nucleotide BLAST."
    c. Under "Enter Query Sequence," check the "Align two or more sequences" box. Enter the two following accession numbers into the respective text boxes.
        i. Type EF514960.1 in the text box under "Enter Query Sequence."
        ii. Type KM107825.1 into the text box under "Enter Subject Sequence."
    d. Click the blue "Blast" button on the lower left side of the webpage.
    e. On the results page, locate the "Description" tab. Under the "Sequences producing significant alignments" header, locate the "Percentage Indent" section in the blue bar on the right side of the webpage. This is the percentage of identical nucleotides in the genetic sequences of the two different species you compared.
    f. If the number is 100%, the two animals represent identical sequences and are likely the same species. If the number is less than 100%, this indicates that the two animals have different sequences and could be different species.
    g. What is your percent of identical nucleotides? Based on the genetic analyses, are the two applesnails the same species or two different species?

4. Based on the information gathered from a) observations, b) the NAS database and c) the genetics comparison, can you assign species identities to the applesnail species represented in the provided images?

Extra Resources:

Videos providing more information on genetics:
www.jove.com/science-education/10814/dna-isolation
www.jove.com/science-education/10819/pcr
www.jove.com/science-education/10561/evolutionary-relationships

If you see a non-native giant applesnail in the wild, report your sighting to the USGS NAS database: https://nas.er.usgs.gov/SightingReport.aspx

Title of Activity: How Giant were the Extinct Sloths?

Created by: University of Florida Department of Biology

Target Age Group: Grades 9-12

Target Setting: Individual or Small Group

Time: 10 minutes

Objective: Learn how paleontologists take measurements on fossils to estimate the size of extinct animals.

Materials:

- Ruler
- Calculator

Directions:

We are going to use measurements from the femur, or upper leg bone, of three extinct sloths. The femur is a long bone located between the hip and the knee. We know from numerous past scientific experiments that femur size is good for estimating body size in animals. Think about it; the size of a mouse's leg compared to its body size versus the size of an elephant's leg compared to its body size.

Neocnus comes
(knee-awk-ness co-mess)

Femur Length:

_____ **(cm)**
This fossil is only about 10,000 years old and was collected from the Caribbean Islands in 1983.

Megalonyx curvidens
(Mega-lawn-ex curve-edens)

Femur Length: _____ **(cm)**
This fossil is around 4.7 million years old and was collected in Polk County, Florida in 1990.

Eremotherium eomigrans
(Ee-re-moe-th-ear-ee-um ee-oh-my-grans)

Femur Length: _____ **(cm)**
This fossil is around 2 million years old and was collected in Alachua County, Florida in 1995. You can see an entire skeleton on display at the Florida Museum!

1. Use a ruler to measure the length of each fossilized sloth femur in centimeters (cm). The length is **between** the black points on each femur. Measure the bone, not the points. Write your answers in the blank spaces provided next to the fossil images.

2. To fit the fossils on the page we had to make them smaller than they are in real life. To scale them back up to their real size, we are going to use a calculator and multiply your measurements by 6.5.
   a. *Eremotheirum eomigrans* femur length _____(cm) x 6.5 = _____ (cm)
   b. *Megalonyx curvidens* femur length _____(cm) x 6.5 = _____(cm)
   c. *Neocnus comes* femur length _____(cm) x 6.5 = _____(cm)

3. Press the LOG button on your calculator, enter your real femur length (cm) from question 2, press enter. Round to the nearest hundredth or second decimal space.
   a. *Eremotheirum eomigrans* answer = _____
   b. *Megalonyx curvidens* answer = _____
   c. *Neocnus comes* answer = _____

4. Now, multiple your answers from question 3 by 3.49:
   a. *Eremotheirum eomigrans* _____ x 3.49 = _____
   b. *Megalonyx curvidens* _____ x 3.49 = _____
   c. *Neocnus comes* _____ x 3.49 = _____

5. Next, subtract 2.9 from your answers in question 4:
   a. *Eremotheirum eomigrans* _____ - 2.9 = _____
   b. *Megalonyx curvidens* _____ - 2.9 = _____
   c. *Neocnus comes* _____ - 2.9 = _____

6. Finally, the tricky part, we need to reverse the LOG that we did earlier. To do this, you'll need to use 10 to the power of your answers from question 5:
   a. 10 ^ _____ = _____
   body size of *Eremotheirum eomigrans* in kilograms (kg*)!
   b. 10 ^ _____ = _____
   body size of *Megalonyx curvidens* in kilograms (kg*)!
   c. 10 ^ _____ = _____
   body size of *Neocnus comes* in kilograms (kg*)!

*You can convert to pounds (lbs) by multiplying your answers by 2.2.

Bonus: How many of you would it take to match the body size of the Giant Ground Sloth, *Eremotherium eomigrans*?

Extra Resources:

www.floridamuseum.ufl.edu/florida-vertebrate-fossils/species/eremotherium-eomigrans
www.floridamuseum.ufl.edu/montbrook
https://twitter.com/BlochLab

Title of Activity: The Science of Enrichment

Created by: Santa Fe College Teaching Zoo

Target Age Group: Grades 9-12

Target Setting: Individual or Small Group

Time: 30-80 minutes

Objective: Environmental and behavioral enrichments, also known as animal enrichments, are an important tool used to help provide the best care for the animal ambassadors that reside at zoos and aquariums. Animal enrichment is a process used to maintain or improve the mental or physical health of animals that are under human care. The goals are to encourage the animals to perform natural behaviors and to give the animals a form of control and choice over their environment.

It may sound like an easy task (sometimes it is!), but providing the animal with successful enrichment takes research, planning and revising. Zoos and aquariums use the scientific method in order to provide the animals with the utmost care.

Animal enrichment is not just for animals in zoos! You can provide any animal that is under human care with enrichment. It could be a pet cat or dog, or even a snake or lizard!

Materials:

You know your animal best. If your cat or dog is known to ingest random items, be sure to take necessary precautions to protect your animal.

- Cardboard boxes
- Paper towel rolls
- Newspaper
- String made from natural materials
- Your pet's favorite food
- SPIDER method handout

Directions:

1. Use the provided form that outlined the SPIDER method to fill out the information needed.
2. Once you have done your research and made your plan, build your enrichment prototype. (Be sure to use only materials that are safe for your pet.)
3. Implement your enrichment and observe how your pet interacts with it. Remove the enrichment once you can no longer observe.
4. Record your observations.
5. Revise your enrichment and try it again another time!

Extra Resources:

This is a great website that talks about and explains enrichments very well.
https://untamedscience.com/biology/ecology/ecology-articles/the-stimulating-science-of-animal-enrichment

This website outlines safety considerations for enrichment.
https://cdn.ymaws.com/theaawa.org/resource/resmgr/files/2018_files/The_Association_Animal_BP.pdf

SPIDER Method Enrichment Form

S - Set Goals
P - Planning
I - Implementation
D - Documentation
E - Evaluation
R - Re-Adjustment

Research:

1. What is the animal that you will be evaluating for enrichment?
2. What are this animal's main sensory modalities (ex. sight, smell, sound) for communicating with conspecifics (other animals of the same species/breed), detecting predators and finding food or mates?
3. Does this species in the wild live up in the trees, on the ground or in the water? Does it switch between these habitats at times?
4. What are some self-maintenance/comfort behaviors (ex. grooming, preening, bathing, wallowing, sunning, etc.)? What are stress behaviors that could be exhibited by this animal?

Set Goals:

- Describe what behavior(s) you are trying to elicit and why. Be specific and think about the research you did on the animal:
- How will you evaluate the effectiveness (success) of this enrichment?

Planning:

Describe the enrichment you would like to do in detail. Include materials, dimensions and any food involved (exactly what the food is, how much you want to use). Describe any safety considerations. You can follow the examples for either a dog or cat below or create your own!

Implementation:

Give the animal the enrichment and enjoy how it reacts! Remove the item when you can no longer observe.

Documentation:

- Did your animal react to your enrichment? In what way did it react? For how long?
- Did this enrichment encourage the goal behavior? Explain.
- Did this enrichment encourage any behaviors not originally identified as goal behaviors? Explain.

Evaluation:

- Did this enrichment encourage the goal behavior? Explain.
- Did this enrichment encourage any behaviors not originally identified as goal behaviors? Explain.

Re-Adjustment:

- What would you alter to better this enrichment, if anything?

Cat Enrichment Example:

My cat loves to look out the window at birds. He also really likes to chase shiny objects and paper balls. I would like to encourage that predatory exercise of stalking and hunting small prey (without the loss of birds). My plan is to have a box with a paper bird hanging from one side.

Materials:

- Medium to large size box (Big enough for the cat to fit in)
- 8-inch string (Natural string in case it is somehow ingested)
- Recycled paper
- Scissors

Directions:

1. Take your paper and make a small hole in the middle.
2. Pass the string through the hole and tie a knot.
3. Mold the paper into a bird (or just a ball).
4. Take your box and cut the top flaps off the box.
5. Cut a small hole in one side of the box.
6. Pass the other side of the string through the hole in the side of the box and tie a knot so that the string does not pull through.
7. Turn the box on its side so that the paper bird is hanging.
8. Place the box on the floor where the cat can interact with it.
9. Observe and record how the cat interacts.

Dog Enrichment Example:

Dogs have an excellent sense of smell. I would like to encourage my dog to use their sense of smell to find treats. Many animals forage for food in the wild and having a good sense of smell is very helpful to accomplish this. I would like to encourage that foraging behavior for my dog.

Materials:

- Small to medium sized box
- Enough toilet paper rolls to fill the box while resting vertically
- Newspaper
- Dog treat or pieces of dog kibble

Directions:

1. Place all of your toilet paper rolls in your box
    a. Be sure to place them vertically so that there are no big gaps
    b. They should be snug, but be able to pull out
2. Place pieces of dog food in a few of the rolls (probably not all the rolls)
3. Either cover the paper rolls with newspaper or stuff newspaper into the rolls
4. Place the enrichment on the floor where the dog can safely access the box
5. Observe and record how the dog reacts to the enrichment

Maria Sybilla Merian

Want to learn more about women and girls in science? Check out these books recommended by the Alachua County Library District!

For Adults:

Title: *All that Remains: A Renowned Forensic Scientist on Death, Mortality, and Solving Crimes*
Author: Black, Sue

Dame Sue Black is an internationally renowned forensic anthropologist and human anatomist. She has lived her life eye to eye with the Grim Reaper, and she writes vividly about it in this book, which is part primer on the basics of identifying human remains, part frank memoir of a woman whose first paying job as a schoolgirl was to apprentice in a butcher shop, and part no-nonsense but deeply humane introduction to the reality of death in our lives. It is a treat for CSI junkies, murder mystery and thriller readers, and anyone seeking a clear-eyed guide to a subject that touches us all.

Title: *Girl Decoded*
Author: El Kaliouby, Rana

An Egyptian-American visionary and scientist provides an intimate view of her personal transformation as she follows her calling—to humanize our technology and how we connect with one another.

Title: *Ten Women Who Changed Science and the World*
Authors: Whitlock, Catherine and Evans, Rhodri

Celebrates the lives and hard-earned accomplishments of ten women from around the world, including two-time Nobel Prize winner Marie Curie, physicist Chien-Shiung Wu and Virginia Apgar, M.D., who forever changed our thinking in astronomy, physics, chemistry, medicine and biology.

For Teens:

Title: *Women in Science: 50 Fearless Pioneers Who Changed the World*
Author: Ignotofsky, Rachel

A collection of artworks inspired by the lives and achievements of 50 famous women in science, technology, mathematics and engineering profiles each notable individual in a volume complemented by infographics on such related topics as the development of lab equipment and the rates of women working in today's STEM fields.

Title: *Hidden Human Computers: The Black Women of NASA*
Author: Edwards, Sue Bradford

Discusses how in the 1950s, black women made critical contributions to NASA by performing calculations that made it possible for the nation's astronauts to fly into space and return safely to Earth.

Title: *Atomic Women: The Untold Stories of the Scientists Who Helped Create the Nuclear Bomb*
Author: Montillo, Roseanne

Introduces younger readers to the stories of Lise Meitner, Elizabeth Rona and Joan Hinton, revealing their less-recognized but essential contributions to the development of the atomic bomb while sharing related insights into the moral implications of their achievements.

Title: *Dreaming in Code: Ada Byron Lovelace, Computer Pioneer*
Author: McCully, Emily Arnold

An award-winning author presents an illuminating biography of Ada Lovelace, the brilliant daughter of Lord Byron, Britain's most infamous Romantic poet, who is now recognized as a pioneer and prophet of the information age for her ideas and concepts, formulated in collaboration with inventor Charles Babbage, that presaged computer programming by almost 200 years.

For Children:

Title: *Born Curious: 20 Girls Who Grew Up to Be Awesome Scientists*
Author: Freeman, Martha

A collection of short biographies introduces the lives and achievements of 20 remarkable women scientists and mathematicians who made the world a safer place, from geologist Adriana Ocampo to pharmacologist Tu Youyou.

Title: *The Story of Environmentalist Wangari Maathai*
Author: Johnson, Jen Cullerton

The Story of Environmentalist Wangari Maathai brings to life the empowering story of Wangari Maathai, the first African woman, and environmentalist, to win a Nobel Peace Prize. This chapter-book edition includes black-and-white illustrations as well as sidebars on related subjects, a timeline, a glossary and recommended reading.

Title: *Maria Sibylla Merian: Artist, Scientist, Adventurer*
Authors: Pomeroy, Sarah B. and Kathirithamby, Jeyaraney

Describes the life and work of Maria Sibylla Merian, who became one of the world's first ecologists and entomologists as well as a famous nature artist.

Title: *Marie Curie and the Power of Persistence*
Author: Valenti, Karla

Complemented by a glossary and timeline and vetted by the Marie Curie Alumni Association, a first entry in a biographical series about history's most accomplished scientists uses a fictionalized storytelling approach to introduce the amazing achievements of the two-time Nobel Prize winner.

Title: *Black Women in Science*
Author: Pellum, Kimberly Brown

Throughout history, Black women have blazed trails across the fields of science, technology, engineering, and mathematics. *Black Women in Science* brings something special to black history books for kids, celebrating incredible Black women in STEM who have used their brains, bravery and ambition to beat the odds.

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