

**THINGS TO  
REMEMBER WHEN  
YOU VISIT**

- For your safety, the safety of others, and of the collection please keep your hands to yourself.
- Do not touch artifacts or plants unless told you may.
- Walk, do not run.
- Please use appropriate voice levels.
- Stay with your group.
- Follow an extra rules that your Museum Instructor provides

**VOCABULARY:  
Use these WORDS IN CLASS  
DISCUSSION, IN LAB REPORTS,  
OR IN EXPERIMENTS!**

- **ECOSYSTEM:** a system formed by the interaction of a community of organisms with their environment.
- **SILVICULTURE:** The care and cultivation of a forest by humans.
- **FRICTION:** the resistance that one surface or object encounters when moving over another.
- **ENERGY:** the property that must be transferred to an object in order to perform work on or to heat.
- **PHYSICS:** The branch of science concerned with the nature and properties of matter and energy.
- **MOTION:** The state in which one objects distance from another is changing.

**Keep CALM and FoRESt ON**

In this interactive challenge, students will be divided into small groups and will work together to complete a series of competitive tasks. Challenges will all be related to forest ecosystems, energy transfer, and physics to help students explore real-world applications of science and sharpen their scientific observation skills in a fun and exciting way. Students will also be conducting forest assessments, experience gravitational forces, and confront friction during their climb in the trees!



**THE FoRESt CHALLENGE is an ALL OUTDOOR EXPeRIENCE:**

- Please dress appropriately for outdoor weather. Closed toed shoes are required.
- Bug spray and sun screen should be applied seasonally.

**Activities:**

Class Built Ecosystems: Bring nature indoors and create terrariums! Discuss the interdependence of producers, consumers, and decomposers and experiment by building key aspects of each terrarium then observing and recording data. Locate on a map well-known examples of all six biomes for ideas on what to put in your ecosystems. For some ideas check out: <http://www.stormthecastle.com/terrarium/>

Forestry Math: Work on some forest word problems that utilize the Pythagorean Theorem. Here is one to start you off: A 20-foot fir tree must be staked to prevent the wind from blowing it over. The base of the tree is clogged with small shrubs, so to avoid them the stake must be set three feet from the base of the tree. How much rope is required to support the tree if the rope is tied to the stake and around the trunk of the tree 15 feet from the ground? Illustrate and solve.

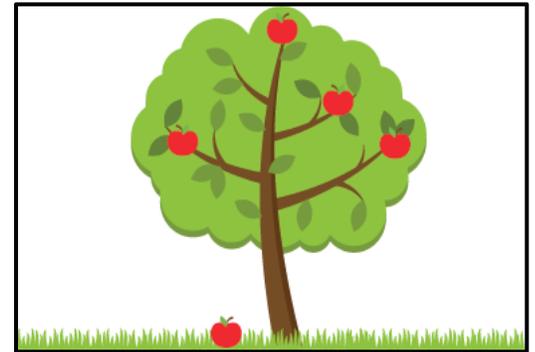


**Newton's Laws of Motions:** Sir Isaac Newton first presented his Three Laws of Motion in 1686 to explain the motion of idealized physical objects.

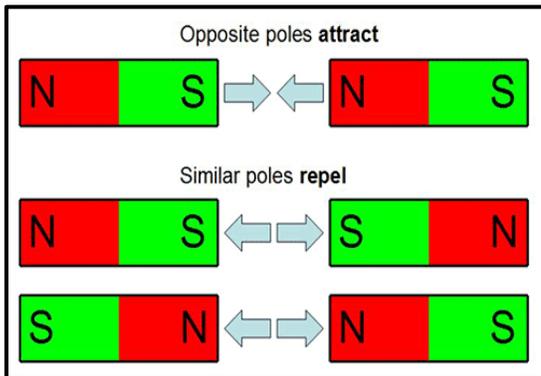
**1<sup>st</sup> Law of Motion:** The law of inertia: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion continues in motion with the same speed and in the same direction unless acted upon by an unbalanced force.

**2<sup>nd</sup> Law of Motion:**  $F = m * a$ : Acceleration is produced when a force acts on a mass. The greater the mass of the object the greater the amount of force needed.

**3<sup>rd</sup> Law of Motion:** For every action there is an equal and opposite re-action.



**GrAvity:** Is the force by which a planet or other body draws objects toward its center. The force of gravity keeps all of the planets in orbit around the sun. Anything that has mass also has gravity. Objects with more mass have more gravity. Gravity also gets weaker with distance.



**Magnetism:** The properties of attraction possessed by magnets, commonly associated with moving electricity and are characterized by fields of force.

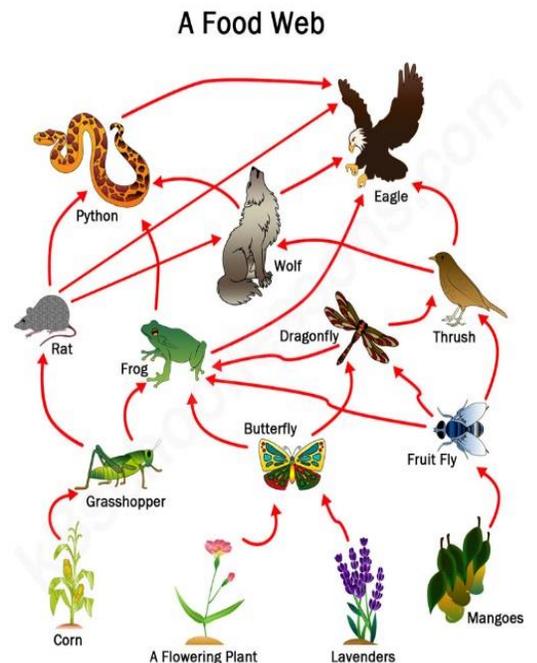
**FOOD WEBS vs. FOOD CHAINS:** A food web is a type of model which shows the interconnecting

food chains in an ecosystem through producers, consumers, and decomposers. A food chain is a feeding hierarchy and represent the flow of food energy and the relationships between feeding organisms. When energy is passed in an ecosystem from one level to the next, only ten percent of the energy will be passed on.

**PRoDuCeR:** an organism that is able to create its own food from inorganic substances.

**CONSUMeR:** an organism that feeds on plants or animals.

**DeCOMPOSER:** An organism that helps to break down dead plants or animals.



(Sources: <https://www.qrc.nasa.gov/www/k-12/airplane/newton.html>; <https://socratic.org/questions/what-is-the-10-rule-used-in-an-energy-pyramid>)

### FUN FACTS

The world's oldest and most massive tree is the giant sequoia. Some sequoias are over 3000 years old and can grow to be more than 250 ft. tall and 20 ft. in diameter!

Birds need gravity to swallow!

One tree can absorb as much carbon in a year as a car produces driving 26,000 miles.

### InterDISCIPLINARY CONNECTIONS

**Language Arts:** Have students identify a local environmental issue impacting their ecosystem. Have the students conduct research and write either a news story or an opinion piece for the school newspaper identifying the issue and their potential solution.

**History:** Have students draw a life size cross-section of a tree from around the school. Have the students research possible significant events in the tree's life along with important historical events that coincided with its lifetime.

**Math:** A tree grows 4 cm a year. This relationship can be modeled by a linear function that shows the number of centimeters grown as a function of time in terms of months. Find the rate of change, slope, and intersection points then graph the function.

### REFLECTING ON YOUR VISIT:

Energy Transference: Work on some word problems to understand potential and kinetic energy.

1. A 1200 kg automobile is traveling at a velocity of 100 m/s. Is its energy PE or KE? How much energy does it possess?
2. A flower pot weighing 3 newtons is sitting on a windowsill 30 meters from the ground. Is the energy of the flower PE or KE? How much energy does it possess?

Galileo's Original Experiment: Have students can recreate Galileo's experiment off the tower of Pisa! Students will identify the relationship between the time of descent and the object's mass. Use marbles made of various sizes but of the same material and drop them from the same height. The use a marble and a ball of the same size but of different materials and try the experiment again. How does air resistance impact this experiment? Can you try it in a vacuum and get different results? See if you come to the same conclusion as Galileo: bodies of the same material falling through the same medium fall at the same speed.



Food Web Mural: Have students illustrate elements of a woodland ecosystem as observed at Heritage Museums & Gardens. Create background features, such as hills and streams, then using photos, cartoons, and computer illustrations add in organisms previously studied. Place a push pin next to each plant and animal and using string connect organisms to plants and animals with which they directly interact to create a visual food web mural.

### ADDITIONAL RESOURCES:

**Project Learning Tree: Environmental Education Activity Guide**, by The American Forest Foundation; <https://www.plt.org>

**Silverwing**, by Kenneth Oppel

**Environmental Protection Agency**, <http://www.epa.gov/students/teachers.html>

**Newton's Laws of Motion**, by NASA; <https://www.grc.nasa.gov/www/k-12/airplane/newton.html>

**The Science of Riding a Zipline**, <http://zipline.wvu.edu/Introduction/>

**Society of American Foresters**,

<http://www.safnet.org/education/educators.cfm#middle>

**The Center for Tree Science** <http://www.mortonarb.org/science-conservation/center-tree-science-securing-future-trees>