Tudor Place Historic House & Garden
Teacher Resource Packet

Code Green: Garden Detectives

Grades 2-5
Dear Educator,

Thank you for your interest in *Code Green: Garden Detectives*. Our hope is that this program, which meets state, District, and national standards of education, complements the curriculum that your students learn in class. During their visit to Tudor Place, your students will explore science and history in our 5½-acre garden, which dates back two centuries.

This Teacher Resource Packet is designed to help you link your classroom lessons with the field trip. The included Pre-Visit activities introduce concepts that will be expanded upon during the field trip, while the Post-Visit section contains activities that reinforce elements covered during the field trip.

If you have any questions, please feel free to contact us at education@tudorplace.org.

We look forward to your visit!

Sincerely,

Tudor Place Education Department
202-965-0400 x108
education@tudorplace.org
What is Tudor Place?

Tudor Place is a National Historic Landmark in Georgetown, Washington, DC. The site includes a mansion, completed in 1816, and 5½ acres of gardens. Dr. William Thornton, designer of the first U.S. Capitol, designed the house, and included a full-round temple portico unique in American residential architecture.

From 1805 to 1983, the Peter family stewarded the estate, witnessing and participating in much of American history. The first owners, Thomas Peter and Martha Parke Custis Peter, came from prominent local families. Thomas was the son of one of the first mayors of Georgetown, and Martha was the granddaughter of Martha Washington. In 1814, Martha Peter watched from her bedroom window as British troops burned the U.S. Capitol. Britannia Peter Kennon, her youngest daughter and the second owner of Tudor Place, operated the mansion as a boarding house for Union officers during the Civil War. The third owner, Britannia’s grandson Armistead Peter, Jr., modernized the house in 1914. His son, Armistead Peter 3rd, and daughter-in-law Caroline created a foundation to preserve the site and educate the public about American history.

Prior to the Civil War, the Peters owned and inherited an extensive number of enslaved men, women, and children, who served the family, tended the household, farmed, and cultivated the garden. Records reveal some of their names and duties. For example, Will Johnson, an enslaved coachman, also tended the smokehouse that still stands on the property. Patty Allen, enslaved as a cook, “lived out,” or made her home offsite, in Georgetown with her free husband and their children. During the Civil War, John Luckett escaped slavery in Virginia and gained paid employment at Tudor Place as gardener. Free African Americans and European immigrants operated the estate in the late 19th and 20th centuries.

During 178 years of ownership, the Peters amassed a collection of American, European, and Asian objects dating from the 18th to 20th centuries. Today, the museum holds more than 15,000 objects, from fine decorative arts to everyday household items, as well as an architectural and archaeological collection. The museum has over 200 objects that belonged to Martha and George Washington. An extensive archive holds one of three surviving letters from George to Martha, written in June 1775.

Over the last 200 years, and six generations in one family, Tudor Place has stood witness to the American story. We look forward to welcoming you and your students to this historic home.
Preparing for Your Visit

Museum Manners

• Please review museum manners with your students ahead of time and explain that there is a “no-touch” policy in the museum’s historic rooms and gardens.
• Please have your students wear a nametag to help our museum teachers actively engage everyone.

Logistics

• We require at least 1 adult chaperone for every 10 students, preferably teachers or classroom aides. Chaperones must remain with the students at all times and should assist with class management.
• Please let us know in advance if any students have special needs. The Tudor Place mansion can be made wheelchair accessible with advance notice, and we are happy to work with you to accommodate other special needs, including ASL interpretation, adaptive classroom materials, and technology.
• Please be prepared to divide the class(es) into even, co-ed groups for the tour. In our small historic spaces, programs provide the best experience when groups have no more than 15 students each.
• Please have students use the restroom prior to leaving school. There is a very limited number of restrooms at Tudor Place.
• Outdoor programs take place rain or shine. Students should come prepared for the weather with coats, umbrellas, water bottles, sunscreen, bug spray, etc. as needed.
• With prior approval, school groups may picnic in the Tudor Place garden. Picnics must be scheduled at the time of field trip booking in order to provide for bus scheduling and to reserve space in the gardens. Picnics may not be scheduled after busing is finalized.

Transportation

• Directions to Tudor Place are available on our website at tudorplace.org.
• Due to regulations established by the District of Columbia government:
  o All visitors must be dropped off and picked up at the Tudor Place entrance, 1644 31st St, NW. For student safety, please ask your bus to approach the house from the north, via R Street, NW.
  o Buses may not park or idle on 31st Street. Legal bus parking is located at: 2500 - 2600 block of Virginia Avenue, NW - north side; 2000 block of Pennsylvania Avenue, NW - north side; 900 block of 20th Street, NW - east side.
• Free busing for Title I schools is available with prior approval, while grant funding lasts.

Fees and Cancellations

• We request a non-refundable $25 deposit, which counts toward the total cost for the program. If the deposit presents a challenge, please let us know.
• The admission fee is $3 per student, with 2 free chaperones and $2 per additional chaperone. The balance will be due on the day of the program.
• If you need to cancel or reschedule, please contact the Education Department immediately at education@tudorplace.org.
• The museum has the right to shorten or cancel programs that are more than 45 minutes late.
Pre-Visit Activities
Listed below are activities that you can use with your class before visiting Tudor Place. All activities meet local and national curriculum standards.

Activity 1: Design a Plant
In this activity, students consider the ways that plants disperse seeds, then design their own plant within a habitat.

After completing this activity, students will be better able to:

- Creatively explore plant features
- Consider the ways in which plants evolve to utilize aspects of their habitats
- Analyze the relationship between seed dispersal vectors and seed shape

Materials
Worksheets, 1 per student (see page after procedure in packet.)
Drawing Materials: pencils, rulers, protractors, etc.

Procedure
1. The teacher can explain how plants use different methods to make sure that their seeds end up in places with optimal growing conditions. Plants grow in many environments and use many different seed dispersal vectors, or natural phenomena that plants have evolved to utilize to ensure that seeds spread to fertile environments. Examples include wind, water, and animals. Seeds have evolved sophisticated shapes that make the most of each vector.
2. Use the photos on the next page to give examples from nature:
   - Maple seeds are shaped like wings to use the wind
   - Dandelion seeds have filaments that catch the wind
   - Burdock seeds have hooked burrs that are so effective at gripping an animal’s hair that they inspired Velcro
   - Blackberry seeds are surrounded by sweet fruit to attract animals
   - Tomato seeds have a special coating that allows the seed to pass safely through an animal’s digestive system
   - Coconut palm tree seeds are able to float in the ocean
3. Distribute a worksheet (see next page) to each student.
4. Students design their own plants and diagram them with labels explaining the features of the plant. Each plant will need a way to disperse its seeds, so students should choose a seed vector and design a seed with a shape and features that utilize that vector.
5. Students can get creative as long as they use strategic thinking. What sort of seed would be distributed by a dinosaur or a dragon? How would a seed be distributed on a planet with low gravity?
6. Students can share their designs with the class, explaining how the design of their seed takes advantage of a specific seed dispersal vector.
Design A Plant

In what environment does your plant grow? ________________________________

Plant Name: ________________________________

Diagram of Plant

Label on your diagram:
- Roots
- Stem
- Leaves
- Flower
- Seeds

Diagram of Seeds

Label on your diagram:
- Wing or feather (if it glides or flies)
- Hook (if it sticks to an animal)
- Float (if it floats in water)
- Coating (if it is eaten by an animal)

How do your plant’s seeds move to new places? Do they fly, hook onto animals, float in water, or use another way? What shape are the seeds so that they can move that way?
Activity 2: Building Words

Scientific words are often made out of short, meaningful parts, like pieces in a puzzle. Scientists put the pieces together to create words that have specific meanings.

For example, the word “biology”, or the study of living things, is made out of the pieces

```
  bio  ology
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“Bio” means life and “ology” means “science,” so “biology” means “life science.” For clarity, in this activity grammar is simplified, and when there are two vowels in a row, they combine into one “o.”

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  life  science
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Materials
Worksheets, 1 per student (see next page in packet.)
Pencils
(Optional) Cutouts of the large puzzle piece following this procedure.

Procedure
1. Choose and write some or all of the prefixes and suffixes on the page following this procedure on the whiteboard. For younger students, choose 2-3 of each. Older students can use them all.
2. Explain that these are pieces that can combine to form scientific words. Give examples using the prefixes/suffixes, their literal meanings, and definitions.
3. Distribute worksheets to each student to complete.
4. Ask for student-created examples and discuss the relationship between the pieces of the words and their meanings.
5. (Optional) For a tactile activity, teachers can cut out the following large puzzle template and write the prefixes/suffixes on the pieces, with the meanings on the back of each piece. Students can play with putting the pieces together to form words.
## Beginnings
- dendro: “tree”
- chrono: “time”
- bio: “life”
- climate: “weather” (over time)

## Endings
- ology: “science”
- ometry: “measurement”
- ologist: “scientist”

### Answer Key:

<table>
<thead>
<tr>
<th>Scientific Word</th>
<th>Literal Meaning</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dendrology</td>
<td>“Tree science”</td>
<td>The science of studying trees.</td>
</tr>
<tr>
<td>Dendrometry</td>
<td>“Tree measurement”</td>
<td>The science of measuring the dimensions of trees.</td>
</tr>
<tr>
<td>Dendrologist</td>
<td>“Tree scientist”</td>
<td>A scientist who studies trees.</td>
</tr>
<tr>
<td>Chronology</td>
<td>“Time science”</td>
<td>The study of the sequence of historical events. Also refers to a diagram that sequences events by time.</td>
</tr>
<tr>
<td>Chronometry</td>
<td>“Time measurement”</td>
<td>The science of measuring time.</td>
</tr>
<tr>
<td>Chronologist</td>
<td>“Time scientist”</td>
<td>A person skilled at studying time.</td>
</tr>
<tr>
<td>Biology</td>
<td>“Life science”</td>
<td>The study of living things.</td>
</tr>
<tr>
<td>Biometry</td>
<td>“Life measurement”</td>
<td>The use of math and statistics to study life sciences. Also, the measurement of parts of the body, like the eye.</td>
</tr>
<tr>
<td>Biologist</td>
<td>“Life scientist”</td>
<td>A scientist who studies life and living things.</td>
</tr>
<tr>
<td>Climatology</td>
<td>“Weather science”</td>
<td>The study of weather over time in a particular area.</td>
</tr>
<tr>
<td>Climatometry</td>
<td>“Weather measurement”</td>
<td>The measurement of weather over time. <em>(Note: not widely used.)</em></td>
</tr>
<tr>
<td>Climatologist</td>
<td>“Weather scientist”</td>
<td>A scientist who studies weather patterns over time.</td>
</tr>
</tbody>
</table>
Building Words

Scientific words are often made out of short pieces that have meanings, like pieces in a puzzle. Make your own scientific words using the pieces below:

Meaning: _____________________  Meaning: _____________________

Try making a word using 2 beginning pieces and 1 end piece:

Meaning: _____________________

Bonus: what is the literal meaning of the word “dendrochronology”?
__________________________________________
Puzzle Template
Field Trip: What to Expect
Thank you for joining us for Code Green: Garden Detectives. Over 90 minutes, your students will experience the gardens of Tudor Place with hands-on activities:

Garden Tour
Students tour the garden with a Museum Teacher and explore age-appropriate, seasonal experiences. On the day of the program, the Museum Teacher will choose activities that make the most of conditions in the garden that day. For example, if that morning the Museum Teacher notices butterflies in the garden, they may focus part of the tour on observing the butterflies. Other activities may include, but are not limited to:

- Using magnifying glasses to examine flowers, leaves, and bugs in our North Garden
- Learning about the sciences of dendrochronology and dendroclimatology at our 200-year-old Tulip Poplar tree
- Playing a kinesthetic game that illustrates seed dispersal vectors
- Examining and smelling fragrant heirloom roses
- Recreating a 100-year-old tennis game on our East Lawn
- Taking a mini “hike” through our woodland Dell

Please note that activities vary based on seasons, weather, and the interests of your students, and may change at the Museum Teacher’s discretion during the tour.

Workshop: Recycled Art
Students will return to our classroom, housed in a repurposed 1914 garage, and review the parts of a flower or tree (roots, stem/trunk, leaves, and flower.) Then, using recycled materials, they construct trees or flowers, using all the parts of the plant and referencing the plants they observed at Tudor Place. Students will take home their creations at the end of the workshop.
Post-Visit Activity

Listed below are activities that you can use with your class after visiting Tudor Place. All activities meet local and national curriculum standards.

Activity 1: What Can Trees Tell Us?

At Tudor Place, students learned that trees gain one ring per year, like candles on a birthday cake. **Dendrochronology** is the science of determining tree age by looking at tree rings. It is also practiced on buildings. At Tudor Place, the students discussed how scientists took samples of wood from parts of the Tudor Place mansion. The scientists used dendrochronology to figure out in approximately what year the wood was cut down, and discovered that those parts of the building were older than we had thought.

In this activity, students use tree rings to tell the story of a tree and its environment. Note that each tree ring begins with the light band of wood and ends with the dark band. The innermost circle represents the **pith** of the tree and should not be counted. The outermost thick, beige or brown ring on each sample represents the **bark** of the tree and should not be counted (Figure 1). For more information, see the **Glossary** and **Additional Resources** at the end of this packet.

After completing this activity, students will be better able to:

- Practice basic dendrochronology science
- Practice basic dendroclimatology science
- Extrapolate meaning from features on a tree cross-section

Materials

Worksheets, 1 per student (see next page in packet.)
Pencils

Procedure

1. Distribute worksheets to each student to complete.
2. Explain that the students will practice counting tree rings to draw conclusions about a tree and the climate it grew in, just like they did at Tudor Place. Remind the students that each ring starts with the light band of wood and ends with the dark band of wood, and that the very middle and very outside rings don’t count. An answer key is provided on the page after the worksheet in this packet.
3. (Optional) Students complete the worksheet by counting the rings together as a class.
4. Discuss why it might be important to be able to tell the weather the tree experienced over its lifetime. What questions could we answer by knowing the weather in a certain period of time? (Compare climate to now, look at stressors on societies like a famine, study the evolution of animals.)

5. Discuss with the students ways that responsible citizens can take care of trees.
What Can Trees Tell Us?

Like birthday candles on a cake, the number of tree rings can tell us how old a tree is. Count the rings. The tiny dark circle at the center and the dark, rough bark on the outside of the tree are not growth rings, so they don’t count. Remember that each dark band means the end of a growing season. During one season, this tree was burned by a forest fire, leaving a scar. The tree continued to grow around the scar each year, but a burn mark was left on that year’s ring.

- How old is this tree? ____________
- Imagine that this tree’s first year growth (represented by the first ring outside of the dark center core) happened in 1800. In what year was the tree scarred by forest fire? ____________

Trees can also tell us about their environment. Trees grow thick rings during growing seasons that provide lots of water and nutrients. They grow thin rings during growing seasons that don’t provide as much water or nutrition.

What does the tree tell us about the weather in the years before the fire? After the fire?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

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What Can Trees Tell Us? (Answer Key)

Like birthday candles on a cake, the number of tree rings can tell us how old a tree is. Count the rings. The tiny dark circle at the center and the dark, rough bark on the outside of the tree are not growth rings, so they don’t count. Remember that each dark band means the end of a growing season.

- How old is this tree? **19**
- Imagine that this tree’s first year growth (represented by the first ring outside of the dark center core) happened in 1800. In what year was the tree scarred by forest fire?

  **1813**

Trees can also tell us about their environment. Trees grow thick tree rings during growing seasons that provide lots of water and nutrients. They grow thin rings during growing seasons that don’t provide as much water or nutrition.

What does the tree tell us about the weather in the years before the fire? After the fire?

**Before the fire was a strong, rainy growing season. After the fire were several years of dry seasons.**
Glossary

Bark – the outermost, protective layer of a tree

Climate – the weather in a place over a long period of time

Dendrochronology – the science of using tree rings and other features of trees to learn about the age and history of a tree or piece of wood

Dendroclimatology – the science of using tree rings and other features of trees to learn about the climates of the past

Garden – a place designed by humans where plants are grown, often for enjoyment

Pith – a soft, spongy part of a plant that moves nutrients through the plant. In this lesson, the pith is the circle at the center of the tree trunk

Seed Dispersal Vectors – Factors, like wind, animals, or humans, which carry seeds to new locations with optimal growing conditions
Additional Resources

History of the Tudor Place garden
http://www.tudorplace.org/who-we-are/garden/history-of-the-garden/

Video clip (1 minute) of a maple seed falling in slow motion
https://www.youtube.com/watch?v=ZUEXKapAVcY

Video clip (43 seconds) of dandelion seeds in slow motion
https://www.youtube.com/watch?v=0MB3nHiogjl

Interactive dendrochronology activity from the National Park Service that divides tree rings into “growth” and “rest” rings, and demonstrates simple cross-dating techniques.
https://www.nps.gov/webrangers/activities/dendrochronology/

“About Tree Rings,” Laboratory of Tree-Ring Research, The University of Arizona
Counting tree rings is a simplified form of dendrochronology. This resource delves into more complex concepts and techniques.
http://ltrr.arizona.edu/about/treerings

Video clip (2 minutes) about dendroclimatology from Professor Steven Chischilly, Navajo Technical College