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Tree Growth Study Kit

Introduction

How can the age of a tree be determined? Is there a way to tell a good year of growth versus a bad year? Perform the following activity and find out!

Concepts

- Tree rings
- Hardwood tree
- Softwood tree

Background

Trees contain some of nature's most accurate records of the past. Each spring and summer a tree adds new layers of wood to its trunk. The wood formed in spring, known as *springwood,* grows fast and is lighter in color because it consists of large cells. In summer, growth is slower. *Summerwood* has smaller cells and is darker in color. These layers of alternating lighter springwood and darker summerwood are called *annual rings*. The number of annual rings can be counted to find the age of a tree! *Note:* It is possible in some years that more than one ring is made. These *false rings* occur due to disease, frost damage, or injury. Under these conditions, ring counts are not always 100% accurate.

The individual layers of growth in the cross section of a tree begins at the center and continues outward to the area of most recent growth. The newest growth layer is surrounded and protected by a layer of bark.

Tree growth in a specific year depends upon a complex set of local growing conditions. The amount of rainfall and water availability is one key variable affecting the growth rate in a given year. Since most trees grow more during wet, cool years than during hot, dry years, tree rings are usually wider during wet years. Drought or a severe winter can cause narrower growth rings. When rings are consistently of the same size, it suggests that the climate is consistent from year to year.

In temperate regions, seasonal growth in diameter of a tree usually continues longer in conifer or softwood trees than in deciduous or hardwood trees—softwood trees continue to produce growth late into the fall. The growth rings in softwood trees are therefore larger than those of hardwood trees. Some hardwood trees like ash, oak, elm, hickory, and black locust have distinct rings. Other hardwoods like birch, maple, poplar, and sycamore produce cells (vessels) of similar size through the growth rings, which makes it more difficult to identify the springwood from the summerwood.

Many hardwood trees may also exhibit two distinct regions of growth (see Figure 1). The outer area of the new growth is usually light in color and represents an area of active or live tissue. This region is known as *sapwood*. A darker region, known as *heartwood*, may also be present. The heartwood is dead and is often filled with gums and resins which gives it a darker color.

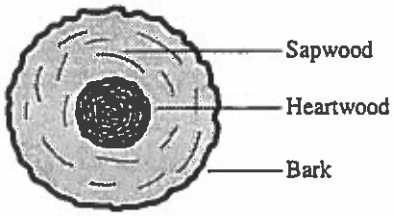

Figure 1.

Scientists can use tree-ring growth pattern data to identify trends construct models of past weather and climate conditions. The field of study that looks at historical patterns in plant growth and climate is known as *dendrochronology*. Modern dendrochronologists do not usually cut down trees to analyze their annual rings. Instead, a boring device known as an increment borer is used to extract a small core sample from the tree. The boring device is screwed into the center of the tree trunk and a straw-sized sample about 4 mm in diameter is removed, and the hole in the tree is then sealed to prevent disease. The tree rounds used in this activity were obtained from limbs of trees that had already been cut for some purpose. Scrap limbs are usually burned for waste, so these tree rounds are, in effect, being recycled.

With the aid of computers, dendrochronologists can analyze regional tree growth data to generate models of past climate changes either in specific regions or worldwide. By analyzing core samples from wooden logs in human dwellings, archeologists can estimate the age of the dwellings. Matching growth patterns with other trees in the area can help pinpoint the age of the wood and also the time of the construction.

Experiment Overview

In this activity, three different tree round samples will be examined and the annual rings counted.

Materials

Tree round samples, 3	Marking pins
Magnifier	Ruler, metric

Safety Precautions

Although the materials in this lab activity are nonhazardous, follow normal safety precautions. Wash hands thoroughly with soap and water before leaving the laboratory.

Procedure

1. Obtain a round tree sample.
2. Describe the overall appearance of the tree round sample and if it is a hardwood or softwood sample in the Data Table under round tree sample #1.
3. Use a pin to mark the center location of the first year's growth.
4. If the sample is from a hardwood tree, use a pin to mark the area that separates the heartwood (the inactive darker wood tissue) from the sapwood (active lighter colored wood tissue).
5. Using a ruler, measure the distance from the center pin to the pin placed in step 4. Record the distance in cm in the Data Table.
6. Count the number of annual rings outwards from the center pin toward the bark to find the age of the tree when it was cut. Mark the last ring with another pin. Record the number of annual rings in the Data Table.
7. Using a ruler, measure the distance from the center pin to the outer pin. This distance may not be even on all sides of the tree round. Record the range of distances in cm in the Data Table.
8. *(Optional)* Locate the ring that would best represent your current age if you were born the same year as this tree.
9. Observe the tree rings and find the best year of growth. Record the tree's age during the best year of growth in the Data Table.
10. Remove the pins from the tree round sample.
11. Obtain another type of tree round sample from another group.
12. Repeat steps 1–11 until the three types of tree round samples have been analyzed. Answer the *Post-Lab Questions*.

Name: _____

Tree Growth Data Table

Round Tree Sample	Observations	Hardwood or Softwood (circle one)	Number of Annual Rings	Distance from Center to Last Ring (in cm)	Age of Tree's Best Growth
1		Hardwood or Softwood If sample is hardwood, distance from center to edge of heartwood _____ cm			
2		Hardwood or Softwood If sample is hardwood, distance from center to edge of heartwood _____ cm			
3		Hardwood or Softwood If sample is hardwood, distance from center to edge of heartwood _____ cm			

Post-Lab Questions *(Use a separate sheet of paper to answer the following questions.)*

1. Which of the tree round samples were hardwoods? Which were softwoods? How can you tell the difference?
2. What causes the darker coloration of the heartwood in the hardwood tree samples?
3. In the hardwood samples, which region was larger, the heartwood region or sapwood region?
4. Compare and contrast the ages of the trees. If the tree round samples are of similar size, how do their ages differ? What does this tell you about the growth rate of different tree species?
5. How does the ring during the tree's best year of growth (step 9 of the *Procedure*) compare to the rings of other years?
6. What factors may be responsible for any differences in the widths of the growth rings?