Be a Tree Ring Detective

Dust storm approaching Stratford, Texas..April 18, 1935
Courtesy NOAA.

The storm took place at sundown, it lasted through the night,
When we looked out next morning, we saw a terrible sight.
We saw outside our window where wheat fields they had grown
Was now a rippling ocean of dust the wind had blown.

It covered up our fences, it covered up our barns,
It covered up our tractors in this wild and dusty storm.
We loaded our jalopies and piled our families in,
We rattled down that highway to never come back again.

~ from "The Great Dust Storm" by Woody Guthrie

Earth's climate is always changing, and these changes can have large impacts on humans. An increase in the number of droughts, floods, or hurricanes, for example, will cost U.S. citizens billions of dollars and threaten the lives of many people. Information on past climate changes can give valuable clues on how to plan and prepare for future climate change. Unfortunately, records of human weather measurements only go back about 150 years. To really understand Earth's climate change history, we need information that goes back hundreds and thousands of years.

One way to get this kind of information is to study tree rings (the analysis of tree rings is known as dendrochronology). As trees grow, their trunks increase in length and thickness. Most trees only grow during part of the year (the growing season). This starting and stopping of the growth process produces visible bands or "rings" of wood around the trunk of the tree. Each ring corresponds to one year of growth. The oldest rings are near the center of the tree, while the youngest rings are at the outside of the trunk next to the bark. The ring just inside the bark is the current year's growth. There are two kinds of wood in each ring: "earlywood" appears light in color and its cells have thin walls; "latewood" appears dark in color and its cells have thick walls. The width of the rings changes according to the environmental conditions that existed during the growing season, so ring width can tell scientists a lot about how climate changed during the years when the tree was growing. If the rings are wide, then conditions were probably favorable for tree growth. Narrow rings, on the other hand, may indicate drought, disease, or other conditions not favorable to growth.

Could you be a good Tree Ring Detective? Try solving this puzzle to find out!

What You Will Do

Cross-date tree-ring samples to find out which sample is oldest,
and then find the age of the oldest sample

What You Will Need

- ❒ Copy of "Tree Ring Sample Sheet"
- ❒ Blank piece of paper
- ❒ Scissors
- ❒ Clear tape

Warning

Be careful with scissors!

How to Do It

Most tree-ring samples are collected with a tool called an "increment borer." This is a hollow shaft of steel, about 3/16 inch diameter, with a sharp threaded bit at the tip. A handle fits into the opposite end and is used to turn the borer into the tree. When the borer is pulled out of the tree, it removes a core of wood that shows the rings. Most trees are able to seal the small bore hole with sap, so coring does not cause any serious damage to most trees that are sampled.

You might think that you could find the age of a tree simply by counting the rings, but it isn't that simple. The problem is that samples taken from trees growing in the same area (and even from the same tree) usually are not identical. There may be "extra" rings in some parts of the tree, or missing rings in other parts. To deal with this problem, dendrochronologists use a procedure called crossdating. This procedure involves comparing and matching the tree ring patterns from several trees that have grown in the same area, and using statistical methods to find the exact year in which the rings were formed. This procedure also allows scientists to compare rings from trees that have grown at different times, so the age of very old wood samples can be accurately determined.

On Page 80, there are two sets of tree ring samples that can be matched for crossdating. Most tree-ring studies involve many more samples and some additional analytical steps (check out the resources listed under "Want to Do More?").

1. Cut out each of the tree ring samples.

2. Turn the blank piece of paper so that the longest side is horizontal, and tape the tree ring sample from the living tree onto the blank piece of paper near the upper right corner.

3. Find another tree ring sample that matches part of the tree ring pattern from the living tree. Line up the matching rings and tape the sample beneath the sample from the living tree.

4. Repeat Step 3 until you have matched all four samples.

5. Count how many rings are in the combined samples, starting with the left-hand ring of the oldest sample and ending with the ring next to the bark of the living tree sample. Be sure to count overlapping rings only once.

6. How old is the living tree? How old is the oldest tree? Which tree seems to have grown under the most stressful conditions? When you think you know the answers, check the answer box.

Want to Do More?

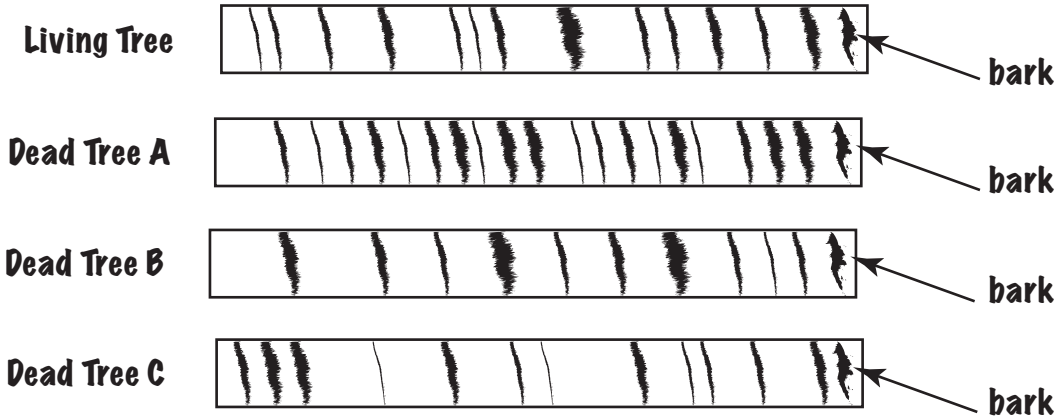
NOAA's Paleoclimatology Web site (*http://www.ncdc.noaa.gov/paleo/paleo.html*) has lots of information on how past climates are studied with tree-rings and other methods (called "proxies") such as ice cores, corals, and sediments. The site also has lots of information about how climate has changed during Earth's history, and how we can plan for future climate change.

http://www.plantbio.ohiou.edu/epb/instruct/ecology/dendro.htm – This is a do-it-yourself introduction to dendrochronology presented by Brian C. McCarthy and Darrin S. Rubino of Ohio University.

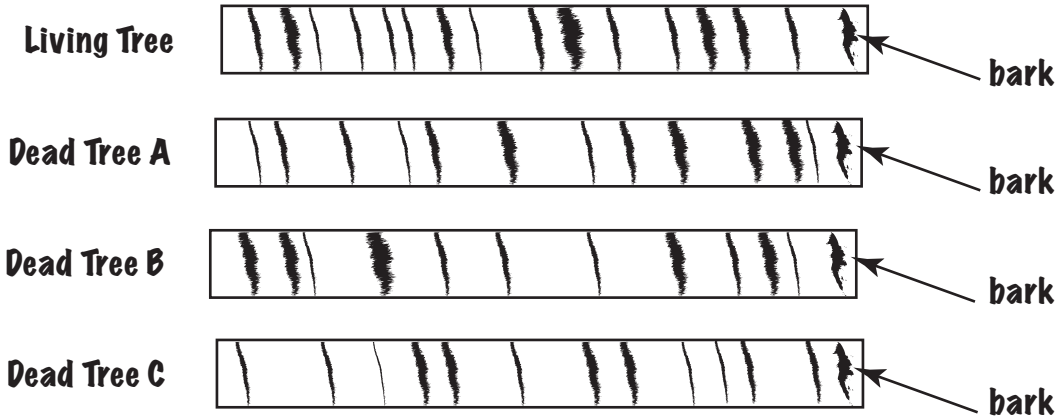
http://www.pbs.org/wgbh/nova/vikings/treering.html – A Web site from NOVA about how dendrochronology was used to study ships of the ancient Vikings.

Tree Ring Sample Sheet

Sample Set 1



Sample Set 2



Dust buried farms and equipment, killed livestock, and caused human death and misery in the Great Plains during the height of the Dust Bowl years. 1935. Courtesy Historic NWS Collection

Answer Box
DO NOT PEEK!

until you have done your detective work....

ANSWERS

Sample Set 1 –
The correct sequence for this set is Living Tree - Dead Tree C - Dead Tree A - Dead Tree B. The oldest tree (Dead Tree B) is 44 years old. Tree A seems to have grown under more stressful conditions than the other trees, since most of its rings are close together, indicating slow growth during those years.

Sample Set 2 –
The correct sequence for this set is Living Tree - Dead Tree B - Dead Tree A - Dead Tree C. The oldest tree (Dead Tree C) is 41 years old. The Living Tree seems to have grown under more stressful conditions than the other trees, since more of its rings are close together than in the other samples, indicating slow growth during those years.