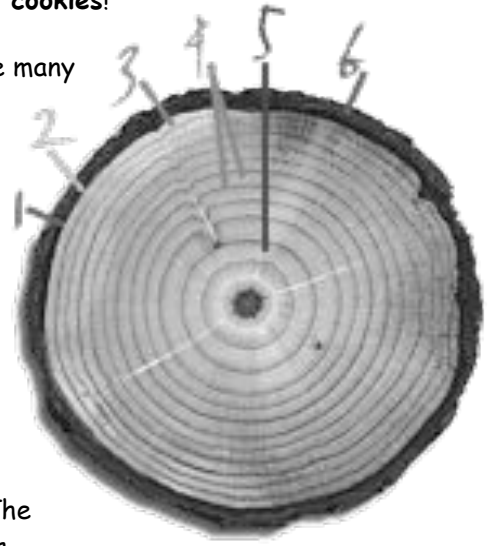


**Tree Cookies!** They're round and full of fiber. But unless you're a termite with special protozoa living in your stomach to digest cellulose for you, you can't digest **tree cookies!**

Tree cookies are cross-sections of tree trunks (stems) that reveal the many different layers that make up a tree. Each layer can tell us something about the tree's life and the climate in which it grew. You are looking at the cut edge of the tubes or **VASCULAR** tissues of the tree stem. Compare to our body. Our **VASCULAR** system of tubes is our **C** \_\_\_\_\_ **SYSTEM**.



**Write the labels by the number as you read.** →

**Item 1** is called the **CAMBIUM**. It is a very thin layer of cells, just one cell thick, inside the bark. The cambium produces both the **XYLEM** (wood growth rings) and **PHLOEM** (bark) cells. Once the inner tree rings are formed, they stay the same size and more are added. The part outside of the **CAMBIUM** has to stretch as the inside gets bigger. **CAMBIUM** cells make new ce \_ \_ \_ that then change to do their job. (Like our **STEM CELLS**.)

**Item 2** is the new **PHLOEM** or **INNER BARK**. Phloem consists of **food tubes** that **carry food down** from the leaves (or needles) to the branches, trunk and roots, where it is used for growth. If the **PHLOEM (inner bark)** is damaged, the roots below do not get food and the tree slowly dies below the damage. **PHLOEM TUBES** carry f \_ \_ \_ d \_ \_ \_ .

**Item 3** is the **XYLEM (sapwood)** or **water tubes** that carry the **water up** from the roots to the leaves. **XYLEM (sapwood)** also gives a tree its strength. X \_ \_ \_ tubes carry w \_ \_ \_ u \_ .

**Item 4** is a **GROWTH RING**. The **lighter** portions are (spring growth rings) and are made up of **large XYLEM tubes** made in the spring, when weather is good for growing. The **darker** portions (summer or fall growth rings) are made up of **smaller XYLEM tubes** that don't grow as big because it is hot (summer) or getting cold (fall). Together, the light and dark rings represent **ONE YEAR** of growth. When you count rings to find the age of a tree, start at the center and then count out. Count dark rings or light rings, but not both. Stop when you get to the **PHLOEM (bark)**. More space in the larger tubes let them appear lighter. **A GROWTH RING** is made up of one d \_ \_ \_ ring and one l \_ \_ \_ r \_ \_ \_ . **COUNT**. The cross-section in the image above was \_\_\_\_\_ years old when it was cut.

**Item 5** is the **HEARTWOOD**. As the tree gets older, the center **XYLEM** tubes get clogged and usually get darker. They are then called **HEARTWOOD** and continue to give the tree strength. **HEARTWOOD** is old X \_ \_ \_ and is found in the cen \_ \_ \_ of the tree.

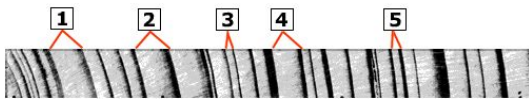
**Item 6** is the **OUTER BARK**. It is the older **PHLOEM** that has been stretched and broken as the tree adds cells and grows at the **CAMBIUM** layer. Now that it is old and broken, it doesn't carry food, but protects a tree from insects and disease, excessive heat and cold, and other injuries. Think about painting a balloon and then blowing it up. The paint would crack (as does the bark) from being stretched. Sycamore trees around school and in the park shed some of their outer bark. Many trees keep most of their bark and it forms deep cracks. **The oldest OUTER BARK (that was made as a young tree) keeps moving to the outside and is the very outer layer of phl \_ \_ \_ , unless it has been shed or worn off. If you peel off the bark, and cause damage to the inner bark, then the roots get no (food or water?) \_\_\_\_\_.**



**EXAMPLE 1- Crowding:** The growth rings of a tree give us a lot of information about the age of the tree, its health, and the climate or other conditions during the years of its growth. The fact that the growth rings on one side of this ← cross section are narrow indicates that the tree either grew on a slope or was crowded, growing very close to something.

**Count. Estimate, if needed.** This tree was about \_\_\_\_\_ years old when cut.

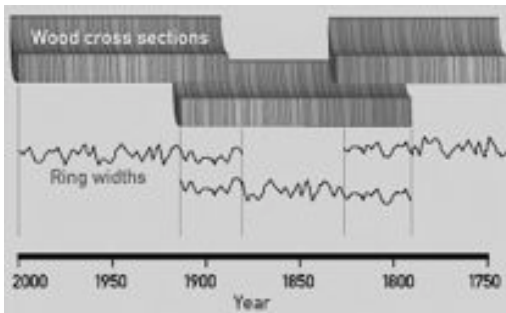
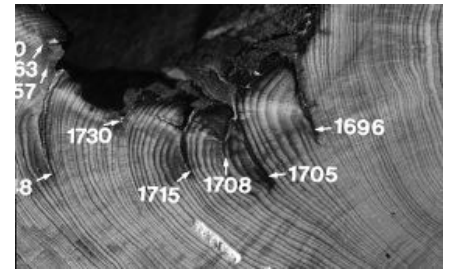
**EXAMPLE 2- Core Sample:** This is a graphic of a **Core Sample:** A core sample is a cylinder the size of a pencil, drilled and taken from a living tree. Compare the growth conditions of this tree, by putting the numbers in order from the worst year to the best year



Worst \_\_\_\_\_. \_\_\_\_\_ Best

**EXAMPLE 3- Cross Dating:** By counting back from the year a living tree was cut, it is possible to determine the date of tree rings with reasonable accuracy.

Events like fires add "marker layers" to tree rings. → Because most of the trees within a limited area will show the scars from the same fires, it is possible to compare dates across several trees. This process of cross-dating allows researchers to establish a timeline or chronology.



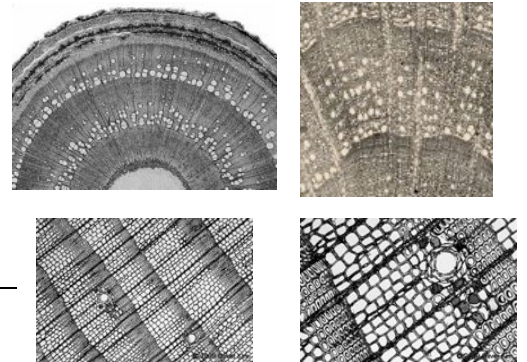
Trees that were cut at different times can be matched as the three at left. ← The weather patterns are matched to show many years before the new tree was sampled. The oldest tree was cut in about the year \_\_\_\_ 30, the middle in 19\_\_ and the newest in \_\_\_\_\_.

Weather patterns are recorded so it is possible to match the growth rings on an old piece of wood to the weather patterns of the past even without having trees from that time in history. This can be used to date wood in old furniture or buildings

**EXAMPLE 4- A Microscopic View:** The 4 images at right → show microscopic views of cross sections of trees. They show the cut edges of xylem and phloem tubes. You can see that the light rings are made of larger tubes and the dark rings of smaller tubes.

**Count** the age of the tree in the first of the four photos.

**Do not count the bark. It was (3, 5, 6) \_\_\_\_\_ years old when cut.**



**EXAMPLE 5- Growth Rings in Other Living Things:** Growth rings can be found on other living things including the scales of fish and reptiles, the shells of shellfish, and the carapaces of turtles. Growth rings do not always mean years, but may mean seasons of growth.

**Count the ridges on a section of the turtle's carapace. It shows \_\_\_\_\_ seasons of growth.**