Conservation Science - Stopping the Rot and Picking Up The Pieces

Activity 4 - As Old As The Trees
Discovering Dendrochronology

Target Audience and Age-Range

This activity is suitable for Family Audiences. It is suitable for children age 10 and over working on their own and for children from age 7 or 8 working with a parent or other adult helper.

Duration

About 15 - 20 minutes

Background

Its often hard to know how old an object is just by looking at it. There are a number of scientific ways of dating objects including radiocarbon dating and using tree-rings. This activity introduces the basic ideas behind tree-ring dating, often called *Dendrochronology*

How Tree-Ring Dating Works

Trees grow in an annual cycle, being dormant in winter and putting on new growth in the summer. This annual cycle of growth produces a pattern of rings in the wood of the tree, with one ring being laid down each year. The width of the rings reflects the weather conditions during the growing season - if the weather was good the ring will be wide, if it was bad (too cold, too wet, too dry etc.) the ring will be narrow. Although the pattern of rings laid down in each tree is unique, the patterns of rings laid down in trees growing in the same area at the same time will be similar. By comparing the patterns of ring-widths in trees of different ages from a given area it is possible to build up a long sequence of ring-width data stretching over as much a s several thousand years. If an sequence of ring-widths from a sample of wood of unknown age is compared with the know sequences it can be matched up with them and so the time at which the sample was growing can be found.

Although the idea is simple enough, doing the necessary comparisons in practise is very difficult, and the technique depends on modern computers for it success. Tree-ring dating is a powerful technique which can be used to date everything from buildings and ships to historic paintings painted on wooden panels.

What You Need

You need some samples of wooden objects showing annual rings, if possible a section of tree trunk with one end sanded and varnished to show the annual rings, and sets of tree-ring sequences for each participant. (see below for making these) also scissors and sellotape or glue for each participant.

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What You Do

After introducing the topic by looking at the wooden objects and the section of tree trunk (if you know when this was felled you can get people to estimate when the tree started growing by counting the rings) give everybody a set of 'tree-ring' cards. Start by cutting out the cards labelled 'sequence 1' to 'sequence 5'. These will form your reference set. Find where these overlap (sequence 1 is youngest, sequence 5 is oldest, assume rings run left-right from youngest to oldest). Once you've found the overlap regions glue the cards on top of each other at the overlaps to make a single long sequence. Count the number of rings in the reference sequence (should be 140). Now cut out sequences A and B and by matching these sequences against the reference set estimate their 'felling dates'.

Health and Safety

No specific hazards beyond those associated with using scissors and glue.

Making The Ring Sequences

The easiest thing to do is to use the sequences supplied. If you enlarge these onto A3 paper it makes them easier to use. If you want to make your own you can do it as follows. The ring widths are obtained from a bounded set of random numbers generated in a excel spreadsheet setting the cell contents =1+INT(6*RAND()). This generates a random integer between 1 and 6 with equal probability - just like throwing a dice[1] . Fill about 200 cells with this formula, giving about 200 random numbers. Print the resulting table and then decide where the sequences will begin and end, allowing an overlap of about 10 -15 numbers between successive sequences. Now draw out the sequences, using the numbers to set the widths between successive lines. you can do this freehand, using a ruler to set the widths, or using a computer drawing package. Once you've made the five reference sequences, make two more 'unknown' sequences to using consecutive subsets of the numbers. Photocopy as many sets of sequences as you like and you're ready to go.

Richard Ellam BSc AMA
L M Interactive
3 Winterfield Road
PAULTON
Bristol
BS39 7RF

Tel/Fax 01761 412 797
e: richard@lminteractive.eclipse.co.uk

[1] If you're really fussy this is incorrect - real tree ring widths are more likely to be normally distributed, with most ring widths close to a mean value. This makes matching the sequences much harder, because the differences are much smaller. Using a bounded-integer random distribution doesn't invalidate the principle but makes things easier all round.