

ROBERSON MUSEUM AND SCIENCE CENTER

Post-Visit Homegrown: Dendrochronology Detective

Grade Level: 3 through 6

New York State Learning Standards: ELA 1, 4; MS&T 3, 4, 7; SS 3

Pennsylvania Learning Standards: M 2.3-2.6; RWS&L 1.1, 1.2, 1.6; S&T 3.1, 3.3

Objectives: Students will learn about dendrochronology and how tree rings can be used to date past events. By becoming Dendrochronology Detectives, students will use problem solving skills, deductive reasoning, math, and logic in order to solve a mystery.

Materials:

- Picture of cross-section of a tree showing rings, Fig. 1 (see attached)
- Picture of tree ring sample from cross-section, showing bands of growth, Fig. 2 (see attached)
- Unlabeled tree ring samples 1-3 for students (see attached)
- Tape, stapler, or glue
- Activity sheet “Three Tree Mystery” for students, grades 3&4 (see attached)
- Activity sheet “Three Tree Mystery” answer key for teachers, grades 3&4 (see attached)
- Activity sheet “Three Tree Mystery” for students, grades 5&6 (see attached)
- Activity sheet “Three Tree Mystery” answer key for teachers, grades 5&6 (see attached)

Procedure:

1. Begin by asking the students, “How and why are trees useful?” and, “What can trees be used for?” Once a few answers are given, tell the students that trees can also be used to help date past events. Allow them to predict how someone might be able to use trees for dating. After some predictions are made, show them the picture of the cross section of the tree, showing the annual tree rings (see Fig. 1 attached).
2. Explain to the students that trees grow annual rings; these circles allow the trunk to grow in diameter. Growth in the cambium, which they learned about in the pre-visit lesson plan, produces growth rings every year. By counting tree rings, each ring representing one year, it is possible to determine how long a tree had been growing before it was cut down.
3. Next, introduce the word “dendrochronology.” “Dendron” is a Greek word meaning tree and “chronology” is the science of determining and arranging dates of past events. Therefore, dendrochronology is the science of studying and analyzing tree rings to date past events.
4. Dendrochronologists use smaller samples from these large cross-sections, which make the rings look more like bands (see Fig. 2 attached).
5. Additional information about dendrochronology:

- a. Students may ask if there is a way to determine the age of a tree without cutting it down. Extracting a core sample from the tree provides tree ring information with minimal damage.
 - b. The pith is the stem in the center of the tree and counts as the first year of the tree's life. The bark is the outer layer of the tree. The bark does not count as an annual ring.
 - c. Each line or bar represents one tree ring. Begin counting with the line at the beginning of the pith. Stop counting once you have reached the line which signals the beginning of the bark.
6. This information is necessary for grades 5&6 in order to answer questions 8 and 9 on the activity sheet.
- a. Wider rings represent more growth during that year. This can be attributed to longer growing seasons and more rainfall. Narrower rings represent less growth during that year. This can be attributed to shorter growing seasons or periods of drought.
 - b. Tree rings can also be useful for determining when past natural events occurred: floods, droughts, insect attacks, lightening strikes, fires, and even earthquakes.
7. Tell the students that they are going to be Dendrochronology Detectives. Their mission, described in detail on the "Three Tree Mystery" activity sheet, is to date the year of publication for three books by examining tree rings. **Note: The teacher may decide to have the students work in small groups rather than independently.**
8. Students complete the activity sheet.

Conclusion: Review the "Three Tree Mystery" activity sheet as an entire class, making sure students explain how they arrived at their final answer. Allow the students from grades 5&6 to share multiple answers on questions 8 through 10.

Attachments:

- Tree Ring Cross-Section Picture (Fig. 1)
- Tree Ring Growth Bands Cross-Section Picture (Fig. 2)
- Activity Sheets
 - Student's Tree Ring Samples
 - Three Tree Mystery (grades 3&4 or grades 5&6)
- Teacher Guides
 - Teacher's Tree Ring Samples
 - Three Tree Mystery Answer Keys

Developed by: Deborah Sason

Date: April 2010

Picture of Tree Rings: Fig. 1



Tree ring sample from cross-section, showing bands of growth: Fig. 2



Name: _____

Student's Tree Ring Samples

Cut out samples on the dotted line.



Name: _____

Date: _____

Three Tree Mystery, Grades 3&4

A few months ago, scientists uncovered three important books. However, their dates of publication, or when they were finished being written, were not recorded. You have been called in as the Dendrochronology Detective to calculate the ages of three trees in order to solve the mystery of the undated books. The wood from the three trees was used to make these important books. By examining the annual growth rings of the trees used to make the books, you will be able to calculate when the books were published.

Three tree ring samples, one from each tree, have been provided on a separate sheet of paper. Cut out the three samples and match rings of similar band widths, representing years, so that they are lined up. (Note: Each line represents one year.) Once the samples are aligned, tape, staple, or glue them in the appropriate spaces provided below. Carefully read the information below and search for clues that may help you to identify the ages of the three trees. Hint: You may choose to mark clues on your tree ring samples in pencil.

Attach tree ring samples here:

| |
|--|
| Key |
|  Pith |
|  Bark |
|  Ring |

Clues:

1. Sample 1 and Sample 2 were planted the same year.
2. Sample 3 grew for 39 years before it was cut down in 2004.
3. Sample 2 was planted in 1978.
4. Each tree was cut down a year before the book using its wood was published.

Using the above information and your tree ring samples, answer the following questions in order to find out when the three books were published.

1. When was the tree from Sample 1 planted? Next, Count the rings, adding one year for every line, to see what year it was cut down.

2. If each tree was cut down a year before the book using its wood was published, what year was the book from tree Sample 1 published? Add one year after the tree was cut down.

3. Count the tree rings, adding one year for every line, to see when the tree from Sample 2 was cut down.

4. When was the book from tree Sample 2 published? Add one year after the tree was cut down.

5. When was the book from tree Sample 3 published? Add one year after the tree was cut down.

6. Label the tree ring samples on the front page with important dates to you. For example, label the year you were born, the year you started school, etc.

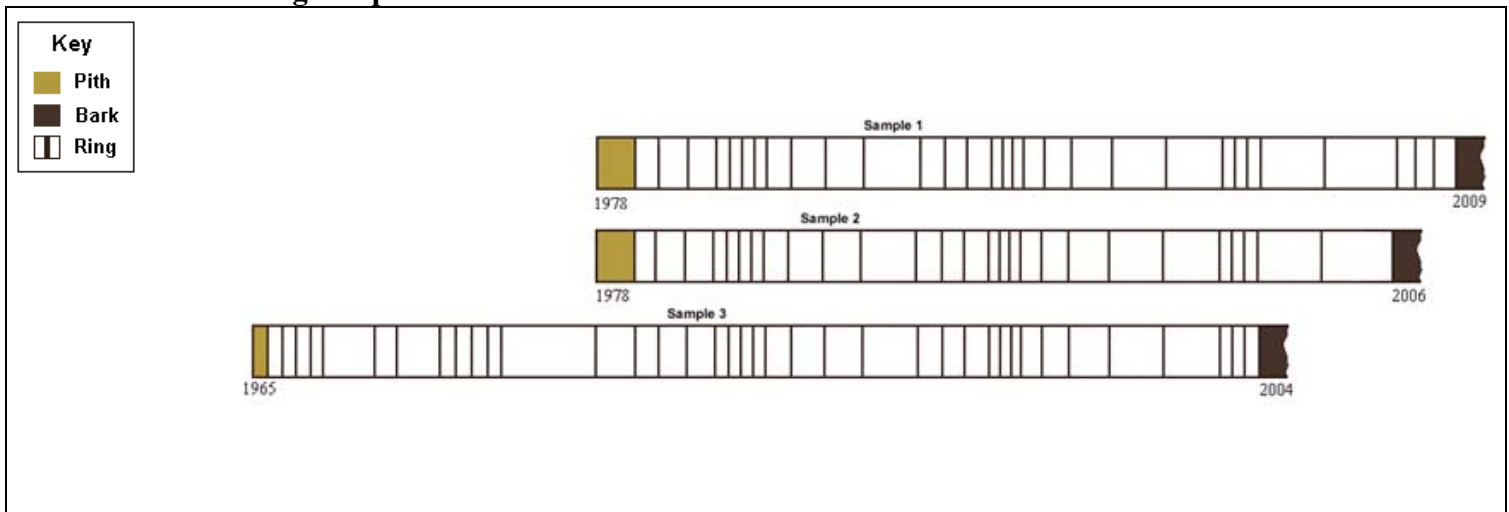
Three Tree Mystery, Grades 3&4

A few months ago, scientists uncovered three important books. However, their dates of publication, or when they were finished being written, were not recorded. You have been called in as the Dendrochronology Detective to calculate the ages of three trees in order to solve the mystery of the undated books. The wood from the three trees was used to make these important books. By examining the annual growth rings of the trees used to make the books, you will be able to calculate when the books were published.

Three tree ring samples, one from each tree, have been provided on a separate sheet of paper. Cut out the three samples and match rings of similar band widths, representing years, so that they are lined up. (Note: Each line represents one year.) Once the samples are aligned, tape, staple, or glue them in the appropriate spaces provided below. Carefully read the information below and search for clues that may help you to identify the ages of the three trees.

Hint: You may choose to mark clues on your tree ring samples in pencil.

Attach tree ring samples here:



Clues:

1. Sample 1 and Sample 2 were planted the same year.
2. Sample 3 grew for 39 years before it was cut down in 2004.
3. Sample 2 was planted in 1978.
4. Each tree was cut down a year before the book using its wood was published.

Using the above information and your tree rings samples, answer the following questions in order to find out when the three books were published.

1. When was the tree from Sample 1 planted? Next, Count the rings, adding one year for every band, to see what year it was cut down.

Planted in 1978; cut down in 2009

2. If each tree was cut down a year before the book using its wood was published, what year was the book from tree Sample 1 published? Add one year after the tree was cut down.

Published in 2010

3. Count the tree rings, adding one year for every band, to see when the tree from Sample 2 was cut down.

Cut down in 2006

4. When was the book from tree Sample 2 published? Add one year after the tree was cut down.

Published in 2007

5. When was the book from tree Sample 3 published? Add one year after the tree was cut down.

Published in 2005

6. Label the tree ring samples on the front page with important dates to you. For example, label the year you were born, the year you started school, etc.

Answers may vary

Name: _____




Date: _____

Three Tree Mystery, Grades 5&6

A few months ago, scientists uncovered three important books. However, their dates of publication were not recorded. In order for the information in the books to be useful, their publication dates must be determined. You have been called in as the Dendrochronology Detective to calculate the ages of three trees in order to solve the mystery of the undated books. The wood from the three trees was used to make these important books. By examining the annual growth rings of the trees used to make the books, you will be able to calculate when the books were published.

Three tree ring samples, one for each tree, have been provided on a separate sheet of paper. Cut out the three samples and match rings of similar band widths, representing years, so that they are lined up. (Note: Each bar represents one year.) Once the samples are aligned, tape, staple, or glue them in the appropriate spaces provided below. Carefully read the information below and search for clues that may help you to identify the ages of the three trees.
Hint: You may choose to mark clues on your tree ring samples in pencil.

Attach tree ring samples here:

| |
|--|
| Key  Pith  Bark  Ring |
|--|

Clues:

1. All of the trees were cut down before the year 2010.
2. Two trees were planted the same year. They were planted the year after the most fertile year with ample rainfall.
3. The third tree was planted 13 years earlier.
4. Their wood was used to make paper for three different books. Each tree was cut down a year before the book using its wood was published.
5. The tree that lived the shortest, showing the least amount of growth rings, was cut down in 2006.

Using the above information and your tree ring samples, answer the following questions in order to find out when the three books were published.

1. Which two trees began growing in the same year?

2. Which tree had the shortest life span?

3. By counting the rings backwards, what year did the tree represented in Sample 2 begin growing?

4. In what year did the tree represented in Sample 1 begin growing?

5. If the tree represented in Sample 3 began growing 13 years before the other two trees, then in what year did the tree from Sample 3 begin growing?

6. Using the year that the trees began growing and the year that they were cut down, calculate the ages of the trees.

7. What are the dates of publication for the three books?

Book from Tree Sample 1: _____

Book from Tree Sample 2: _____

Book from Tree Sample 3: _____

8. What do the wider rings mean? What do the narrower rings mean?

9. In what other ways can using the rings of the tree be useful?

10. Label the tree ring samples on the front page with important dates to you. For example, label the year you were born, the year you started school, etc.

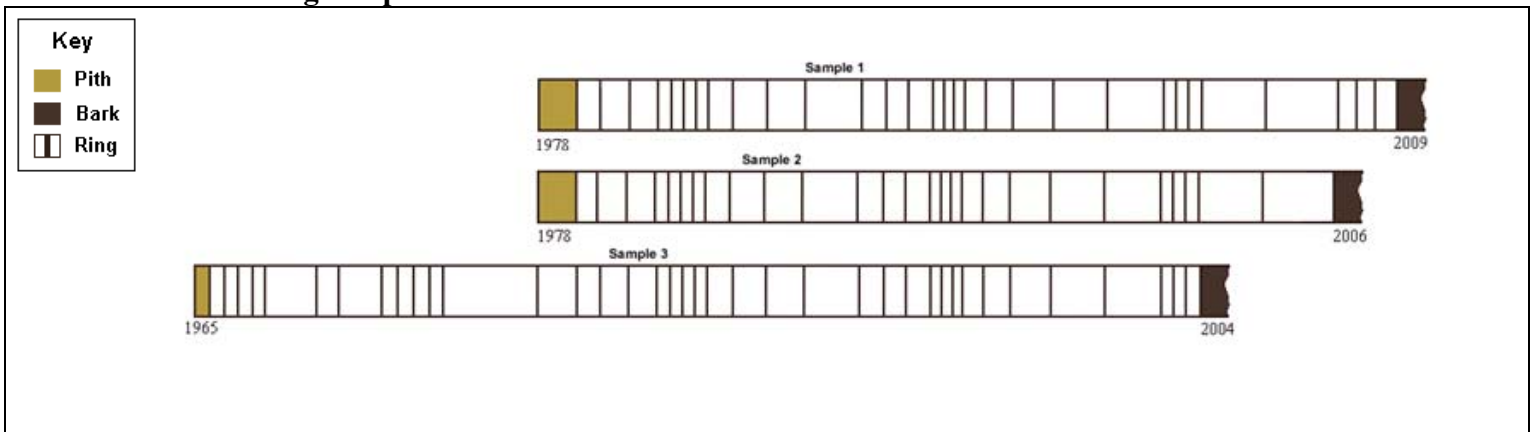
Three Tree Mystery, Grades 5&6

A few months ago, scientists uncovered three important books. However, their dates of publication were not recorded. In order for the information in the books to be useful, their publication dates must be determined. You have been called in as the Dendrochronology Detective to calculate the ages of three trees in order to solve the mystery of the undated books. The wood from the three trees was used to make these important books. By examining the annual growth rings of the trees used to make the books, you will be able to calculate when the books were published.

Three tree ring samples, one for each tree, have been provided on a separate sheet of paper. Cut out the three samples and match rings of similar band widths, representing years, so that they are lined up. (Note: Each bar represents one year.) Once the samples are aligned, tape, staple, or glue them in the appropriate spaces provided below. Carefully read the information below and search for clues that may help you to identify the ages of the three trees.

Hint: You may choose to mark clues on your tree ring samples in pencil.

Attach tree ring samples here:



Clues:

- All of the trees were cut down before the year 2010.
- Two trees were planted the same year. They were planted the year after the most fertile year with ample rainfall.
- The third tree was planted 13 years earlier.
- Their wood was used to make paper for three different books.
- Each tree was cut a year before each of the three books were published.
- The tree that lived the shortest, showing the least amount of growth rings, was cut down in 2006.

Using the above information and your tree ring samples, answer the following questions in order to find out when the three books were published.

1. Which two trees began growing in the same year?

Sample 1 and Sample 2

2. Which tree had the shortest life span?

Sample 2

3. By counting the rings backwards, what year did the tree represented in Sample 2 begin growing?

1978

4. In what year did the tree represented in Sample 1 begin growing?

Also 1978

5. If the tree represented in Sample 3 began growing 13 years before the other two trees, then in what year did the tree from Sample 3 begin growing?

1965

6. Using the year that they began growing and the year that they were cut down, calculate the ages of the trees.

Sample 1 is 31 years old, Sample 2 is 28 years old, and Sample 3 is 39 years old

7. What are the dates of publication for the three books?

Book from Tree Sample 1: 2010

Book from Tree Sample 2: 2007

Book from Tree Sample 3: 2005

8. What do the wider rings mean? What do the narrower rings mean?

Wider rings represent more growth during that year. This can be attributed to longer growing seasons and more rainfall. Narrower rings represent less growth during that year. This can be attributed to shorter growing seasons or periods of drought.

9. In what other ways can using the rings of the tree be useful?

Answers may include: evidence for floods, droughts, insect attacks, lightning strikes, fires, and even earthquakes.

10. Label the tree ring samples on the front page with important dates to you. For example, label the year you were born, the year you started school, etc.

Answers may vary