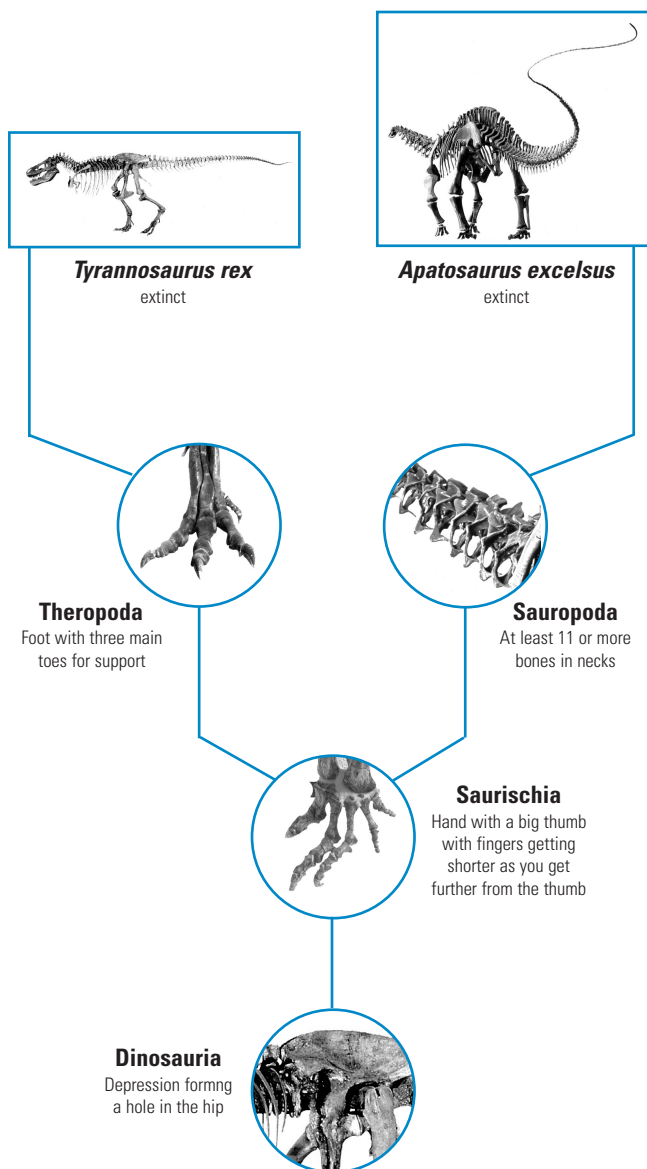


Understanding Cladistics

Activity for Grades 5–8

Introduction

At the American Museum of Natural History, scientists use a method called cladistics to group animals. They look for unique features, such as a hole in the hip socket, that the animals share. Animals with like features are grouped together. A chart, called a cladogram, shows these relationships. Using cladistics, scientists can reconstruct genealogical relationships and can show how animals are linked to one another through a long and complex history of evolutionary changes.



Objective

In this activity, students will explore cladistics and create a cladogram of their own.

Materials

- **Understanding Cladistics**
- A penny, nickel, dime, and quarter for each pair of students
- 6-8 dinosaurs pictures duplicated for each group, downloadable from amnh.org/content/download/1740/24669/file/dino_16_illustrations.pdf

Procedure

1. Write *lion, elephant, zebra, kangaroo, koala, buffalo, raccoon, and alligator*. Ask students how the animals are related and what might be a good way of grouping them into sets and subsets. Discuss students responses.
 2. Explain to students that scientists use a method called cladistics to determine evolutionary relationships among animals. They look for features that animals share, such as four limbs, hooves, or a hole in the hip socket. Animals with like features are grouped together. Scientists make a chart called a cladogram to show these relationships.
 3. Tell students that they will examine the features of various coins to determine how they are related. Remind students that cladistics is used to determine relationships among organisms, and not necessarily objects. The exercise they are about to do will introduce them to how cladistics works. Have students work in pairs. Distribute **Understanding Cladistics** to students. Have them complete the activity and compare their cladograms. Discuss how they arrived at their conclusions and any differences among the cladograms.
- Answers:** *The first feature (round) has been identified for students. Possible other features are silver-colored and rib-edged. However, students may choose other features to classify the coins that are equally correct. What is important to note is that a coin at any node must have the features of all previous nodes.*
4. Duplicate and distribute illustrations of six to eight dinosaurs. Ask students to work in groups to classify the dinosaurs according to features they identify. Have groups share their findings.

Understanding Cladistics

Name _____ Date _____

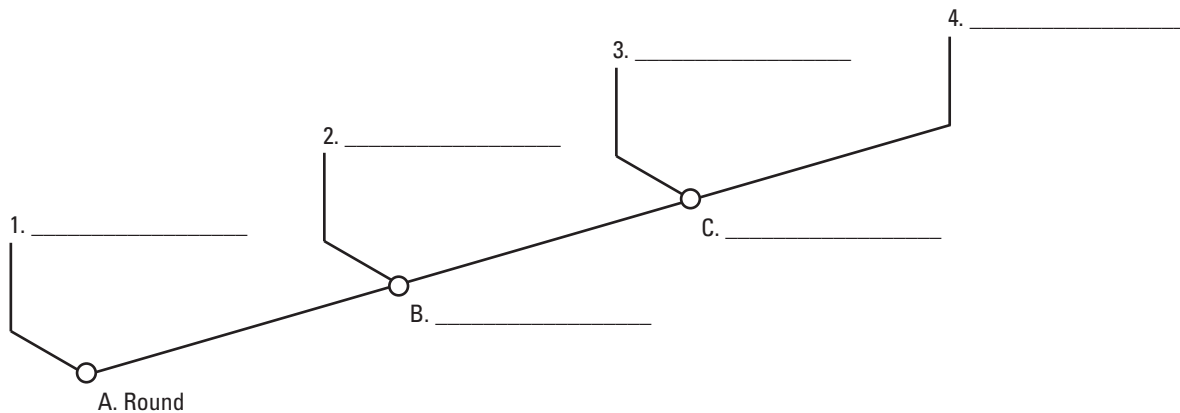
You and your partner will examine the features found in a penny, a dime, a nickel, and quarter and construct a cladogram of your own.

1. Before constructing a cladogram, scientists look for features in animals and note whether the feature is present or absent. They have special computer programs to help them do this. You will use the chart. Begin by looking at the coins. What feature do all the coins have in common? They are all round. Put a plus sign on the column marked *round* under each coin.

| FEATURES | Penny | Nickel | Dime | Quarter |
|----------|-------|--------|------|---------|
| A. Round | | | | |
| B. | | | | |
| C. | | | | |

2. What other feature do most of the coins share? Identify these feature and write it in the column marked *features*. Put a minus sign, if the coin does not have this feature. Put a plus sign if the coin has this feature.

3. What other feature do most of the remaining coins share? Identify this feature and write it in the last space in the column marked *features*. Put a minus sign if the coin does not have this feature. Put a plus sign if the coin has this feature.



4. Use the chart to complete the cladogram. The first node (branch in the tree) A is labeled *Round*. All the coins at this node and beyond share this feature. Label the other two nodes (letters B and C).

5. What coin is round, but does not share any more features with the other coins? Write the name of the coin in number 1. What coin shares the first and second feature with the other coins, but no more? Write the name of the coin in number 2. Which two coins share all the features you have identified? Write their names in numbers 3 and 4. Use your cladogram to answer these questions:

- Which two coins are the most closely related?
- Which coin is a distant relative of these two coins?
- What feature(s) does the nickel share with the dime?