

Unit 3

Evolution and Phylogenetics

Description

Molecular tools, including the ability to compare large DNA sequences from many different organisms, are refining our knowledge of evolutionary histories. Many relationships that were based on fossil evidence are being confirmed and some new relationships are being discovered. Some evolutionary tools and techniques are also useful in forensic applications.

Menu of Unit Activities

Note: All activities, handouts, solutions, and tips can be found in the Appendix of this guide.

Activity 1: Classifying Life (35 minutes + 30 minutes of video)

A hands-on exercise that compares the Linne, Whittaker, and Woese classification systems by classifying six different organisms.

Activity 2: Construction of a Phylogenetic Tree (60 minutes)

Morphological and molecular characteristics are used to make phylogenetic trees of swordtail fish.

Activity 3: HIV and the Dentist (25 minutes)

A case study on the use of comparative evolution to trace the source of an infectious agent.

Before the Session

Facilitator: Copy and assemble the following activity materials. (See the Activities section in the Appendix of this guide for master copies of transparencies and handouts, plus Tips and Suggested Answers.)

Activity 1: Classifying Life requires:

- One set of the Organisms To Be Classified (master copy provided, cut along dotted lines after copying)
- One copy of the Evolution and Phylogenetics online text chapter per team (available online at <http://www.learner.org/channel/courses/biology>)
- One copy of the Discussion Questions per person (master copy provided)
- Tips and Suggested Answers

Activity 2: Construction of a Phylogenetic Tree requires:

- One copy of the Instructions and Physical Information per person (master copy provided)
- One copy of the Genetic (rDNA) Information and Discussion Questions per person (master copy provided)
- One copy of the Evolution and Phylogenetics online text chapter per two people (available online at <http://www.learner.org/channel/courses/biology>)
- Tips and Suggested Answers

Activity 3: HIV and the Dentist requires:

- One copy of the Comparative Genomics Data and Questions per person (master copy provided)
- Tips and Suggested Answers

Facilitator: Make sure that the room has these supplies:

- pens or pencils and paper
- overhead projector and markers
- VCR and TV
- black/white board with chalk or markers

Session Activities and Video

Activity 1a: Classifying Life—Pre-Video Activity (30 minutes)

- Read the Setup.
- Divide the group into six teams.
- Each team should take one organism to classify and one copy of the Evolution and Phylogenetics chapter.
- Spend five minutes working in teams. Each team will determine the classification of its organism in the three different systems.
- Go through the organisms as a group. Each team should spend a few minutes stating the classification of its organism in the three different systems, with a brief explanation of each classification. Answers are in Tips and Suggested Answers.

Video (30 minutes)

- Watch the Evolution and Phylogenetics video.

Activity 1b: Classifying Life—Post-Video Discussion (5 minutes)

- Discuss the Discussion Questions as a group.

Activity 2: Construction of a Phylogenetic Tree (60 minutes)

- Read the Setup.
- Divide the group into four teams.
- Each person should take one copy of the Instructions and Physical Information, and one copy of the Genetic (rDNA) Information and Discussion Questions.
- Each team should take one copy of the Evolution and Phylogenetics chapter.
- Spend 10–15 minutes working in teams to construct a phylogenetic tree based on the physical information.
- Spend 10–15 minutes working in teams to construct a phylogenetic tree based on the genetic information, and comparing the two trees.
- As a group, compare trees made by the different teams and discuss the Discussion Questions. Answers are in Tips and Suggested Answers.

Session Activities and Video, cont'd.

Activity 3: HIV and the Dentist (25 minutes)

- Read the Setup.
- Arrange into pairs and have each person take a copy of the Comparative Genomics Data and Questions.
- Spend 10 minutes working in pairs on the Questions.
- Spend 15 minutes discussing the Applications and Ramifications as a group.
- Answers are in Tips and Suggested Answers.

Summary (5 minutes)

- If time permits, as a group or in pairs, define the major ideas or “take home” lessons of this unit and its applications.