

Activity Seven

# Be a Scientist

**Episode Title:** Any and all episodes; “Explosion of Life” (Annelids) most exemplary

**Activity Subject:** Science careers and science process

**Grade Level:** 6-12

**National Science Education Standards:**

Standards are noted as (standard:benchmarks).

Grades 6-8

- Earth and Space Sciences (1:4), (2:2,7,8)
- Life Sciences (4:1,2,3,5), (5:3,4,5,6), (6:2,3,4,5), (7:1,2,3,4,5)
- Nature of Science (12:2,7,8), (13:1,2,3)

Grades 9-12

- Earth and Space Sciences (1:4), (2:5)
- Life Sciences (5:5), (6:1,2,5), (7:2,4,6,7)
- Nature of Science (11:1,2,3), (12:1,6,7), (13:2,5,6)

**Learning Objectives:**

- Students assume the role of a Functional Morphologist, Paleontologist, Taxonomist, or Ecologist and become contributing members of a scientific team.

- Students view *The Shape of Life* from the perspective of their scientific role.
- Students take notes according to their scientific discipline.
- Students share what they learn with their research team.
- Each scientific team shares with the class their observations on the phylum and discusses how the different fields of inquiry provide different pieces of information.

**Assessment:** Students complete individual worksheets, report to their scientific team, and contribute to class discussion.

**Time:** One hour to view a single episode (“Explosion of Life”) or to view chosen sequences from several episodes; one to two additional class periods for team meetings and discussion

**Group Size:** Groups of four students working in teams

**Materials and Preparation**

Preview *The Shape of Life* series and select sequences highlighting the scientists and their study subjects in each hour for use in this exercise (see “Science Careers” and “Science Process” in “Video Time Code Index”). Alternatively, the teacher may prefer to have the students perform this exercise using a single episode. For this approach, we recommend Episode 4, “Explosion of Life,” due to its rich assemblage of scientists pursuing their various interests. Copy student worksheets for each team member. The questions listed represent the types of questions a scientist or team of scientists of that specialization would explore.

**Procedure**

1) Divide class into research teams of four scientists, including a Func-

tional Morphologist, Paleontologist, Taxonomist, and Ecologist and distribute the student worksheets (one for each scientific discipline per team).

- 2) Describe the primary focus of each specified scientific discipline, using descriptions provided in “Cool Science Careers.” (Copy and distribute this page to students, if desired.) Have students obtain additional information from library and Internet research, if desired. All listed careers are subsets of Biology. An excellent web resource is found at: <http://www.sicb.org/careers/index.php3> (the SICB web site).
- 3) Let students within the group decide who will be the Functional Morphologist, Paleontologist, Taxonomist, and Ecologist.

- 4) Have students view either one episode (Episode 4: “Explosion of Life”) or several sequences chosen from one or more of *The Shape of Life* episodes (see “Materials and Preparations”). Have students take notes on the worksheet for their scientific profession.
- 5) Have each research team of the four different scientists meet and share their observations of each phylum. Additionally, you can form teams of all of the functional morphologists, all of the paleontologists, all of the taxonomists, and all of the ecologists to compare their notes and develop a class report on both the phylum observations they documented and their scientific professions.

## Cool Science Careers

### Functional Morphologists



*John (Jack) Costello, Ph.D., Providence College (Appears in Episode Two)*

A functional morphologist studies the relationship between form and function in the natural world. For example, a functional morphologist might ask questions like: How do fish use their muscles to swim? How do lizards use their lungs to breathe? How do snails use their radula to graze for food? Functional morphologists investigate how organisms use their anatomy to perform life functions and interact with their environment. Biomechanics is a sub-division within functional morphology that employs principles from engineering to investigate everything from the physiology and mechanics of whole organisms to the basic materials from which they are constructed.

### Paleontologists



*Geerat Vermeij, Ph.D., University of California, Davis (Appears in Episode Six)*

Paleontologists study the history of life on Earth. Much of a paleontologist's work involves searching for and identifying fossils. Fossils are the remains or traces of organisms (plants, animals, fungi, bacteria, and other single-celled living things) that lived in

the geological past and are preserved in Earth's crust. Using fossils, paleontologists piece together evolutionary patterns and structures and decipher how life has changed over time in relation to the environment. There are many subdivisions of paleontology, including vertebrate and invertebrate paleontology, micropaleontology (studying fossils of single-celled organisms), paleobotany (studying plant fossils), and taphonomy (studying how fossils are made).

### Taxonomists



*Cristina Diaz, Ph.D., University of California, Santa Cruz (Appears in Episode One)*

Taxonomists are biologists concerned with the naming and classifying of the diverse forms of life on Earth. Through collections, dissections, and detailed observations, these scientists decipher relationships between and within species. Recently, new tools, like genetic sequencing, are helping taxonomists decipher some of life's most hidden secrets and interrelationships. Taxonomy has become increasingly important as scientists attempt to create a unified catalogue of Earth's many species. To date, over a million-and-a-half species have been described, and estimated tens of millions are still to be named. Compiling an accurate and complete catalog of life is fundamental to many tasks, such as understanding the impact of invasive species and developing worldwide conservation strategies.

### Ecologists



*Jennifer A. Clack, Ph.D., Cambridge University (Appears in Episode Eight)*

Ecologists study how organisms live and interact with other organisms and with their environment. For example, an ecologist might study how the burrowing of worms affects nutrient cycling in a mudflat or how weather patterns and climate changes influence the structure and composition of whole ecosystems. There are numerous subdivisions in ecology, including behavioral ecology and paleoecology. A behavioral ecologist might study what role jellyfish play in the open ocean food web. A paleoecologist like Dr. Clack, above, might study ancient ecosystems by looking at fossils, tree rings, ice cores, or coral cross-sections to decipher Earth's climate and the assemblage of organisms present at a specific time in the past. The study of ecology is becoming increasingly important as scientists continue to reveal the impact of human-induced changes on specific ecosystems and the global environment.

### To Be a Scientist

Scientists are often thought of as men in laboratories, wearing white coats and glasses. What were the scientists like in *The Shape of Life*? What kind of work did they do and where did they do it? Would you want to be a scientist? If so, what field of science would you choose? What education does it take to become that type of scientist?

# *The Shape of Life*

## Functional Morphologist Viewing Guide

Name \_\_\_\_\_

Period \_\_\_\_\_

| <b>Phylum</b>  |  |
|--|--|
| <b>What is the defining body plan of animals in this phylum?</b>   |  |
| <b>How do animals in this phylum move? What type of support system do they have?</b>                     |  |
| <b>How do animals in this phylum eat? What type of digestive system do they have?</b>                    |  |
| <b>How do animals in this phylum sense their surroundings? What type of nervous system do they have?</b> |  |
| <b>How do animals in this phylum reproduce?</b>  |  |

# The Shape of Life Paleontologist Viewing Guide

Name \_\_\_\_\_

Period \_\_\_\_\_

| <b>Phylum</b>   |  |
|---|--|
| <b>What types of fossils were found representing this phylum?</b>                   |  |
| <b>Where/when were the fossils found?</b>   |  |
| <b>What events/processes might have preserved the fossils?</b>                      |  |
| <b>How do the fossils compare to animals of this phylum on Earth today?</b>         |  |
| <b>What do these fossils tell us about the evolution of this phylum of animals?</b> |  |

# ***The Shape of Life***

## **Taxonomist Viewing Guide**

Name \_\_\_\_\_

Period \_\_\_\_\_

| <b>Phylum</b>   |  |
|---|--|
| <b>How many species are in this phylum?</b>                           |  |
| <b>What is the body plan of animals in this phylum?</b>               |  |
| <b>What species from this phylum are discussed in the episode?</b>    |  |
| <b>What specialized adaptations make the species unique?</b>          |  |
| <b>What characteristics distinguish this phylum from other phyla?</b> |  |

# The Shape of Life

## Ecologist Viewing Guide

Name \_\_\_\_\_

Period \_\_\_\_\_

| <b>Phylum</b>  |  |
|--|--|
| <b>In which habitats are species from this phylum found?</b>   |  |
| <b>What are the conditions of the habitats?</b>  |  |
| <b>What adaptations do species of animals within the phylum have for survival in their habitats?</b> |  |
| <b>What are some possible food chains/food webs for animals in this phylum?</b>                      |  |
| <b>How are materials cycled in these habitats?</b>   |  |