

Shape of Life

Be a Scientist

Video Title: The Shape of Life, scientist videos: Jack Costello, Gary Vermeij, Ian Lawn (Functional Morphologists); Damhnait McHugh and John Paerse/Don Wobber (Ecologists); Jenny Clack, James Hagedorn, Kristy Curry Rogers, Des Collins (Paleontologists); Mitch Sogin and Matt Scott (Geneticists). *In some of the videos, the scientist's title is different than the way they're categorized here.*

Activity Subject: Science careers and science process

Grade Level: 6 – 12 grades

Introduction

There are several types of scientists represented in the Shape of Life scientist videos. This lesson will require students to do a report on distinct scientific fields using the videos, Internet resources and the handout about “Cool Science Careers”. Learning about the different science disciplines can help students see the connection between what they learn in the classroom and what goes on in the enterprise of science. To start this lesson, describe the types of scientists using the attached sheet (“Cool Science Careers”). Students can choose (or be assigned) to play the role of one of these types of scientist and then form groups of the same type of scientist. Each student takes notes while watching one video about “their scientist” at shapeoflife.org/scientist. Students discuss the questions together and answer the questions in the worksheet (attached) to gain a better understanding of the way the scientist works.

Assessments Written and verbal presentation

Time One class period

Group Size Varies: entire class, individual student and small groups

Materials and Preparation

- “Cool Science Careers” handout
- Worksheets for each scientist
- Access to the internet

NEXT GENERATION SCIENCE STANDARDS

MS Nature of Science: Science is a Human Endeavor

Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas.

MS Nature of Science: Scientific Knowledge Is Based on Empirical Evidence

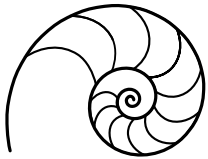
Science knowledge is based upon logical and conceptual connections between evidence and explanations.

HS Nature of Science: Science is a Human Endeavor

Technological advances have influenced the progress of science and science has influenced advances in technology. (HS-LS3-3)

Learning Objectives:

Students watch videos of scientists at work: Functional Morphologists, Ecologists, Paleontologists, or Geneticists and become familiar with the disciplines.



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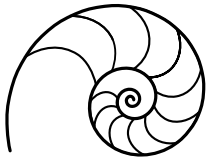
Materials, Preparation and Procedure

Materials and Preparation (continued):

- The Shape of Life, scientist videos: Jack Costello, Gary Vermeij, Ian Lawn (Functional Morphologists); Damhnait McHugh and John Paerse/Don Wobber (Ecologists); Jenny Clack, James Hagedorn, Kristy Curry Rogers, Des Collins (Paleontologists); Mitch Sogin and Matt Scott (Geneticists). In some of the videos, the scientist's title is different than the way they're categorized here. For example, Mitch Sogin is identified as an Evolutionary Biologist in the video but in the lesson we've identified him as a Geneticist since he uses genetics in the segment.

Procedure:

1. Write on the board the four types of scientists: Functional Morphologist, Ecologist, Paleontologist and Geneticist. Ask the class to generate ideas as to what scientists in each field study. Ask the students to justify their ideas. Make the point that there are many fields in biology that are exciting career choices for interested people.
2. Distribute "Cool Science Careers" and have students read it and obtain additional information from library and Internet research, if desired. All listed careers are subsets of biology. **Suggested web resources include:**
 - For Functional Morphologist:** <https://sites.google.com/a/asu.edu/morph/home>
http://www.encyclopedia.com/topic/Functional_Morphology.aspx
 - For Paleontologist:** http://education.nationalgeographic.com/education/encyclopedia/paleontology/?ar_a=1
http://www.priweb.org/outreach.php?page=edu_prog/publicedprograms/be_a_paleontologist
 - For Ecologist:** <http://www.esa.org/esa/education-and-diversity/info-for-high-school-students/#one>
<http://kids.nceas.ucsb.edu/ecology/ecologyascareer.html> (middle school level)
 - For Geneticist:** <http://www.wisegeek.com/what-does-an-evolutionary-biologist-do.htm>
<http://nationalzoo.si.edu/SCBI/CCEG/>
<http://www.birds.cornell.edu/page.aspx?pid=1674>
3. Have students choose what kind of a scientist they want to be and then put them into groups, or divide class into groups of Functional Morphologists, Ecologists, Paleontologists, or Geneticists.
4. Students, as individual or as a group, watch two of the scientist videos of the type they have chosen and take notes. For example,
 - The Functional Morphologist Group #1 watches Costello and Vermeij
 - The Functional Morphologist Group #2 watches Lawn and Vermeij
 - The Ecologist Group watches McHugh and Pearse/Wobber
 - The Paleontologist Group #1 watches Clack and Hagedorn;
 - The Paleontologist Group #2 Curry-Rogers and Collins
 - The Geneticist Group watches Sogin and Scott
5. As a group of Ecologists, for example, the students discuss the answers to the questions on the worksheet and prepare a report to give to the whole class.

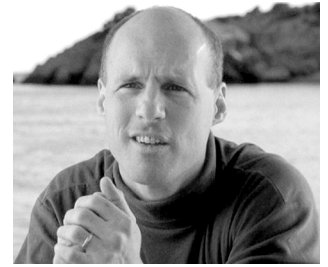


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Be a Scientist - Functional Morphologist Viewing Guide

View Scientist Videos for: Jack Costello

Student Name: _____



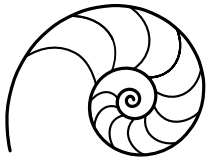
What specific features of the jellyfish's body plan was Costello studying?

What was Costello trying to find out?

What method did Costello use to study the jellyfish?

What did you learn about the survival strategies of the animal?

What drives the Costello's passion?



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Be a Scientist - Functional Morphologist Viewing Guide

View Scientist Videos for: Ian Lawn

Student Name: _____



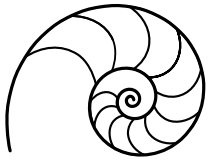
What specific features of the animal's body plan was Lawn studying?

What method did Lawn use to study the anemone?

What did Lawn learn about the anemone?

What did you learn about the survival strategies of the animal?

What drives Lawn's passion?



the Shape of Life

Be a Scientist - Functional Morphologist Viewing Guide

View Scientist Videos for: Geerat Vermeij

Student Name: _____



What specific features of a molluscs' body plan was Vermeij studying?

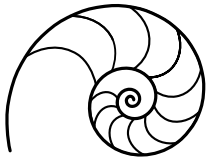
What did you learn about the survival strategies snails?

What does Vermeij learn about a snail's life from studying its shell? (What function does the shell serve?)

What does a shell's battle scars tell Vermeij?

What method was the Vermeij using?

What drives Vermeij's passion?



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Be a Scientist - Ecologist Viewing Guide

View Scientist Videos for: Damhnait McHugh

Student Name: _____



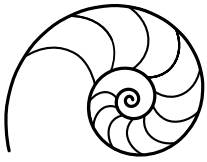
In which habitats are annelid species found?

What adaptations do annelids have for survival in their habitats?

What role do annelids play in the ecosystems where they live?

What methods does McHugh use to teach her students?

What drives the McHugh's passion?



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Be a Scientist - Ecologist Viewing Guide

View Scientist Videos for: John Pearse/Don Wobber

Student Name: _____



In which habitats are sea stars species found?

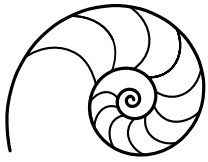
What adaptations do sea stars have for survival in their habitats?

What role do sea stars play in the ecosystems where they live?

What methods do Pearse and Wobber use?

What did Pearse and Wobber learn from these methods?

What drives the Pearse and Wobber's passion?



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Be a Scientist - Paleontologist Viewing Guide

View Scientist Videos for: James Hagedorn

Student Name: _____



What types of fossils did Hagedorn find?

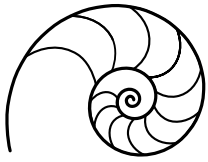
Where did Hagedorn find the fossils?

What events/processes might have preserved the fossils?

What do these fossils tell us about the evolution of this phylum of animals?

What methods did Hagedorn use?

What drives the Hagedorn's passion?



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Be a Scientist - Paleontologist Viewing Guide

View Scientist Videos for: Jenny Clack

Student Name: _____



What types of fossils did Clack study?

Where did Clack find the fossils?

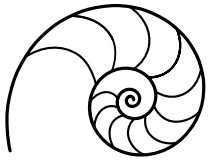
What events/processes might have preserved them?

Why do you think Clack gave the fossil a name?

What methods did Clack use to study the fossils?

What do the fossils tell us about the evolution of Chordates?

What drives Clack's passion?



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Be a Scientist - Paleontologist Viewing Guide

View Scientist Videos for: Kristi Curry Rogers

Student Name: _____



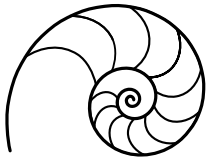
What types of fossils did Curry Rogers study?

Why was she particularly interested in bones?

What methods did Curry Rogers use?

What do the bones tell us about the evolution of dinosaurs?

What drives the Curry Rogers passion?

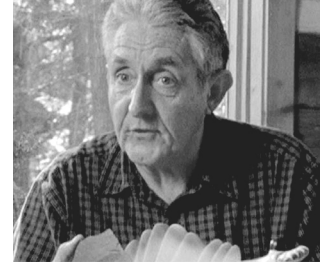


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Be a Scientist - Paleontologist Viewing Guide

View Scientist Videos for: Des Collins

Student Name: _____



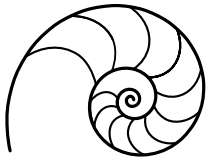
What types of fossils did Collins study?

Where did Collins find the fossils?

What methods did Collins use to study the fossils?

What do these fossils tell us about the evolution of animals?

What drives the Collins passion?

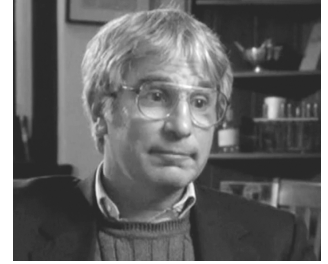


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Be a Scientist - Geneticist Viewing Guide

View Scientist Videos for: Mitch Sogin

Student Name: _____



What big question was Sogin trying to answer?

How did Sogin go about answering that question?

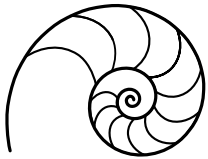
What specific methods did Sogin use?

Why did Sogin choose the animal he worked on?

What did Sogin find out

What drives the Sogin's passion?

For Internet research: Genetics is a fast moving field. How have the methods changed since the video was filmed?

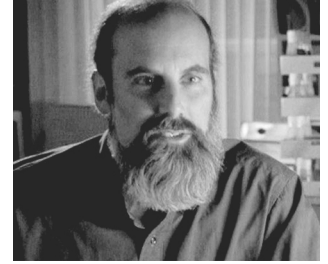


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Be a Scientist - Geneticist Viewing Guide

View Scientist Videos for: Matt Scott

Student Name: _____



What big question was Scott trying to answer?

How did he go about answering that question?

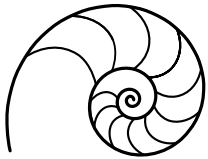
What specific methods did Scott use?

Why did Scott choose the animal he worked on?

What did Scott find out?

What drives the Scotts's passion?

For Internet research: Genetics is a fast moving field. How have the methods changed since the video was filmed?



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Cool Science Careers - Handout

Functional Morphologists

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.



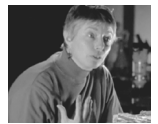
Ecologists

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. 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.



Paleontologists

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).



Geneticists

Geneticists try to solve the puzzles of DNA and heredity. Their research is on the frontiers of biology. Geneticists may study, for example, the relationships of organisms; reconstruction of patterns of evolutionary history; variation of organisms, and how genes regulate development and behavior. Their work is primarily in a lab setting where they may work in basic research, or in medical or agricultural research, for example. But there are careers in genetics that apply to ecology and wildlife like ecological genetics and population genetics.

