

Classroom Activities
"Ocean AdVENTure: From Deep Sea to Deep Space"
<http://library.advanced.org/18828>

I. CREATURES OF THE DEEP

A. Background:

Long, long ago sailors began to spin fascinating tales of sea creatures too horrible or too beautiful to resist. Few people actually saw such creatures, yet few doubted their existence -- until recent years. As we learned more about the sea, mythic monsters seemed simply products of overactive imaginations stimulated by long and frightening sea voyages.

In 1977, the discovery of hydrothermal vents led to new and fantastic tales of bizarre fauna in the deep sea once again. Unlike the earlier sailors, today's scientists can substantiate their stories with photographs, videos, and even samples for study.

B. Assignment:

Divide the class into crews. Each crew will find one example of fauna from a hydrothermal vent or other deep-sea environment and

 ¥ describe it from two points of view: as an imaginative sailor in the early 1800's, and as a scientist of today. Is either description less fantastic?

 ¥ read one crew's description, either sailor's or scientist's, to a partner crew who will draw it, without seeing the actual image. Trade roles, so the partner crew reads its description for the other crew to draw.

 ¥ compare the actual and the crew-drawn images

 ¥ discuss the similarities and differences faced by crews of early sailing ships and crews on submersibles today, both of whom set out on dangerous voyages to unknown destinations.

C. Resources:

You may find images of creatures of the deep sea, including hydrothermal vents, on these and other Web sites:

 ¥ Pompeii worm at
 http://library.advanced.org/18828/data/fn_4.html

 ¥ Tube worms at http://library.advanced.org/18828/data/fn_3.html

 ¥ "Deep-Sea Bestiary" from NOVA Online/Into the Abyss" at
 <http://www.pbs.org/wgbh/nova/abyss/life/bestiary.html>

 ¥ "Heavy Metal and Acid Rock" at
 <http://www.pbs.org/wgbh/nova/abyss/life/extremes.html>

II.SOUND BITE

A. Background:

Hydrothermal vents are in the news again. There are reports of plans to mine hydrothermal vents for biotechnological research as well as gold. As a famous oceanographer, you have been asked to provide a 30- to 60-second sound bite on your views of vent mining.

B. Assignment:

Are you for or against mining vents for minerals and biotechnological resources? Why? Prepare your statement for the news media.

C. Resources:

1. Ethics section of "Ocean AdVENTure" at
<http://library.advanced.org/18828/data/ethics.html>
2. Industrial and medical applications at
http://library.advanced.org/18828/data/si_3.html
3. Vent reserve proposal at
<http://www.lgs.jussieu.fr/~intridge/reserve.htm>

III. CHIEF SCIENTIST

A. Background:

1. Congratulations! You have just been named Chief Scientist of an upcoming cruise to investigate hydrothermal vents. You will be in charge of many scientists who are specialists in several different fields. You will also have a small group of school science teachers on board to assist the researchers. They know a lot about science, but little about vents. They have many questions.

2. Your job as Chief Scientist is to coordinate the research work. You also must coordinate teaching the teachers about vents. The scientists will help you instruct them, using information from the "Ocean AdVENTure" virtual cruise and other Web resources.

B. Assignment:

1. Learn about vents. If this is a class project, assign classmates to become experts in these vent-related topics: general information, research tools, fauna, geology, significance, ethics, and unsolved mysteries.

2. Hold a training meeting for the teachers so the experts can answer their questions listed below. Suggested sources for answers follow the questions; other helpful Websites are listed in the Resources section.

a. General Information Expert

(1) What is a hydrothermal vent?

http://library.advanced.org/18828/data/db_2.html

(2) Where are they located?

http://library.advanced.org/18828/data/db_2.html

(3) If vents were first discovered only in 1977, does that mean that they are a very recent development on our planet?

http://library.advanced.org/18828/data/db_2.html

(4) What vent facts belong in the "wow!" category?

http://library.advanced.org/18828/data/db_3.html

(5) RELATED ACTIVITY: What does an actual vent look like?

http://library.advanced.org/18828/data/db_2.html

b. Research Tools Expert

(1) What is a submersible?

<http://library.advanced.org/18828/data/glossary.html#submersible>

(2) What's an ROV?

http://library.advanced.org/18828/data/rt_3.html

(3) What does a bathymetric map look like?

http://library.advanced.org/18828/data/interactivity_5.html

(4) Some scientists believe whale carcasses may host vent propagules. I'd like

to hear the sounds of a whale that scientists have recorded.
Carcass theory: <http://library.advanced.org/18828/data/mysteries.html>
Whale calls: <http://newport.pmel.noaa.gov/whales/whale-calls.html>

(5) RELATED ACTIVITY: Please demonstrate how a submersible is able to descend and ascend.

http://library.advanced.org/18828/data/interactivity_3.html

c. Fauna Expert

(1) What is the basis of the hydrothermal vent's food chain?

http://library.advanced.org/18828/data/fn_2.html

(2) How do tubeworms survive without sunlight or a mouth?

http://library.advanced.org/18828/data/fn_3.html

(3). What new domain of life has been found in a vent?

http://library.advanced.org/18828/data/fn_4.html

(4) Are there just a few creatures around an active vent?

http://library.advanced.org/18828/data/fn_4.html

(5) RELATED ACTIVITY: How could I make a model of the fauna around a hydrothermal vent?

<http://www.ocean.washington.edu/outreach/revel/eduframework.html>

d. Geology Expert

(1) How is a vent formed?

http://library.advanced.org/18828/data/db_2.html#3

<http://library.advanced.org/18828/data/geology.html>

(2) What is a chimney?

http://library.advanced.org/18828/data/ge_2.html

(3) Is the Mid-Ocean Ridge, along which most hydrothermal vents are located, just in the Pacific Ocean?

<http://library.advanced.org/18828/data/research.html>

(4) Why is understanding the theory of plate tectonics helpful when studying vents?

<http://library.advanced.org/18828/data/geology.html>

<http://library.advanced.org/18828/data/research.html>

(5) RELATED ACTIVITY: Please demonstrate a model of a vent or play a recording of an erupting undersea volcano.

<http://www.neaq.org/learn/kidspace/vent.html>

Volcano: http://library.advanced.org/18828/data/rt_2.html

e. Significance Expert

(1) What regulating role do hydrothermal vents probably play in the ocean?

<http://library.advanced.org/18828/data/significance.html#2>

(2) Are the vents likely to provide any solutions to human's medical problems?

http://library.advanced.org/18828/data/si_3.html

(3) What's so important about extremophiles?
http://library.advanced.org/18828/data/si_3.html
http://library.advanced.org/18828/data/fn_4.html

(4) Why is Jupiter's moon, Europa, mentioned in connection with hydrothermal vents?
http://library.advanced.org/18828/data/si_2.html

(5) RELATED ACTIVITY: Why do you think this excerpt of a poem by T.S. Eliot has often been quoted when discussing hydrothermal vent research?

"We shall not cease from exploration
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time."

f. Ethics Expert

(1) What ethical issues about vents have been raised?
<http://library.advanced.org/18828/data/ethics.html>
http://library.advanced.org/18828/data/si_4.html

(2) What are the positions held by various groups about these issues?
<http://library.advanced.org/18828/data/ethics.html>
http://library.advanced.org/18828/data/si_4.html

(3) What is your personal recommendation regarding these issues?

(4) RELATED ACTIVITY: Hold a mini-debate on the pros and cons of:

- ¥ mining vents for all or some of their resources, or
- ¥ putting all vents off limits to scientific research and mining

g. Unsolved Mysteries

(1) What are two or more theories regarding fauna colonizing new hydrothermal vents?
<http://library.advanced.org/18828/data/mysteries.html>

(2) What are some possible theories about vents' glow and flickering light?
http://library.advanced.org/18828/data/ms_2.html

(3) Why do some scientists suspect life on our planet may have begun tucked away in a hydrothermal vent?
http://library.advanced.org/18828/data/si_2.html

(5) RELATED ACTIVITY: What theories and ideas for research do you have to help us understand the mysteries of hydrothermal vents?

C. Resources:

1. An extensive glossary of terms related to hydrothermal vents is at
<http://library.advanced.org/18828/data/glossary.html>

2. Descriptions of various oceanographers' jobs, including the Chief

Scientist, begin at
<http://library.advanced.org/18828/data/scientists.html>

3. General links

- a. A good place to start is the Ocean Planet site at
http://seawifs.gsfc.nasa.gov/OCEAN_PLANET/HTML/oceanography_recently_revealed1.html
- b. Another great site for links is "Hydrothermal Vent Systems" at
<http://geosun1.sjsu.edu/~dreed/105/vents.html>
- c. For some interesting information on a cruise to study hydrothermal vents during the summer of 1998, check out especially the logbook section of
http://newport.pmel.noaa.gov/nemo_cruise98/
- d. Science for Kids at Suite 101 has some vent links at
http://www.suite101.com/article.cfm/science_for_kids/12090/

4. Geology

- a. For information on the geology of vents, check out the NOAA (National Oceanic and Atmospheric Administration Site) at
<http://www.pmel.noaa.gov/vents/geology/geology.html>
- b. An excellent discussion of tectonic plates is available on the US Geological Survey's site at
<http://pubs.usgs.gov/publications/text/dynamic.html>

Also Earthlink at
<http://home.earthlink.net/~dlblanc/tectonic/ptABCs.html>

- c. For a huge listing of geology links on vents and lots more, please see
<http://home.rmi.net/~michaelg/HOTLINKS.html>

5. Fauna

- a. For general information on vent life forms, check out the American Museum of Natural History's Black Smokers site at
http://www.amnhonline.org/expeditions/blacksmokers/life_forms.html
- b. For a brief article on the effects of pressure on organisms, and images of cool deep-sea fauna, check out
<http://www.pbs.org/wgbh/nova/abyss/life/>

D. CONGRATULATIONS for completing a virtual voyage of discovery to hydrothermal vents! You may wish to print out the certificate for yourself at
http://library.advanced.org/18828/data/interactivity_1.html