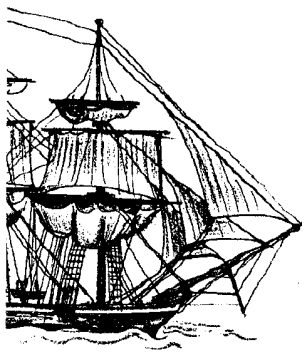
Explorers of the Ocean Depths
The *Challenger* Expedition of 1872–1876
Three Level Guide

Key Concepts

The Challenger Expedition was the first scientific expedition to measure and sample the oceans in a systematic way.

2. Some of the work aboard a scientific research ship is tedious and drudgery.



Background

Early oceanic explorers believed that the deepest parts of the ocean were completely lifeless. Plants and animals were thought to occur in greatest numbers near the surface and decrease with depth. Scientists believed that no life could exist deeper than about 300 fathoms. This hypothesis was based on very scant information; it really was based more on myth than real scientific work.

By the mid 1800's, the British were dispatching ships and survey parties all over the world to map and catalogue much of the world. Generally, when a survey party went out, a naturalist accompanied (as was the case with Charles Darwin on board the *Beagle*), but the primary function of the expedition was geographic in nature.

The *Challenger* Expedition was the first purely oceanographic expedition, and because of that, is generally considered to be the event that gave birth to the science of oceanography. The following article explains how that expedition took place and provides students with a look at the day-to-day events aboard a research expedition. (It should be noted that modern expeditions, while laden with much more sophisticated instrumentation and equipment, are very much the same as the Challenger. When the three scientists descend in the submersible *Alvin* for 6 to 8 hours, the crew on the surface has little or nothing to do. There's still a lot of monotony!)

Materials

For each student:

- One copy of the "Explorers of the Ocean Depths" Three-Level Guide
- One copy of article: "Explorers of the Ocean Depths—The Challenger Expedition of 1872-1876",) "Oceans", Nov. 1973)

Teaching Hints

Explain to students that the guide will take them through three levels of questioning, from a literal level, to inference, and then to analysis and synthesis. The idea is not to "get the answer right" per se, but more importantly, to use the questions as a guide to the major ideas in the article, and to try to incorporate those ideas into one's own knowledge base. It is important to emphasize to the students that their reasoning is much more important than their answer. In fact, in levels two and three, there may be no "right" or "wrong" answer!

Suggest that the students read the statements in the three-level guide before they read the article. (Some students may prefer to read the article first, then go back over it a second time with the three-level guide). The guide is intended to be a vehicle for helping students look for certain concepts in the article.

When students have finished, discuss the guide, referring to the article. You may wish to have students work in collaborative groups to compare their answers. The process of resolving differences of opinion can be very instructive.

It is sometimes helpful to have students note the page number and paragraph where they found evidence to support their answer. You may require the students to provide sound, complete explanations for the answers they chose!

For additional information about Three-Level Guides, see Teacher Background, Lesson 2, "Meanwhile, in the Pacific...", Part 2.

Key Words

characteristics - in this case, typical or distinctive qualities of an organism

evolution - a process of gradual, progressive change or development; specifically, change in the gene pool of a population from generation to generation by such processes as mutation, natural selection, and genetic drift

fossil - any remains, impression, or trace of a living thing of a former geologic age

inheritance - the collective genetic characteristics transmitted from parent to offspring

selection - any natural or artificial process that results in differential reproduction among members of a population so that the inheritable traits of only certain individuals are passed on, or are passed on in greater proportion, to succeeding generations

variation - a difference or deviation in structure or character from others of the same species or group

Answer Key

Level 1

Students should agree with the following statements: 1, 6, 7, 9 and 11.

LEVEL I

Directions: Read the statements carefully. Then, as you read the article, refer back to the statements and check those that you believe say or paraphrase what the author said. Be ready to support the statements you checked and explain what is inaccurate about the statements you have not checked.

__X__ 1. The *Challenger* expedition was the first major effort to systematically investigate the depths, temperatures, and fauna of the oceans of the world.

_____ 2. William Carpenter got the idea for this expedition from Charles Darwin.

_____ 3. Edward Forbes believed that life was abundant at depths below 300 fathoms.

_____ 4. It took over 10 years to convince the British government to fund the *Challenger* Expedition.

_____ 5. It did not cost any more to fund the *Challenger* Expedition than it did to keep the *Challenger* going as a navy vessel.

__X__ 6. One of the considerations justifying the expedition was the need to know more about the sea bottom for the installation of undersea telegraph cables.

__X__ 7. The *Challenger* did most of its voyaging under sail.

_____ 8. The Admiralty told the *Challenger's* captain that the most important object of the voyage was to verify whether certain dangers shown on ocean charts actually existed.

__X__ 9. The deepest sounding made by the *Challenger* was 26,580 feet.

_____ 10. The greatest accomplishments of the expedition were in the field of physical oceanography, especially in the area of oceanic circulation.

__X__ 11. The *Challenger* demonstrated that the oceans were teeming with unknown life that had not yet been classified.

_____ 12. The expedition proved that *Bathybius,* which Thomas Huxley claimed was the protoplasm that began the evolutionary process on earth, actually existed in the deepest parts of the ocean.

Level 2

Students should agree with the following statements: 3 and 5.

LEVEL I

Directions: Read each statement. Then, using the article as reference, decide whether you agree or disagree with each statement. Check those statements which you feel can be supported by the article. Be ready to support your opinions.

_____ 1. Life on board the *Challenger* was a constant adventure for the crew.

_____ 2. The public was extremely supportive of the Expedition.

__X__ 3. Only one of the scientists who went on the Expedition later became rich from his discoveries.

_____ 4. The British government allocated 200,000 pounds for the expedition, but felt justified in doing so.

__X__ 5. The *Challenger* Expedition sparked a renewed interest in marine science.

Level 3

Students should agree with statement two. They may agree with statement three and argue that the *Challenger* Expedition initially cost much more than budgeted. In the end, however, the justification can be made based on the discoveries (such as the phosphate deposits in the Marshall Islands) that occurred.

LEVEL III

Directions: Read each statement, relating the details and interpretations drawn from the article to ideas and experiences you've had in reference to the topic. Check the statements you agree with and be ready to support your opinions.

_____ 1. Scientific expeditions such as the *Challenger* expedition (including ones that take place today) are of little practical value.

__X__ 2. The voyage of the *Challenger* sought to answer questions of an intellectual nature.

_____ 3. The cost of a scientific expedition, such as the *Challenger* expedition, can rarely be justified.

Acknowledgments:

"Explorers of the Ocean Depths—The Challenger Expedition of 1872-1876" is used with permission from *Oceans* (Oceans Magazine Co., Menlo Park, CA.); November 1973.

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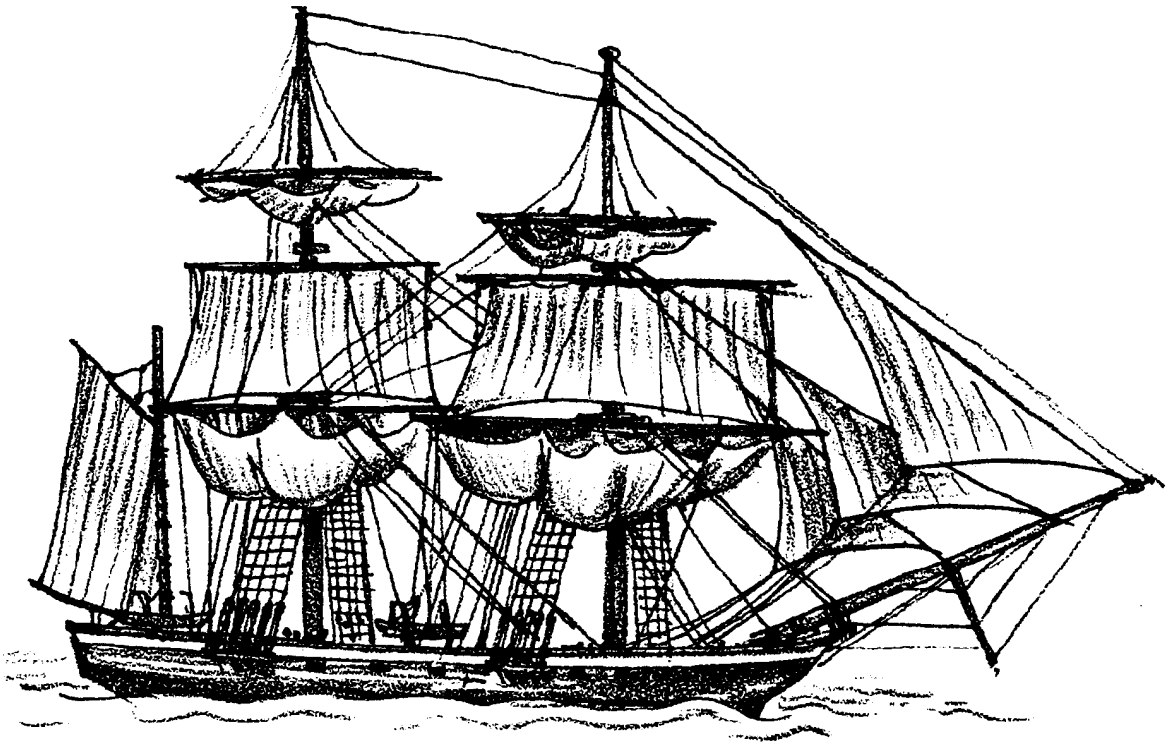

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LEVEL II

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