

muse®

Mysteries of the Deep

Navigate the deep sea with this issue of MUSE and learn how scientists use a variety of physical and human resources to bring about a greater understanding of the underwater world.

CONVERSATION QUESTION

How are we solving the mysteries of the deep sea?

TEACHING OBJECTIVES

- Students will learn how new species of sea life are discovered.
- Students will learn how artists represent scientific discoveries.
- Students will learn how cave divers are helping us discover the ancient past.
- Students will classify scientific information.
- Students will obtain information from a nonfiction text.
- Students will study the processes utilized to explore and preserve underwater caves.
- Students will work collaboratively to create artistic and informative murals depicting underwater features.
- Students will research the significance of a piece of artwork that was created to represent an idea, event, or person in American history.
- Students will solve and create mathematical word problems based on information in the text.



In addition to supplemental materials focused on core STEM skills, this flexible teaching tool offers vocabulary-building activities, questions for discussion, and cross-curricular activities.

SELECTIONS

- **Scavenging for Knowledge**
Narrative Nonfiction, ~850L
- **Artists at Sea**
Expository Nonfiction, ~1150L
- **Deep Chambers**
Expository Nonfiction, ~1050L

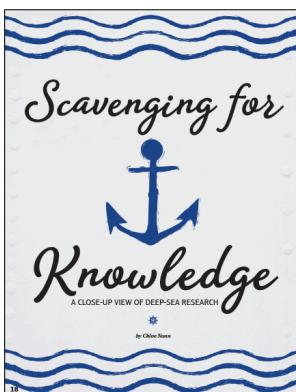
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Scavenging for Knowledge

pp. 18–21, Narrative Nonfiction

Board the research vessel with National Geographic explorer, Chloe Nunn, and discover what lies in the deep, dark realms of the sea. Students will learn how oceanographers study the sea floor and how they collect research samples.

Lexile Score: ~850



RESOURCES

- Species of the Sea

OBJECTIVES

- Students will learn how new species of sea life are discovered.
- Students will classify scientific information.
- Students will work collaboratively to create artistic and informative murals depicting underwater trenches and canyons.

KEY VOCABULARY

- amphipod** (p. 19) a tiny crustacean, similar to a snail
- dislodge** (p. 20) to force out of position
- oceanographer** (p. 19) a scientist that studies oceans and marine biology
- submersible** (p. 19) a ship or craft capable of operating under water

ENGAGE

Conversation Question: How are we solving the mysteries of the deep sea?

"Who lives in a pineapple under the sea?" As a fun, motivational activity, show the class a portion of a SpongeBob episode in which many of the underwater characters appear. Challenge students to name the characters and how they would be classified in marine biology terminology. (Ex: Mr. Crabs: crustacean; Gary (sea snail): mollusk, etc.) Allow them to use resources for classification purposes if necessary.

INTRODUCE VOCABULARY

Review the key words and definitions with the class. Guide students to notice that all of the terms contain prefixes and/or suffixes. Have students work in pairs to identify the root words and prefixes/suffixes. Do students arrive at the correct definition when breaking up the words and defining each part? How can this be a useful skill, particularly when reading a science article?

READ & DISCUSS

Reinforce comprehension of the concepts in the article by using the following prompts to direct discussion.

- Describe the most basic method for sampling the sea floor.
- What is the abyssal plain?
- Why do most deep-sea vehicles have high-tech arms?
- Why do canyons support more kinds of life than the open space of the abyssal plain?
- What did the author learn about the species of amphipod that she discovered?

CONCEPT/SKILL FOCUS: Classifying Information

INSTRUCT: Reread the text box on page 20 with the class. ("I Found a New Species!") Review with students that a taxonomic key is a method used to classify and identify organisms. Introduce the graphic organizer, "Species of the Sea," as a basic template for cataloging information. Students will imagine discovering their own organism and then proceed to record the information. (Advanced students may also want to use the seven levels of animal classification system, if your class has studied it.)

ASSESS: Evaluate the students' work on the graphic organizer.

EXTEND

Art & Science This article discusses how trenches and canyons form in different places on our ocean floors. Divide the class into two groups; trenches and canyons. Assign them the project of creating a mural depicting their sea floor feature, complete with accurate labeling. Furthermore, they should provide specific data about their formation, as well as at least three other fun facts.

Species of the Sea

Use information from the article, "Scavenging for Knowledge," to learn how scientists record their discovery of a new species. Imagine discovering your own species and complete the organizer below.

Official Description:

Accurate Drawing:

Related Species:

Lifestyle Information:

Lifecycle Information:

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Artists at Sea

pp. 28–32, Expository Nonfiction

Picasso once said, "Everything you can imagine is real." This article explores how artists and scientists work together to bring deep-sea knowledge and beauty to a larger audience.



Lexile Score: ~1150

RESOURCES

- Deep Sea Inspiration

OBJECTIVES

- Students will learn how artists represent scientific discoveries.
- Students will obtain information from a nonfiction text.
- Students will research the significance of a piece of artwork that was created to represent an idea, event, or person in American history.

KEY VOCABULARY

- bioluminescent** (p. 28) a living organism that emits light as a result of an internal reaction
- collaborating** (p. 28) to work jointly with others, especially in an intellectual endeavor
- installation** (p. 28) a work of art that usually consists of multiple components, often in mixed media, and that is exhibited in a large space

ENGAGE

Conversation Question: How are we solving the mysteries of the deep sea?

Supply the students with scrap pieces of colored paper to cut into small pieces. Distribute, or have them create, a simple template of a sea creature (fish, octopus, sea star, etc.) and have them create a mosaic. Launch into the reading of the article, "Artists at Sea."

INTRODUCE VOCABULARY

Post and discuss the vocabulary words and definitions. Guide students to notice that all of the key terms have 12 or more letters. Have the students choose one of the words and create new words using some of the letters. (Three-letter words = 1 point, four-letter words = 2 points, five-letter words = 3 points, etc.) Who can get the highest score?

Challenge students to complete this activity with a different "big" word from the article.

READ & DISCUSS

Read the article aloud with the class. Have students reread the article in small groups and answer the questions below. Discuss responses.

- How can art share scientific phenomena with a different audience?
- How do artists participate during deep-sea expeditions?
- What are some of the advantages of representing scientific information through an artistic platform?
- Why do scientists need artists on board when videography is so accessible?

CONCEPT/SKILL FOCUS: Obtaining Information

INSTRUCT: Guide students to obtain information from the text, captions, and photos in the article. Remind them that the article was written to teach readers how artists represent scientific phenomena by becoming part of a scientific team. Introduce the *Deep Sea Inspiration* graphic organizer and instruct students to record relevant data in the appropriate sections.

ASSESS: Review the information that the students recorded on their charts. If errors are noted, redirect the students to make corrections.

EXTEND

Social Studies Discuss with students that just as artists are inspired by science, they are also inspired by history. Show the students some famous works of art (*Washington Crossing the Delaware*, *Raising the Flag at Ground Zero*, Mount Rushmore, etc.) that were created to represent important people and places in time in American history. Have students choose a historical artwork and write a research paper that explains its significance. Include a copy of the artwork.

Deep Sea Inspiration

Obtain information from the article, “Artists at Sea,” to complete the chart.

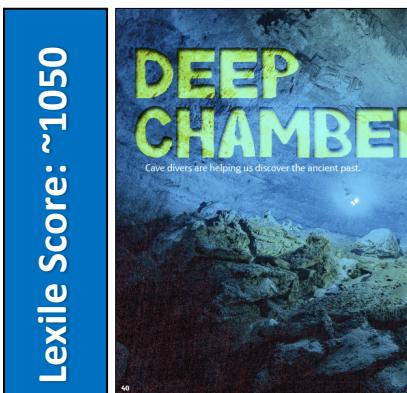
Artist	Name of Art Installation	Medium (Material)	Explanation of Project
Rebecca Rubenstein			
Karen Romano Young			
Adam Swanson			
Lizzy Taber			
Michelle Schwengel-Regala			

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Deep Chambers

pp. 40–45, Expository Nonfiction

Dive into this article and explore the deep chambers of the limestone caves beneath Mexico's Yucatan Peninsula. Students will learn about the process of the dive, the discovery of ancient artifacts, and the three-dimensional plan to preserve the site.



RESOURCES

- Cave Curiosities

OBJECTIVES

- Students will learn how cave divers are helping us discover the ancient past.
- Students will study the processes utilized to explore and preserve underwater caves.
- Students will solve and create mathematical word problems based on information in the text.

KEY VOCABULARY

- decompression** (p. 43) a process where divers carefully breathe out nitrogen gas to reduce air pressure
- epoch** (p. 44) a period of time that is a subdivision of a period
- photogrammetry** (p. 45) a tool that blends large numbers of photographs into three-dimensional digital maps

ENGAGE

Conversation Question: How are we solving the mysteries of the deep sea?

Allow the class to share knowledge about cave diving by creating a K-W-L (Know-Want to Know-Learned) chart on the board. Have students contribute any prior knowledge to the “know” list and record anything that they would like to learn in the second column. Revisit the chart at the conclusion of the lesson to complete the last column.

INTRODUCE VOCABULARY

Post the title of the article, “Deep Chambers,” and tell students that the key words relate to the content of the article. Ask them to predict how these words might be used when discussing underwater caves.

READ & DISCUSS

Read aloud the following questions prior to reading the text. Advise the students to note where in the article these answers are found. Discuss responses to the questions as a post-reading activity.

- What happened to most caves when warming temperatures melted much of the world’s glacier ice?
- What did divers discover when they entered Hoyo Negro?
- Why didn’t explorers tell anybody about their discovery for a few years?
- How do the recovered artifacts shed new light on the life in the ancient Yucatan?

CONCEPT/SKILL FOCUS: Studying Processes

INSTRUCT: Guide students to articulate that the main idea of this article is to explain how cave divers are playing an important role in solving the mysteries of the deep sea, as well as answering questions about ancient civilizations.

Distribute the graphic organizer, *Cave Curiosities*, and tell students that they will be using information from the article to study the processes necessary to make such underwater discoveries possible.

ASSESS: Circulate and discuss the article’s content with students. Collect and examine graphic organizers to further evaluate individual understanding of the studied process.

EXTEND

Mathematics On page 45, the article states, “So far people have mapped 800 miles/1,290 km of underwater passages in the Yucatan Peninsula. It is estimated that there’s at least twice that much remaining to explore.” How many miles/km remain to be explored? What is the total distance of underwater passages in the Yucatan Peninsula? Instruct students to use the RDW (Read-Draw-Write) process to express their answers. Have them use other measurement data from the article to create their own word problems for classmates to solve.

Cave Curiosities

Use information from the article, “Deep Chambers,” to describe the processes below.

Explain how divers discovered Hoyo Negro.

Explain the advanced training and the process of the dive.

**Deep
Chambers**

Explain the information that was gathered about the artifacts recovered in Hoyo Negro.

Explain the high-tech plan for preserving Hoyo Negro.