



## **LESSON FOUR: BURIED TREASURE BENEATH THE SANDS**

### **DURATION**

45 - 60 minutes

### **OVERVIEW**

Students will learn about archaeology and artifacts. By using examples of everyday objects, students will determine what objects and materials will survive in a saltwater environment and how they react in the ocean. Students will learn about artifact recovery and conservation in underwater archaeology by following an object's journey from the past into a modern museum.

### **SKILLS AND LEARNING STANDARDS**

The following learning standards are addressed:

**2-PS1-1 Describe and classify different kinds of materials by observable properties of color, flexibility, hardness, texture, and absorbency.**

**2-PS1-3 Analyze a variety of evidence to conclude that when a chunk of material is cut or broken into pieces, each piece is still the same material and, however small each piece is, has weight. Show that the material properties of a small set of pieces do not change when the pieces are used to build larger objects.**

**4-ESS1-1 Use evidence from a given landscape that simple landforms and rock layers to support a claim about the role of erosion or deposition in the formation of the landscape over long periods of time.**

**5-PS1-2 Measure and graph the weights (masses) of substances before and after a reaction or phase change to provide evidence that regardless of the type of change that occurs when heating, cooling, or combining substances, the total weight (mass) of matter is conserved.**

**5-PS1-3 Make observations and measurements of substances to describe characteristic properties of each, including color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility.**

## ESSENTIAL QUESTIONS

How do we learn things about the past? What does an archaeologist do? How is underwater archeology different from archeology on land?

## OBJECTIVES

By the conclusion of the lesson students will be able to:

- Understand how science and history work together as archaeology
- Discuss what an artifact is and how artifacts are recovered
- Discuss the physical properties of objects

## LESSON BACKGROUND

As discussed in the previous lesson, one important way we learn about the past is through **primary sources** - information that was produced/documentated by people who lived during a time period of interest. A second important source of information about the past comes in the form of material objects left behind by people in the past. These objects, called, ‘**artifacts**,’ are recovered and studied by **archaeologists** in order to gain insight into human history and culture.

What the objects are made out of determines how they will survive over time. A lot of objects don't become artifacts because they don't survive from the past to today. The artifacts that archaeologists find tell a narrative about the people that used these objects. Sometimes we only see part of the picture because we only have some of the artifacts.

The objects at the Whydah Pirate Museum were on a ship in the ocean. When the ship wrecked and sank into the water, all of the objects ended up on the ocean floor or were brought onto the beach by the ocean currents and waves. The objects remained underwater for almost 300 years before they were discovered by divers.

This process is where underwater archaeology differs from archaeology on land. Artifacts that have been on dry land from the time they stopped being used by the people of the past to when they were rediscovered by modern people do not undergo the same changes as artifacts that have been in the ocean.

When an object that was not designed to be **waterproof** or **water-resistant** is exposed to water, the object undergoes a chemical **reaction**. This reaction breaks down the **material** of the object as it is submerged. The physical and chemical **properties** of these materials will determine how that object reacts in the water.

In the ocean—a saltwater environment—these reactions are different. Saltwater and freshwater have different properties. The main effect this has on shipwrecked artifacts is that the salt is very **corrosive** to these objects. Underwater environments present a challenge to archaeologists because the artifacts need to have special treatment before they can be allowed back into the air.

Many artifacts are recovered from the ocean inside a **concretion**. Concretions are hardened aggregates of sand, clay, rock, and even seashells from the ocean floor. They form around man-made objects because of a chemical reaction between the salt in the sea water and the materials of the objects themselves (primarily iron). These hardened lumps may look like rocks, but x-rays can reveal the artifacts hidden inside.

The water and salt that are absorbed by these artifacts over time while they are in the ocean need to be gradually removed upon recovery from the sea. This process is called **conservation**. Artifacts recovered from land and the sea all have to go through conservation, but underwater conservation may take a much longer time to complete because of all of the damage caused by the absorption of the water.

Not everything from the *Whydah* survived after centuries underwater. Many fragile objects, such as paper, maps, and books, as well as organic material like food and even the pirates' bodies, are not recovered by archaeologists. Some iron pieces are too rusted to be **preserved** and put on display, much of the wood from the ship has rotted away.

Sometimes removing, or **excavating**, an object from the concretion is impossible.

The Whydah Pirate Museum displays the artifacts from the *Whydah Galley* that have been recovered, cleaned, and preserved. As you go through the museum (or virtual tour) think about what objects are on display. What sort of things do you expect to find on a pirate ship? Think about what objects have survived and what objects are not on display and why that is. What story do these artifacts tell us about history based on what has made the journey from past to present?

## GLOSSARY

Archaeologist	a person who studies human history through the excavation and examination of physical objects from historical sites
Artifact	an object made by a human being, typically used to specify an item of historical importance
Concretion	a hard solid mass formed by the accumulation of matter, particularly sediment such as sand and dirt in the presence of iron
Conservation	the preservation, repair, and prevention of deterioration of archaeological, historical, and cultural sites and artifacts
Corrode	destroy or damage slowly by chemical reaction
Deteriorate	become worse, get damaged, decay
Excavate	dig or remove materials
Material	the matter or substance from which a thing is made

Preserve	treat or prepare an object in its current state to keep it intact and prevent decay
Primary Resource	Information (e.g., from books, newspaper articles, maps, testimonies) recorded by people who were alive during the time period being studied
Properties	characteristics of an object, can be physical (size, shape, color, density) or chemical (flammable, corrosive, reactive)
Reaction	a chemical process in which different materials act on each other and are changed in the process, this can cause physical and/or chemical property changes
Waterproof	not allowing water to pass through; a material not damaged by water
Water-resistant	able to partially stop water from passing through; a material that could be somewhat damaged by water

#### ACTIVITIES:

##### **Physical Properties of Objects**

This activity will provide a visual representation of what an artifact can be.

##### **Materials:**

A selection of everyday objects

##### **Task:**

Select a variety of objects - different sizes, materials, and functions. Discuss what materials each object is made of and what it is or what it does. Try to have a variety of examples that are all one material (wood, plastic, glass, ceramic, etc.), made of two or more materials (wood and metal, plastic and metal), organic (plants, food) and inorganic. Based on the properties of these objects, discuss which things would survive on land, which will survive in the water? Will they last 10 years? 50 years? 100 years?

##### **How Do Objects Settle in the Ocean?**

This activity will demonstrate the density of objects compared to the environment.

**Materials:**

A rectangular fish tank or similar clear-sided container

Sand, clay, rocks

Water

Objects of various weights and materials (marbles, coins, rubber duck (something that floats), wooden sticks/twigs, shells, etc.)

**Task:**

Fill the tank with clay and sand, add water but leave a large space at the top. Place the objects into the simulated ocean. Shake the tank back and forth to simulate ocean movement. See where the objects settle - which things sink, which float, which are heavier than others. Do some pieces keep moving, or do they stop at a certain depth as they move through the sand?

**What Do Your Artifacts Tell About You?**

This activity will teach students to think about how history is learned.

**Materials:**

Students' backpacks and contents (Alternatively, for distance learning, ask students to collect a handful of different items from their households).

**Task:**

What objects from their own backpacks will survive over time? What if their backpack ended up in the ocean? What would archaeologists be able to learn about a person based on what objects they found? Theoretically students will have papers, books, pencils, ipads/phones (they wouldn't work after being in the water, or even a long time on land without power - what would historians think of this technology?), lunch/snacks, and toys.

**From Object to Artifact**

In this activity students will create a diagram of the journey of an object on board the *Whydah*.

**Materials:**

Paper/poster  
Art supplies

**Task:**

Create a diagram of an item as it goes from everyday object to an artifact in a museum. The diagram should follow this pattern and include the corresponding questions to trace that specific object the students choose: The object arrives on the pirate ship, how did it get there? What country did it come from, was it traded for other goods? Did it come from another ship and was then stolen by the pirates who brought it aboard the *Whydah* when they captured her?

The *Whydah* sank into the ocean off of Cape Cod and all of these objects went to the ocean floor, where they sat for many years. Divers recover the objects, where many have become transformed into unrecognizable shapes trapped inside concretions. The concretions are x-rayed to see what is inside and are moved into tanks of water on land to keep them preserved until they can be excavated.

Archaeologists will excavate the objects, some of which may be stuck together inside the concretion. They remove the sand and debris from around the objects (see image below) and then the extracted pieces are cleaned. From the cleaning stage the object undergoes preservation where it is stabilized and sealed to prevent further damage to the pieces. These artifacts are then put on display in the museum.

*A concretion in the midst of being excavated. Silver 'cobs' (coins) can be seen protruding from the side.*



### **Bonus Exercise:**

Have students look up pictures of artifacts from different archaeological sites. For each artifact, instruct students to write an 'artifact card' that describes the artifact, to include categories such as shape, color(s), composition, age, location. Ask them to consider what factors enabled each artifact to survive over time and become part of the archaeological record. For example, the image below shows artifacts recovered from the Whydah shipwreck. What explains the survival of a delicate material like the embroidered silk ribbon? (Answer: It was wrapped around the pistol - When the iron barrel interacted with salt water, it formed a large concretion that covered



the ribbon and protected it from sources of degradation like bacteria, sunlight, etc.).

