

ROBERSON MUSEUM AND SCIENCE CENTER

Post-Visit Link: Undersea Exploration and the Titanic Artifact Conservation & Becoming a Museum Curator

Grade Level: 3rd - 7th

New York State Learning Standards: M S & T 1, 2, 4, & 5

Pennsylvania Learning Standards: S & T 3.1, 3.2, 3.6 & 3.8

Objectives: Students will learn about Edwin Link's contribution to undersea exploration and then study modern day undersea exploration using the case study of the R.M.S. Titanic that sank on April 14, 1912. Today the undersea explorer Robert Ballard, who found the Titanic in 1985 and returned to the site in 2004, has provided us with a wealth of knowledge concerning how we think the ship sank as well as conducting scientific analyses of its deterioration and of the many artifacts left behind. The students will also conduct an experiment that illustrates the conservation and restoration of artifacts.

Materials:

- Old Photograph
- Salt water
- Container such as a bowl or a jar
- Paper Towel
- White paper
- Paper clips
- Pencils
- Tape
- Glue
- Staples

Procedure:

Part I: A Discussion of Undersea Exploration

1. During the 1950s, the inventor Edwin Link began to turn his creative interest toward undersea exploration. "So little is known about the potential of the ocean", he said, "yet it is bound to be enormous".
2. Link and his wife Marion began sailing and treasure hunting, first as a hobby, which later quickly became serious archeological research. Link began to develop vehicles to explore the ocean's depths.
3. Robert Ballard (born: June 30, 1942) is another American undersea explorer, marine scientist and a U.S. Naval officer who has been on over 65 underwater expeditions in submarines and deep diving submersibles. His most famous find was the R.M.S. Titanic in 1985. At the time of its discovery, Ballard did not have the technology to explore her hull and locate artifacts. He returned, however, in 2004 with remotely controlled submersible vehicles equipped with cameras and robotic devices that revolutionized undersea exploration.
4. Ballard was first able to find the Titanic using sonar. He then sent down a submersible name ALVIN. ALVIN carries along with it a remote controlled vehicle called ARGO that explores the sea down to 20,000 feet and captures video signals and broadcast live, two-way satellite information to schools and museums. ARGO is also capable of collecting artifacts and brings them back to the surface.

5. About the Titanic: The Titanic, a trans-Atlantic ocean liner, was designed to set new standards of luxury for those who could afford to travel in style. The cost to build the Titanic in 1912 was \$7,500,000.00. In today's dollars that would be over \$400 million dollars. No expense was spared.
6. Today, the Titanic and its contents have endured in a harsh under water environment. Salt water, high pressure and acidic sediments have taken their toll. The ship itself is disappearing beneath tons of rust. Artifacts brought to the surface deteriorate quickly unless immediate steps are taken to preserve them.
7. The Titanic was covered with rust which forms when iron corrodes. Since iron corrodes naturally in salt water, no one was surprised to see signs of rust on the Titanic. Much of the rust was in the form of reddish brown stalactites, which scientists named "rusticles". No one paid much attention to these structures until a good bit of the ship caved in. This meant that the structural integrity of the ship was weakening over time. Many microbiologists began to study the theory that rust eating bacteria were eating away at the ship and at the artifacts that were present. Tests were done and this was found to be the case. Marine archaeologist on the scene became active and decided that it was time to salvage what they could from the site before it was all gone.

Part II: Becoming an Artifact Conservationist

1. The environmental conditions at the Titanic provide a mixed situation for preserving artifacts. On the good side, the combination of no light, little oxygen and near freezing temperatures aid in the preservation of objects. On the negative side: the bottom silt is acidic, the pressure is 400 times greater than the surface and the electrochemical activity of sea water along with deep sea bacteria that eat at metal have stained and corroded many metal objects.
2. All recovered objects must be treated immediately after they are exposed to air. The surface of some metal objects made of iron can explode, fizzle or steam when exposed to the corrosive oxygen in air. When objects soaked in sea water begin to dry out, the salts that have embedded in them crystallize, taking up more space and causing minute fractures that can rupture the glazes on ceramics. Wood, leather, paper, and other organic objects can also deteriorate quickly if allowed to dry, since bacteria grow more quickly when items are exposed to light and oxygen.
3. As soon as artifacts are recovered from the sea, they are stabilized for shipment. After careful cleaning with a soft brush, they are placed in foam-lined tubs of water and then transferred to a conservation laboratory on land.
4. Once objects arrive at the lab, they are washed repeatedly in water to remove the salts from the surface. Salts that are deep within the object are removed by placing them in electric currents which pull out the salts that carry a charged particle. This object may also be treated with several other chemicals to remove rust and mold and they may be injected with wax to fill in spaces left behind by water. Paper, may be freeze dried, treated for mold and then stored in the dark.

Procedure for Students:

1. Crumple and tear a photograph. Tell the class they are museum curators and that this photograph came from the Titanic. As curators they have been asked to conserve and restore the artifact. How would they go about this task?
2. Define conservation and restoration. To conserve is to protect from further damage and to restore is to make it look as close to the original as possible.

3. Explain that they must first conserve the artifact. Anything that is done to it at this point might damage it further. They must be careful how they handle it. Should they be wearing gloves? Have them brainstorm ideas.
4. The next task is to restore the artifact. What did the photograph look like in its original state? Ask students to brainstorm how they would do this?
5. Divide the class into groups of 2-3 students. Each group will receive the following materials:
 - Small pieces of a photograph soaking in a container of cold salt water.
 - Sheet of plain white paper, randomly torn into 3-5 pieces.
 - Large paper clip bent and twisted.
 - Pencil broken in half.
 - Tape, glue, stapler, paper towels to dry the wet paper.
6. Tell the students that these are important artifacts found at the wreckage site of the Titanic. For each object, students will:
 - Decide what objects originally looked like.
 - Make a plan to restore the object.
 - Use tape, glue, staples or some other method to restore the object so that it looks as close to new as possible.
7. Now turn to the last page in your hand out. It contains some of the real artifacts that Bob Ballard found at the site of the Titanic. Choose five of these artifacts and discuss how you would conserve and restore them. Also tell why you decided on the five you picked as items to put in your museum. Also discuss if there were any objects during their experiment or during this last part of this activity in which they chose objects from the list, that the goal of conservation may have conflicted with the goal of restoration for fear that restoration would damage the object. Ask your students if they think that scientists working with objects from the Titanic may have had to decide to only restore some objects partially so as to conserve them?

Attachments: Artifacts found by Bob Ballard (3 pages)

Developed by: Barbara Betza

Date: June 26, 2008

Student Handout

Inventory of Artifacts Recovered from Three Sites in the *Titanic* Debris Field

Item	Material	Site
pair of wool socks	textile (wool)	00-27
pair of wool socks	textile (wool)	00-27
pair of wool socks	textile (wool)	00-27
pair of wool socks	textile (wool)	00-27
pair of wool socks	textile (wool)	00-27
five linen handkerchiefs	textile (linen)	00-23
silk necktie	textile (silk)	00-23
pair of silk socks	textile (silk)	00-23
cravat	textile (silk)	00-23
four London omnibus tickets	paper	00-27
polka dotted handkerchief	textile (silk)	00-12
red box containing a dropper and a pen	paper, glass, metal	00-27
red box containing a dropper and a pen	paper, glass, metal	00-27
two cotton rags	textile (cotton)	00-12
long john pants	textile (cotton)	00-12
cambray blue work shirt	textile (cotton)	00-27
white cotton work shirt	textile (cotton)	00-27
dress bibb	textile (cotton)	00-23
white cotton long sleeve work shirt	textile (cotton)	00-27
white cotton work shirt with red stripes	textile (cotton)	00-27
man's shirt collar	textile (cotton)	00-23
man's shirt collar	textile (cotton)	00-12
man's shirt collar	textile (cotton)	00-12
three man's shirt collar	textile (cotton)	00-23
man's shirt cuff	textile (cotton)	00-23
four leather suspender brace ends	leather	00-12
silver match box	metal (silver)	00-23
folding pocket knife	metal (brass), wood	00-12
eraser	rubber	00-23
miniature imitation pistol	metal (brass)	00-23
milk warmer with White Star Line logo	metal (brass, copper)	00-23
swivel loupe	leather, glass, metal	00-27
pencil	graphite	00-12
First Class silver plated tureen	metal (copper, silver)	00-12
Second Class soup tureen	metal (copper, silver)	00-12
Second Class blue and white plate	ceramic (earthen ware)	00-12
sink splash with decanter holder	metal (silver), stone	00-23
Third Class sink with drain plug	metal (brass), ceramic	00-27
brown ceramic jug	ceramic (earthen ware)	00-12
brown ceramic jug	ceramic (earthen ware)	00-12
screw down window	metal (bronze), glass	00-23
coal	coal	00-27
lavatory slate	stone	00-12

Student Handout pg 2

Inventory of Artifacts Recovered from Three Sites in the *Titanic* Debris Field

Item	Material	Site
oval port hole with glass	metal (brass), glass	00-12
ventilating port hole	metal (cast iron, bronze)	00-23
ventilating port hole	metal (cast iron, bronze)	00-23
leather travel bag	leather, paper	00-23
dome metal object	metal	00-12
turnbuckle	metal (brass)	00-23
table base	metal (cast iron, brass)	00-12
leather bag	leather, paper	00-23
deck bench armrest	metal (bronze)	00-12
deck bench end	metal (cast iron)	00-12
boiler access plate	metal (bronze)	00-27
bearing liner	metal (babbet metal)	00-27
water boiler	metal (brass, copper)	00-27
large wrench	metal (wrought steel)	00-27
over port hole frame	metal (brass)	00-12
bearing liner	metal (babbet metal)	00-27
watertight shaft	metal (bronze, steel)	00-27
deck light	metal (brass), glass	00-23
glass bottle with contents	glass, paper, cork	00-12
floor tile	textile (linoleum)	00-12
floor tile	textile (linoleum)	00-12
door knob with eschutcheon & hardware	metal (brass)	00-12
floor drain	metal (cast iron)	00-12
lead crystal bead	glass	00-12
gong	metal (brass)	00-12
spigot from folding lavatory tilt sink	metal (brass)	00-12
toilet	ceramic, metal (iron)	00-23
window from officers quarters	metal (brass), glass	00-23
taffeta bag with contents	textile	00-23
leather satchel with initials "JCS"	leather	00-23
pair of leather work boots	leather, metal	00-27
wool jacket	textile (wool)	00-27
wool vest	textile (wool)	00-27
wool suit pants with suspenders	textile (wool)	00-27
white cotton dress shirt	textile (cotton)	00-23
short sleeve wool smock	textile (wool)	00-12
man's left shoe	leather	00-12
gold plated cylindrical tin	metal	00-23
speaking tube	metal	00-23
two large ceramic fuse holders	ceramic, metal (copper)	00-27
large pieces of wood	wood	00-27
glass dish with White Star Line logo	glass	00-23
steering wheel stand	metal (bronze, iron)	00-23

Student Handout pg 3

Inventory of Artifacts Recovered from Three Sites in the *Titanic* Debris Field

Item	Material	Site
beveled gear with shaft	metal (bronze, steel)	00-23
crystal candy dish with White Star Line logo	glass	00-12
Third Class cup with White Star Line logo	ceramic	00-12
Third Class mug with White Star Line logo	ceramic	00-12
bronze base for First Class staircase	metal (bronze)	00-27
wash basin	ceramic	00-12
mustard bottle	glass, cork	00-12
First Class demitasse cup	ceramic	00-12
binoculars	metal, glass	00-23
Second Glass soap dish	ceramic	00-27
Third Class soup bowl with White Star Line logo	ceramic	00-27
cherry toothpaste jar with lid	ceramic	00-12
three silver plated porrigers	metal	00-12
spittoon	metal (copper)	00-12
bath tub hot and cold water fixture	metal (brass)	00-12
small hot and hold water fixture	metal (brass)	00-23
three First Class chamber pots	ceramic	00-23