Come Dive With Us! Georgia Archaeology Month 2017 is a partnership between The Society for Georgia Archaeology (SGA) and the U.S. Army Corps of Engineers (USACE), Savannah District to explore Georgia’s Civil War archaeology. The focus is the wreck of the Confederate ironclad vessel, the CSS Georgia. We invite you and your students to discover this interesting part of our history, while meeting Georgia Performance Standards and Next Generation Science Standards. Come with us as we explore the depths of not only social studies, but science, mathematics, language arts, and broad educational concepts! This educational package was made possible by the generous support of SGA, USACE, and these co-sponsors: Brockington and Associates, Friends of the Georgia Museum of Natural History, Georgia DNR Historic Preservation Division, The LAMAR Institute, and New South Associates.

The CSS Georgia recovery project is the largest and most complex underwater archaeology project in Georgia to date.

From 1868 through the early 1970s the wreck was seen as a nuisance to navigation and channel dredging.

New laws in the late 1970s established protections for the wreck. For the next four decades the U.S. Army Corps of Engineers oversaw archaeological assessments and a recovery plan.

In 2015 underwater archaeologists began the complex mapping and recovery of the CSS Georgia. They used multibeam sonar, GIS, GPS, and an underwater positioning system to map, record, and recover the wreck and its artifacts.

It will take years to conserve the artifacts and recovered portions of the wreck that have been submerged for over 150 years.

Learn about the CSS Georgia project:
CSS Georgia Web Page: http://1.usa.gov/1G6S2Hn

SHEP Web Page: http://1.usa.gov/1fhPEb3
Museum of Underwater Archaeology Web Page: http://www.themua.org/cssgeorgia

At the time of construction, the CSS Georgia was 1 of 5 ironclad vessels developed as “cutting edge weapons” during the American Civil War.

In 1862 the Ladies Gunboat Association in Savannah held local fundraisers and received state-wide donations totaling $115,200 for vessel construction.

Unique vessel design made the CSS Georgia a floating battery that defended Savannah rather than an offensive weapon for the Confederacy.

Confederate troops scuttled the CSS Georgia in 1864 in advance of Union Major General William T. Sherman’s “March to the Sea” and taking of Savannah.

The wreck lay on the bottom of the Savannah River channel until 2015 when underwater archaeologists recovered it.
The WORM That Eats SHIPS

Objectives: Students will learn how *Teredo* worms have adapted to various environments; why they are invasive; why they are an economic and cultural problem; how they represent a transfer of energy in the food chain; the symbiotic relationships within them; and the effect of environmental factors on a species. Students will use the example of the CSS *Georgia* to understand the topics above better.

Materials: “The WORM That Eats SHIPS” handouts (p. 5-6) and the map handout (p.7), one of each for each student; Styrofoam cups (minimum 5 per student); markers, Internet access (if possible); dictionary; paper and pencil for each student.

Georgia Performance Standards:
- CCGPS ELACC4L1
- CCGPS ELACC7RL2
- CCGPS ELACC7L6
- CCGPS ELACC9-10W2, W7
- Science S4L1, S7L4
- HS Zoology SZ4
- HS Biology SB4

Social Studies Skills Matrices
- Map and Globe Skills 12
- Information Processing Skills 2, 3, 5, 7, 11

Reading Standards for Literacy in History/Social Studies
- L6-8RHSS2, RHSS4, RHSS7, RHSS10

Writing Standards for Literacy in History/Social Studies, Science
- L6-8WHST2, WHST4, WHST6

Benchmarks for Science Literary Concepts
- Energy Transformations

Aligns with Next Generation Science Standards (NGSS):
- MS. Matter and Energy in Organisms and Ecosystems
- MS. Interdependent Relationships in Ecosystems
- HS. Interdependent Relationships in Ecosystems

Background
The CSS *Georgia* was an ironclad vessel constructed in Georgia by the Confederacy in 1862. Ironclads were sheathed in iron in an attempt to protect them from enemy vessels firing upon them. Ladies from across the state and the south raised money to fund its construction. The vessel was built of wood and iron railroad rails. This made it too heavy to be propelled by its engine, so the CSS *Georgia* sat in the Savannah River defending the city until December 1864 when Union Major General William T. Sherman took the town on his March to the Sea. Confederate troops sunk the vessel so Union troops would not get it. Several years after the Civil War, and several times during the 20th century, attempts were made to salvage parts of the wreck. During this time, the U.S. Army Corps of Engineers (USACE) dredged the river repeatedly to make the channel deeper. In 2015, the USACE hired underwater archaeologists to excavate the CSS *Georgia* wreck. This was done so that the Savannah River channel could be dredged five feet deeper to allow larger ships coming through the Panama Canal to enter Savannah’s port.

The *Teredo* worm was given its name in 1758 by Carl Linnaeus. It is recognized today as an invasive alien species. In 1733 Dutch zoologist Gottfried Snellius first recognized that it was actually a mollusc and not a worm. *Teredo navalis* grow from 8-24” long depending on their environment.
The WORM That Eats SHIPS

Procedure

1. Have students read the two handouts “The WORM That Eats SHIPS” (pages 5 & 6). Instruct students to list unfamiliar words from the handouts (some are underlined) and use a dictionary or internet source to find (and write down) their definitions. Have students write 1-3 paragraphs summarizing what they have learned about Teredo worms and their environment.

2. Have students put numbers on the map labelling cities, countries, or geographical areas where the Teredo worm was mentioned in the handouts. Number the areas chronologically, based on when the species was first observed.

3. Food Chain/Web – Encourage students to make 3-D food web/chains by using Styrofoam cups to represent each component in the food chain. (They can brainstorm the list or pull from a list on the board that might include entities not related to the food chain.) Items in the Teredo worm food chain might include sunlight, trees, wooden ship, Teredo worms, people. (This is the order of consumption on the food chain, and the order the students will stack their finished cups, beginning with sunlight and ending with people. Don’t put them in order when making the list.) If they are not brainstorming the list, consider adding a few bogus items in the list to make students think.

Instruct students to put the cups on their desk, rim side down. They will use markers to write the name of the entity they select on the outside rim of the cup and then draw an image of it on the cup above the rim. (One entity per cup). When finished have the students stack the cups in the correct order to represent the food chain. Discuss the order with them as a class, along with these discussion questions:

4a. Who/what are the producers, consumers, and decomposers in the Teredo worm’s world?

4b. Ask students to brainstorm the flow of energy as you draw their answers on the board:

- sunlight $\rightarrow$ photosynthesis in tree $\rightarrow$ gives tree energy to grow trunk $\rightarrow$ person cuts trunk and makes a ship $\rightarrow$ Teredo worm eats wood $\rightarrow$ bacteria in worm digests cellulose in wood $\rightarrow$ digested cellulose turns into glucose/sugar giving worm energy $\rightarrow$ worm reproduces $\rightarrow$ person eats worm and gets energy from the food $\rightarrow$ the person uses that energy to cut down a tree to make a boat and the energy cycle starts all over again!

5. Share with students that the CSS Georgia shipwreck mentioned in “The WORM That Eats SHIPS” is located in Savannah, Georgia. It was sunk near the mouth of the Savannah River, which flows into the Atlantic Ocean (see inset on map). The final 45 miles downstream on the river is tidally influenced, so salt water from the ocean is pushed up the Savannah River when the tides come in. This makes the normally fresh water river brackish. The salinity changes due to the tides, and can range from a few parts per thousand (ppt) to 35 ppt, the latter of which approaches ocean salinity.

5a. Ask students to review their two page hand-out and make a list of factors that might be responsible for the sudden presence of Teredo worms on the CSS Georgia shipwreck. Considerations include water temperature, changing salinity levels, dredging soils off of wreck (exposing wood to worms’ larvae), increased ship traffic from foreign countries, and release of foreign ballast water from ships coming from other ports.
5b. Ask the following and brainstorm answers with K-8th grade students. For Middle and High School Students, write the questions on the board and have students write informative/explanatory text incorporating the answers, using the handouts as well as independent research. How can the Teredo worm population be reduced or eliminated in the Savannah River harbor? Some possibilities: require ships to empty their water ballast several miles offshore in the Atlantic Ocean rather than near the Savannah River; work with scientists to develop natural, environmentally safe mechanism for eliminating Teredo worms, try to maintain saline levels in the river that are too low for Teredo worms to survive.

5c. How has the Teredo worm adapted to dangers in its environment? It digs and coats tunnels with calcium deposits, making a strong, secure place to hide from predators, low temperatures, and unfavorable salinity levels. Unlike others, the Teredo has evolved to have bacteria that can digest wood.

6. How does the bacteria, Teredinibacter turnerae, depend on the Teredo for its own survival? Why does the Teredo need the bacteria to live? The bacteria lives within the Teredo, where it thrives. The bacteria enables the Teredo to digest the wood cellulose as sugar/energy and to fix nitrogen so the Teredo can absorb amino acids. This is an endosymbiotic relationship, a mutually beneficial relationship between a host organism and an organism inside the host.

Resources for “The WORM That Eats SHIPS” Activity


Museum of Underwater Archaeology CSS Georgia http://www.themua.org/cssgeorgia, launched April 5, 2016 with new additions to follow


Greetings and Salutations! My name is *Teredo navalis*, but you can just call me Terry. Some call me a naval shipworm. I am NO lowly worm! I am a **mollusc** because I have a shell that opens and closes, kind of like a clam, but a lot smaller. In fact, my shell is at one end and it is so small that most of me hangs out of it! I sure LOVE wooden ships and lots of other wooden things, too. Love to eat them, that is! I don’t know why they call me the termite of the sea. Hey are you hungry or is it just me?

- My shell is for drilling and digging through wood, not for hiding inside! I hide in the long holes I drill in the wood. I coat the holes with a calcium deposit that hardens and protects me from fresh water, ice, air, and things that want to eat me!
- I can’t stand fresh, cold, or hot water! The salt, or salinity must be over 8%. Water temperature must be between 52-59 degrees Fahrenheit.

Wood sure is tasty with all those sugar molecules in its **cellulose**. All that wood could give other shipworms heartburn. Not me, buddy! I’ve got bacteria that uses enzymes to break down the cellulose so I can digest it and to allow the nitrogen to build **amino acids**. Makes a yummy meal for a shipworm!

**REPORT CARD for Terry the Shipworm**

<table>
<thead>
<tr>
<th>Description</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clears the oceans and mangrove swamps of rotting wood</td>
<td>A+</td>
</tr>
<tr>
<td>Provides cool-looking wood that people can make things out of</td>
<td>A+</td>
</tr>
<tr>
<td>Provides food for some people in the Philippines, Vietnam, and other parts of Asia</td>
<td>A+</td>
</tr>
<tr>
<td>Eating ships, wharves, and docks since 3000 B.C. through today</td>
<td>F-</td>
</tr>
<tr>
<td>Spreading around the world, even in places not lived in before</td>
<td>F-</td>
</tr>
</tbody>
</table>

**Bonus** The scientific name for the bacteria inside Terry is *Teredinibacter turnerae*. Research the bacteria. Why it is called endosymbiotic? What is one of its enzymes, cellulase, derived from? Why is it used on stonewashed denim jeans, in laundry detergents, and maybe in biofuels?
Greeks, Phoenicians, and later Romans spread wax, tar, and lead on the hulls of their wooden ships, trying to keep *Teredo* worms from eating them.

A “plague” of *Teredo* worms destroyed enough wooden dikes in the Netherlands to cause flooding and threaten the country, which replaced them with stone dikes.

French engineer Marc Brunel patented a mechanical method of tunneling under the Thames River in England. His method was based on the *Teredo* worm using its fine-ridged shell to drill while not being crushed. The design is still in use.

*Teredo* worms in San Francisco Bay destroyed a major wharf or pier every week for two years. Damage in 1919-1921 cost between $2-$20 billion in today’s dollars.

Underwater archaeologists dive on the Civil War CSS *Georgia* wreck in the Savannah River in Savannah, Georgia.

U.S. Army Corps of Engineers dredged river channel around CSS *Georgia* wreck.

For the first time, underwater archaeologists document *Teredo* worm-eaten wood on the CSS *Georgia* shipwreck.
**Objectives:** Students will: learn about corrosion, conduct an experiment, make a solution, create an electrochemical reaction, observe oxidizing and reduction, and discover relationships between ions, electrons, and currents.

**Materials:** Handouts in this lesson (p. 9 - 10) as appropriate for grade level/abilities. See experiment on p. 11 for materials list.

**Procedure:** Introduce background information to students. Have upper grade level students read handouts (p. 9 - 10); assist middle grade level students in understanding the handouts. Lead a class discussion (for upper and lower grade level students) about those two handouts and big-picture concepts. Distribute handout (p. 11) and materials for experiment. Allow students to conduct the experiment. Lead a classroom discussion about the results and the scientific rationale behind the results. Discuss how the experiment and molecular results would have differed depending on what was used at the cathode (i.e. instead of a penny, iron or instead of a penny, nothing – as in the electrolysis of water).

**Background**

The CSS **Georgia** was an ironclad vessel constructed in Georgia by the Confederacy in 1862. Ironclads were sheathed in iron in an attempt to protect them from enemy vessels firing upon them. Ladies from across the state and the south raised money to fund its construction. The vessel was built of wood and iron railroad rails. This made it too heavy to be propelled by its engine, so the CSS **Georgia** sat in the Savannah River defending the city until December 1864 when Union Major General William T. Sherman took the town on his March to the Sea. Confederate troops sunk the vessel so Union troops would not get it. Several years after the Civil War, and several times during the 20th century, attempts were made to salvage parts of the wreck. During this time, the U.S. Army Corps of Engineers (USACE) dredged the river repeatedly to make the channel deeper. In 2015, the USACE hired underwater archaeologists to excavate the CSS **Georgia** wreck. This was done so that the Savannah River channel could be dredged five feet deeper to allow larger ships coming through the Panama Canal to enter Savannah’s port.

Underwater archaeologists excavated thousands of artifacts weighing many thousands of pounds. Many of them are metal and require conservation or else they will rust away. Archaeologists at the conservation lab will perform electrolysis on the iron artifacts so that they can be studied and exhibited. Large pieces, like iron cannons, will take several years of electrolysis and conservation to stabilize and protect them.
Shackles
Underwater archaeologists excavated these leg shackles from the CSS Georgia shipwreck. The wreck was in the Savannah River, in Savannah, Georgia. It is likely that the shackles were put on the legs of sailors who tried to desert, forcing them to stay on the miserably hot, leaky, noisy vessel.

The image on the far left shows what the shackles looked like when brought up from the river after being submerged since 1864. The image in the middle is an X-ray of the shackles, showing what the shape really looked like under all the rust. While it looks sturdy, only the outside shell of the shackles, remained. Most of the metal had rusted away. Archaeologists treated the hollow iron remains as a mold, and filled it with a synthetic material. They removed the rusty iron shell, revealing a cast of the mold. The image on the far right shows this cast, which is what the shackles would have looked like when they were used during the Civil War.

This cannon was one of several recovered by underwater archaeologists from the CSS Georgia wreck. Once removed from the water and exposed to air, metal artifacts like this corrode quickly. In order to stop the corrosion and see the artifacts in greater detail, iron objects like this were sent to a conservation lab. There conservators conducted electrolysis on the rusty metal.
Electrolysis
If corroded artifacts still contain a large amount of their original metal, archaeologists often can clean and conserve them using a treatment called **electrolysis**. This is a method that uses an electro-chemical (electrical AND chemical) reaction to treat rust by turning it into iron. Electrolysis uses an electric current to drive a non-spontaneous chemical reaction.

Electrolysis creates a closed electric circuit. A container is filled with a solution made by mixing sodium bicarbonate (baking soda) and water. This makes a slightly basic solution (rather than an acidic solution) that works well on rusted iron and also helps conduct electricity through water. (Water alone has a high resistance to electric current. Dry baking soda is sodium bicarbonate, NaHCO₃, and does not conduct electricity UNTIL it is dissolved in water.) The solution works because when the baking soda dissolves in water, it makes positive and negatively charged ions. These ions move through the solution making an electrical current (the same way electrons make a current when they move through a wire). This solution is called the electrolyte and produces these gasses: hydrogen (H₂), oxygen (O₂), and carbon dioxide (CO₂).

After the solution is made, the corroded artifact is suspended in the solution and connected to the negative end of a battery. This electrode is called a cathode. A piece of scrap iron/nail is suspended in the same liquid across from the artifact. The scrap iron is connected to the positive port of the battery. This electrode is called the anode. You have made an electrolytic cell, in which positive and negative electrodes are in a solution containing positively and negatively charged ions. This arrangement creates an electric current (electrons) that passes through the liquid and results in chemical changes to the metals. This happens when the negatively charged ions (electrons) travel in the current to the anode (positive battery terminal). Meanwhile, positively charged ions travel to the cathode (the negative terminal).

The electrolysis process works because of oxidation and reduction. Oxidation is a chemical reaction that happens when something GIVES Up or LOSES electrons, or oxidizes. When iron metal oxidizes it loses two electrons and becomes ferrous iron, Fe++. If it loses three electrons it becomes ferric iron, Fe++. Reduction is the opposite of oxidation. Reduction is a chemical reaction in which something ACCEPTS electrons. For instance if that ferrous iron, Fe++ was reduced by accepting two electrons, it would become iron metal, or Fe++. Oxygen likes to accept electrons and be reduced, making it oxide or O₂⁻. When oxygen mixes with iron metal, the iron gives electrons to the oxygen and the oxygen accepts the electrons lost from the iron. So the iron is oxidized and the oxygen is reduced. This results in one kind of rust known as ferric oxide, or Fe₂O₃. Whenever something is oxidized, something else must be reduced because electrons have to come from somewhere to go somewhere.

In the electrolysis process, the anode is connected to the positive terminal and accepts electrons. So who is giving up the electrons? The water is oxidizing at the anode surface, giving up electrons and producing oxygen. The bubbles coming from the scrap iron/nail are oxygen. Meanwhile, the cathode is on the negative battery terminal. The negative terminal supplies electrons and the water and the rusty artifact accept them. When they do this, the reduction produces hydrogen. The bubbles coming from the cathode are hydrogen gas. This process turns the orange rust to black iron metal. When the process is complete, conservators immediately dry the artifact and coat it with micro-crystalline wax or other surface coating to keep the rust from coming back. Conservators use electrolysis on other metals in addition to iron.
From Corrosion to Conservation

**Materials:** Corroded objects (penny used here, but a rusty nail would work better), scrap steel (non-galvanized nail used here), 1 9-volt battery, low-voltage plastic wrapped wire, wire stripper (correct size for wire), needle-nose pliers, clear plastic cup, teaspoon, water, baking soda (1 teaspoon per cupful of water), plastic spoons (1 per cup), eye protection, rubber or vinyl gloves (1 set per student). **Procedure:**

1. Gather supplies. Work in well ventilated area. For one plastic cup, a student will:
2. Cut two wires the same length, long enough to reach from the battery over and into the cup, while wrapped around the battery terminal and the penny. Using the wire strippers, cut and then pull the plastic wrapping off of each end. Make sure to bare enough wire so that the end can be wrapped around the penny.
3. Securely wrap the end of each wire to one of the battery terminals. Tighten with needle nose pliers if necessary. Securely wrap the other end of the wire coming from the negative terminal (-) to the object to be cleaned. Securely wrap the other end of the wire coming from the positive terminal (+) to the nail.
4. Write a description of the penny, noting the color and location of any corrosion.
5. Fill cup ¾ with water.
6. Place nail and penny (connected by wire) in water but not touching each other and keeping battery outside cup. (Prop up battery if necessary so objects can stay submerged). Why is there no reaction?
7. Remove nail, penny, and wires from water, being careful to keep wires securely wrapped. Add one teaspoon of baking soda to water and stir until dissolved. Repeat Step 6. What do you observe? What is happening?
8. After 15 minutes and again after 30 minutes pull wire out with penny on it. Make written observations about changes you see. When you think all the corrosion is gone, rinse off the penny and write down what happened. Try to explain it on a physical, chemical, electrical, and molecular level.
From Corrosion to Conservation

Resources
Museum of Underwater Archaeology
CSS Georgia
http://www.themua.org/cssgeorgia, launched April 5, 2016 with new additions to follow.

Rick’s Woodshop Creations
“Electrolysis”

Texas A&M, Center for Maritime Archaeology and Conservation

Above left and right: Hardware from the gun carriage of a cannon. Left shows before conservation, right is after conservation (USACE, Savannah District; William Wilson).

Below left: Image shows location of the hardware (“eye” tackle) on a cannon carriage. (USACE, Savannah District).
Brown Water Scavenger Hunt

Have students use the 2017 Georgia Archaeology Month Poster (front and back) to answers these questions:
1. What metal was used on the outside of the CSS Georgia ship to protect it in battle?
2. Why was this a good or bad idea?
3. Name two ways that CSS Georgia artifacts were damaged by being underwater.
4. Who paid to have the CSS Georgia ship built?
5. How did archaeologists “see” the wreck in dark brown water?
6. How many female archaeologists can you count on the poster?
7. Why did Confederate soldiers sink their own ship?
8. On a separate piece of paper, draw a picture of what you think the crane on the front of the poster is bringing up from the wreck.
9. On the other side of your picture, imagine you are ANY one of the following characters and write a story about the associated topic. (If possible, get more information for your story from the internet websites listed under the “Learn More” section on the poster.)

A. Underwater Archaeologist: A Week Working on the CSS Georgia Project
B. Confederate Sailor: A Week Living on the CSS Georgia Ironclad Ship
C. Woman in the Ladies’ Gunboat Society: How and Why I Raised Money to Build the CSS Georgia.
D. 9,000 Pound Dahlgren Rifled Cannon: My Life from Manufacture to Aboard the CSS Georgia Ship to 150 Years Underwater

Answers to the 2017 Georgia Archaeology Month Poster (front and back) questions:
1. What metal was used on the outside of the CSS Georgia ship to protect it in battle? Iron/railroad rails
2. Why was this a good or bad idea? Both! It made it strong and therefore difficult for cannon balls and other artillery to shoot holes in it and sink it. But the railroad rails made the vessel so heavy that the engine could not power the ship!
3. Name two ways that CSS Georgia artifacts were damaged by being underwater. Iron artifacts rusted. Wood artifacts got eaten by teredo worms. Salts in the water damaged glass and other items. Barnacles covered the artifacts.
4. Who paid to have the CSS Georgia ship built? The Ladies’ Gunboat Society raised money to have it built.
5. How did archaeologists “see” the wreck in dark brown water? They used sonar (side scan sonar and multi-beam sonar). They used GIS and GPS to see where the divers were on the wreck.
6. How many female archaeologists can you count on the poster? There are at least five.
7. Why did Confederate soldiers sink their own ship? Union troops under Major General William Sherman were coming to capture Savannah, so the Confederates scuttled, or sank the ship to keep the Union from using it.
8. On a separate piece of paper, draw a picture of what you think the crane on the front of the poster is bringing up from the wreck.
9. On the other side of your picture paper, imagine you are one of the following characters and write a story about the associated topic. (If possible, get more information for your story from the internet websites listed under the “Learn More” section on the poster.)

A. Underwater Archaeologist: A Week Working on the CSS Georgia Project
B. Confederate Sailor: A Week Living on the CSS Georgia Ironclad Ship
C. Woman in the Ladies’ Gunboat Society: How and Why I Raised Money to Build the CSS Georgia.
D. 9,000 pound Dahlgren Rifled Cannon: My Life from Manufacture to Aboard the CSS Georgia Ship to 150 Years Underwater
**Ideas for extended study, STEM topics, and Science Fair projects.**

1. What is the engineering involved in the evolution of vessels from wooden sailing warships with small guns mounted broadside to steam-powered, low-freeboard ironclads with screw propellers and large guns and turrets?

2. What chemistry is involved in historic changes to black powder and the invention of brown powder?

3. What affect did the evolution of naval explosive torpedoes and explosive shells have on the evolution of gun size and shape and vice versa?

4. How was the vessel design, the weight of the railroad iron, and the screw propulsion interrelated and what effect did each have on the other?

5. What is the science and technology of steam engines and what laws of science do they represent?

6. What scientific and mathematical principles are involved in archaeologically documenting the CSS *Georgia* underwater?

7. What equipment and technology do underwater archaeologist employ at the CSS *Georgia* and other submerged sites?

8. How does side-scan sonar and multi-beam sonar function and why is this useful for underwater archaeology?

9. How do saltwater inversions in freshwater tidal areas affect the use and results of side scan sonar, multi-beam sonar, and USB underwater GIS technology?

10. What are the principles of SCUBA diving, nitrogen narcosis, and the bends?

11. What principles and laws of science are enacted through the use of air bag lifts?

12. What engineering principles and mathematical formulas are useful and necessary to apply to raising the CSS *Georgia* shipwreck? How do the weight of the casemate and cannons, and the use of a crane on a barge versus on land affect the calculations?

13. What chemistry and physical science is involved in conserving iron, wood, textiles, ceramics and bottles, and other artifacts from the CSS *Georgia*? How do electrolysis, polyethylene glycol, fresh water baths, and other conservation treatments halt deterioration on artifacts and ultimately stabilize and preserve them?

14. How did hydrostatics and hydrodynamics affect the CSS *Georgia* and other ironclads?
Web Sites


The official repository for the CSS Georgia project. Includes primary and secondary documents and resources. The video documentary will be here when completed, and other videos, photographs and images.

SHEP (Savannah Harbor Expansion Project) The US Army Corps of Engineers established two web pages for the CSS Georgia. The duration of the web pages is unknown. Its CSS Georgia Web Page is located at [http://1.usa.gov/1G6S2Hn](http://1.usa.gov/1G6S2Hn) The page that addresses broader harbor expansion issues in addition to the CSS Georgia is the SHEP Web Page located at [http://1.usa.gov/1fhPEb3](http://1.usa.gov/1fhPEb3).


The Society for Georgia Archaeology [www.thesga.org](http://www.thesga.org) has a variety of resources available. Visit them all, and be sure not to miss certain links, such as the link to resources:

[http://thesga.org/category/georgia-archaeology-resources/teacherstudent/](http://thesga.org/category/georgia-archaeology-resources/teacherstudent/)

that has a journal containing a free download of classroom activities and also free downloads of education packets/Lesson Plans from past Archaeology Months. Another page on this website-

contains background info and ideas for archaeology projects for science fairs.

The Society for Historical Archaeology [www.sha.org](http://www.sha.org) has an assortment of useful information throughout. Make sure you visit the part at [http://www.sha.org/EHA/splash.cfm](http://www.sha.org/EHA/splash.cfm) for some fun.


The Southeastern Archeological Center of the National Park Service has history and prehistory content, as well as information about archaeology and underwater archaeology, and resources for teachers at [https://www.nps.gov/seac/hnc/hnc.htm](https://www.nps.gov/seac/hnc/hnc.htm).

Underwater Archaeology Lesson Plans

FPAN (Florida Public Archaeology Network). Classroom archaeology activities, including a shipwreck section: [http://www.flpublicarchaeology.org/resources/](http://www.flpublicarchaeology.org/resources/)


NOAA. Additional underwater archaeology and related lesson plans: [http://oceanexplorer.noaa.gov/explorations/12newworld/background/edu/lessonplans.html](http://oceanexplorer.noaa.gov/explorations/12newworld/background/edu/lessonplans.html).
Additional Teachers’ Resources


Teachers! Take note. Special awards given for archaeology projects in the Georgia Social Studies Fair. Awards sponsored by The Society for Georgia Archaeology and the Georgia Council of Professional Archaeologists. Include $50 cash in junior division and $50 cash in senior divisions. (Awards subject to change.) For more information (and also potential ideas for science fair projects) go to [http://thesga.org/category/georgia-archaeology-resources/science-fair-guidelines/](http://thesga.org/category/georgia-archaeology-resources/science-fair-guidelines/).

Books for Children and/or Young Adults

Ballard, Robert

Blackman, Steve.

Glatthaar, Joseph

Hackwell, W. John
1988 *Diving to the Past: Recovering Ancient Wrecks*.

Lampton, Christopher

Macaulay, David

Schiller, Herbert M.

Smith, KC

Underwater archaeologists prepare to dive on the CSS *Georgia* wreck in the Savannah River.