Underwater Archaeology and the Confederate Submarine *H.L. Hunley*

Robert S. Neyland,
Underwater Archaeology Branch, Department of the Navy, Naval Historical Center, 805 Kidder Breese St, SE, Washington Navy Yard Washington, DC  20374-5060

Underwater Archaeology as a Scientific Pursuit

Underwater archaeology is an interface between science and history. Materials recovered from archaeological sites are more than just ancient artifacts and objects; they are sets of data that can help us answer many questions about the evolution and development of human culture, technology, and the interaction of different peoples with each other and their environment. The study of archaeological occurrences from our more recent past enables archaeologists and historians to compare the written archival record with physical evidence left in the ground and under the sea. In the case of submerged sites, the assemblage of archaeological material can be more complete than that retained by sites above water. This is due to the fact that archaeological sites such as shipwrecks or sunken cities are often the result of a single catastrophic event rather than the gradual accumulation of discarded material such as daily refuse.

Underwater archaeology is a rapidly developing specialization in the broader spectrum of archaeology; currently, work is being conducted in every ocean and major body of water off the coast of virtually every country. Inland waterways are also being studied. In the United States, for example, states that have do not have a coast possess rivers and lakes that contain submerged cultural materials. Underwater archaeology, more than any other sub-discipline of archaeology, is heavily dependent upon technology. Areas within underwater archaeology that employ the use of cutting-edge technological innovations include SCUBA diving, survey, mapping, and conservation.
History of H.L. Hunley

The Confederate submarine H.L. Hunley is an example of a shipwreck lost with all hands at the moment of its success in war. It represents an early submarine prototype and a wartime secret weapon for which no accurate plans or accounts existed prior to its discovery. It was a technological marvel, very much ahead of its time. Shipwrecks are usually described as time capsules. This description is especially true for Hunley, since two closed hatches and an intact iron hull essentially encapsulated its interior.

Hunley was the third in a line of submarines built by a group of investors and southern patriots. Both of its predecessors were scuttled or lost without ever seeing battle. The first was built in New Orleans, but was scuttled and abandoned when that city surrendered to Federal forces. The team of engineers and investors, led by Horace Lawson Hunley, a New Orleans lawyer and patriot, moved operations to Mobile, Alabama where they built yet another submarine. While in Mobile, the members of the submarine program were under the direction of the Confederate Secret Service. The second prototype, known as Pioneer II, was later lost while being towed outside of Mobile Bay. Although the loss of the second submarine prototype was a setback, the group remained undeterred and quickly constructed a third vessel. This submarine would later bear the name of Horace Hunley.

Shallow waters and the great distance between land and the Union blockading fleet made it impossible to successfully employ the submarine in Mobile Bay. General P.G.T. Beauregard, commander of the military defense of Charleston, South Carolina, requested that the submarine be transferred there to strike at Union ships and lift the blockade of that port. The submarine arrived in Charleston in 1863 and was put through a series of trials. Tragically, it sank on two separate occasions with the loss of 13 crewmembers. The second sinking claimed the life of Horace Hunley and members of the engineering team from Mobile. General Beauregard, although discouraged, allowed the submarine to be raised and deployed again with a new volunteer crew. The submarine was put under the command of Lt. George E. Dixon, a Confederate Army engineer from Mobile who had worked on a steamboat prior to the war, and was reputed to exhibit great courage. Dixon was convinced that the submarine could successfully attack and destroy enemy ships. He put his volunteer crew through rigorous training in preparation for an assault on one of the Federal blockade vessels.

On the evening of February 17, 1864 the submarine left Battery Marshall, a Confederate gun emplacement located at Breach Inlet on Sullivan’s Island. Hunley’s commander steered a course for USS Housatonic, a 207-foot steam screw sloop-of-war. At about 8:45 p.m. Hunley’s screw planted a barbed torpedo in the starboard after side of the Housatonic’s hull and backed their
vessel away. A member of the crew then pulled a lanyard and detonated the explosive charge. The torpedo was attached well beneath the Housatonic’s waterline and the hole that resulted from the explosion caused the ship to sink in a matter of minutes. Members of the Housatonic’s crew reported that the hole was so large that the officers’ wardroom furniture floated out of it. Luckily for the crew of Housatonic, the ship was anchored in 30 feet of water. Although the ship’s hull sank to the bottom, its masts and rigging still protruded from the water and the crew was able to cling to it until rescued. Only five men died aboard Housatonic. From their position in the wreck’s rigging, Housatonic survivors saw a blue signal light waved from one of the submarine’s conning towers. Confederate sentries ashore also reported seeing the blue signal light and in response lit a bonfire for the submarine to navigate home by. These are the last reported sightings of Hunley. The submarine never returned to Breach Inlet. In fact, its resting place when found was only 900 feet to seaward of the wreck of Housatonic.

**Discovery and Responsibility for the Submarine H.L. Hunley**

Hunley was discovered in 1995 by a dive team funded by best-selling author Clive Cussler. The discovery came at the end of a search that spanned almost 15 years. The announcement of the submarine’s discovery initiated discussion about ownership, protection, and responsibility for the wreck remains. Eventually, the United States Navy and the State of South Carolina Hunley Commission were established as the entities that would oversee the submarine’s recovery, excavation, and long-term preservation. The not-for-profit group Friends of the Hunley was formed to create private funding and assist with day-to-day project operations. The South Carolina Hunley Commission was created by legislators to represent the State of South Carolina and was charged with the reburial of the submarine’s eight-man crew.

The federal government was involved because Hunley was once the property of the government of the Confederacy. The Civil War ended with the Confederacy’s surrender to the United States. As victor, the government of the United States became the owner of all Confederate States’ property, including all vessels afloat, abandoned and/or sunk.

**Recovery and Conservation**

The decision was made to recover H.L. Hunley and its crew because the site could not be protected indefinitely from looting while it remained offshore. Well before recovery plans were formulated, various relic collectors made offers for pieces of the submarine. The highest offer for a single piece of Hunley—the submarine’s propeller—reached $100,000. Hunley was (and still is) considered a war grave, and Navy policy dictates that the remains of military personnel should be recovered for identification and burial, especially when it is likely that looters might disturb those remains. The remains of Hunley’s crew are being treated the same as all other U.S. military remains: with dignity, respect, and honor. When identification is complete Hunley’s crew will be buried with ceremony alongside the graves of the submarine’s two previous crews.
Diving For Science 2005 Proceedings Of The American Academy Of Underwater Sciences

Underwater archaeologists determined that the sub should be recovered intact and that the excavation of the interior should be done in a controlled laboratory environment rather than in the swift, zero-visibility waters present off Charleston, South Carolina. The marine engineering firm Oceaneering International, Inc. was contracted to assess available recovery options. The primary criteria for the engineering plan were that the submarine be recovered intact, that it be recovered in the same position in which it was found on the seabed, and that all the archaeological data surrounding the submarine be recovered scientifically. While archaeologists had determined the upper part of the hull appeared to be sound and well preserved, the condition of the bottom of the submarine was unknown. Naturally, important questions arose: Had the submarine’s hull already ruptured and spilled its contents—including human remains—into the open sea? Had some of the crew attempted to leave the sub, but been drowned just outside of the conning tower hatch? Were components of the lower hull—particularly the riveted boiler plates—corroded to the extent that Hunley’s seams would split during excavation or the recovery process?

Some engineering options that were considered and then rejected included recovery of Hunley in a box with a block of sediment around it and removal of the submarine in a simple lifting frame. The first plan was impractical because the soil around the submarine was likely to liquefy if the iron plates for a box were vibrated into the seabed. Eventually a unique recovery system was designed that incorporated the use of a bridge-like supporting structure underneath which the submarine would be suspended using a series of 33 slings. Each sling held a bag that was filled with a two-part foam compound that expanded around the shape of the submarine and solidified in approximately 20 minutes. The slings and foam bags not only supported the weight of the submarine but also provided constant pressure to the hull’s exterior that effectively countered the pressure exerted by the tremendous amount of sediment contained within the hull. On the end of each sling was a load cell that measured the torsion force at that position along the hull. Engineers on the surface advised divers to adjust each sling in such a way that the weight of the submarine was evenly distributed and the outward pressure against the hull from the sediment inside was effectively counteracted.

The ends of the truss (support structure) had to be supported and kept from sinking into the sea bottom. This was accomplished by placing two large steel cylinders called suction piles at either end of the truss. Hydraulic suction was used to sink the 42-ton piles into the seabed. Following the recovery, the suction piles were removed by pumping water back into them. The combined truss and sling assembly containing Hunley was raised from the seafloor by a barge with 6 legs that could be set in the mud and used to jack the
platform above the ocean’s surface. A large crane with a 300-ton lift capacity was located on the barge. This crane was capable of lifting \textit{Hunley} clear of the sea and placing it on a small barge for removal to a conservation facility located on shore.

On August 8, 2000, \textit{Hunley} was successfully recovered and transported to the Warren Lasch Conservation Center in North Charleston, South Carolina. Prior to this event, project staff had spent a year planning and developing the recovery effort, as well as the construction of a world-class conservation laboratory dedicated to underwater archaeology and the preservation of \textit{Hunley}. Recovery alone would eventually cost $2.5 million, and renovations for the laboratory approximately $2.7 million. It is anticipated that the conservation of \textit{Hunley} and its artifact assemblage will take 10 years or longer to accomplish. The annual projected cost will come close to $1 million. The recovery, conservation, analysis, and interpretation efforts necessary to investigate an entire shipwreck are very expensive; and while the initial recovery may seem difficult it is actually the easy part of a shipwreck recovery project. This is why most underwater archaeologists insist that shipwrecks should be preserved in place rather than excavated, recovered, and conserved.

Once \textit{Hunley} was raised from the seabed its transport from sea to shore involved not only archaeologists and engineers, but also the United States Coast Guard and many elements of state and local government and law enforcement. Transport of the submarine to the laboratory became a major media event. A procession of over 500 private boats followed the transport barge into Charleston harbor and thousands of people lined the sides of the Cooper River to cheer \textit{Hunley}’s return home.

\textbf{Archaeology of \textit{H.L. Hunley}}

\textit{Hunley}’s interdisciplinary research team includes archaeologists and conservators from the United States and abroad, as well as leading forensic anthropologists, biologists, geologists, engineers and materials scientists. This extraordinary team of scientists is accomplishing a variety of tasks using 21\textsuperscript{st} century technology, including three-dimensional laser scanning to map the submarine and the positions of artifacts; Magnetic Resonance Imaging (MRI); Computer-Assisted Tomography (CAT) scans; and virtual-reality applications. We have conducted “first-time-ever” research on the effects of industrial radiation and its effects on DNA identification and our conservation team is currently experimenting with new preservation
techniques using cold-plasma reduction and sub-critical fluids. Ultimately, all of the aforementioned may impact the way archaeology and artifact conservation is conducted in the future.

As our investigation of Hunley has progressed, we have discovered a wealth of interesting—and surprising—information about its construction, its mission and its crew. Because Hunley was one of the Confederacy’s most secret weapons, none of its original drawings or plans survived the Civil War. Consequently, very little was known about its construction. The vessel recovered in 2000 differs significantly from the sketches and replicas made of it following the surrender at Appomattox. We have discovered that it is more than just a converted steam boiler; to the contrary, it is a technological marvel with a sleek, hydrodynamic shape that was both practical and elegant. Sophisticated forms of internal machinery, such as a system of hand pumps, valves and plumbing to shift water between the sub’s ballast tanks, were found throughout the hull. Archaeologists discovered a series of iron frames used to stiffen and provide additional integrity to the interior of the vessel. These were never reported in the historical record. The propulsion system of Hunley bears no resemblance to what is presented in archival sources either. Other elements of machinery previously undocumented include a steering mechanism resembling a whipstaff or aircraft joystick, counterweighted propeller shaft complete with hand brake mechanism, a wooden force bellows to pump fresh air into the crew compartment, and an innovative torpedo spar that was attached to the bottom of the prow rather than at the top, as was erroneously reported in historical accounts.

Numerous artifacts discovered within the Hunley’s crew compartment reveal much about the lives of those who operated the submarine. Among other things, these items will assist the identification of each crewmember, offer clues about their respective social status, age, origin, habits and health, and reveal what each man thought was important enough to bring with him on the submarine. The complete inventory of artifacts totals over 2000, and over 5000 samples have been collected as well. Perhaps the most intriguing items were associated with the remains of Lt. George Dixon. For example, the discovery of a mangled twenty-dollar gold coin (discussed later) confirmed historical accounts of Dixon being wounded at the Battle of Shiloh. However, a diamond brooch and ring, perhaps carried for his fiancée, were totally unexpected.

Diamond encrusted gold brooch (left) and ring (right).
While Lt. Dixon carried items attesting to his greater wealth or higher social status, the remainder of the crew carried possessions that suggest a more common sailor or soldier’s life. These artifacts included pipes, pencils, wallets, and the occasional battle souvenir or necessity.

**Excavation**

Following *Hunley’s* recovery, the team of archaeologists, forensic anthropologists, geologists and other specialists initiated plans to enter the hull and excavate the interior of the submarine. Because the submarine was completely filled with sediment, geologists collected samples in an effort to answer questions about the submarine’s loss and what happened to it after it sank and settled on the seafloor. The latter events are commonly referred to as the “site formation processes” by underwater archaeologists. Three holes were discovered in the submarine’s hull, but it is currently unclear if they contributed to the submarine’s loss or resulted from subsequent impacts to the wreck (for example, by anchors dragging into the hull). It is believed that sediment analysis will reveal the answer to these and other questions. Forensic anthropologists and other specialists participated in the planning phase by developing protocols for the documentation, removal, preservation, and analysis of the crew’s skeletal remains.

One of the big problems confronting *Hunley* Project archaeologists was how to enter the closed hull of the submarine without damaging it or the archaeological material that it contained. Even if the hatches were to be opened the small diameter of the conning towers would prevent entry and severely limit the extent of excavation. Scientists wanted to gain the maximum amount of work area with the least amount of damage to the hull. Ultimately, project planners decided to remove every other hull plate on the submarine’s upper surface. This was accomplished by drilling out the rivets holding each plate to the hull and carefully removing the plate. The conning towers and hatches were left alone. Eventually, four upper hull plates were removed; this allowed archeologist to initiate a controlled excavation comprised of extensive mapping and documentation, and the removal of artifacts, skeletal remains, and a variety of samples. Because *Hunley* was stored in a tank of chilled water and the water level in the tank could be raised or lowered, the archaeological team was able to lower the water level during excavation and maximize recovery and documentation efforts. At the close of each day, the tank was refilled with water and the submarine and its contents were completely immersed.
Project archaeologists also had to figure out how to map the distribution of artifacts and samples taken from the sub. This was no easy task, since the shape of the hull—when viewed in cross-section—resembles an egg tilted at a 45-degree. Traditional methods of mapping were inefficient because of the hull’s enclosed shape and restrictive attributes. In order to solve the problem, 21st century technology was employed. A scanning device incorporating the use of lasers was able to generate extremely accurate maps of the submarine’s complete interior and exterior surfaces. The “point clouds” created by the scanning device are comprised of several million individual three-dimensional survey points. Individual artifacts and samples were mapped with a system utilizing laser technology and a computer program that could calibrate distance and angle to a point in order to accurately place it within the hull.

Preservation was excellent inside the submarine. Sediment and isotope studies indicate that Hunley was completely filled with fine silt. The silt created an anaerobic environment that slowed the degradation of iron and organic substances such as wood, leather, bone and textile. Wood and bone were very well preserved. Leather and textiles were well preserved but extremely fragile. Wood, leather, and textile materials have had much of their cellular constituents replaced with water and cannot be allowed to dry out. Ultimately, the water in these items will need to be replaced with a preservative substance such as polyethylene glycol. Surprisingly, human hair and soft tissue (in the form of brain matter) were also preserved in the anaerobic sediments.

The submarine was completely filled with sediment. This sediment contained information that greatly complimented information exhibited by Hunley’s various artifacts. The silt that accumulated within Hunley preserved the submarine and its contents as it rested on the seafloor, while sediment outside the submarine provided clues about the marine environment that developed on and around the hull during the two decades that it took for it to be completely buried. Sedimentary studies explain the site formation process—the filling sequences inside the hull—and provide an understanding of the physical, chemical, and biological processes that occurred on the site. Geologists and other scientists are currently analyzing sediment samples for bacteria, large marine fauna, sediment textual parameters, Fourier grain shapes, microfossils (foraminifera, ostracodes, dinoflagellates, pollen, diatoms), 210PB and Cesium profiles, carbon-hydrogen-nitrogen ratios, and trace metals. These data are critical for developing a timeline of what happened to Hunley after it sank, and will advance scientists’ knowledge of the ocean’s physical, chemical, and biological environments and processes along the inner coastal shelf.
of South Carolina. *Hunley* is also an environmental time capsule that enables us to understand historical, geological, and climatological aspects of the region.

Sediment sampled from inside the submarine may also contain clues about South Carolina’s environment in 1864, as well as the health and diet of the submarine’s crew. Sediment samples recovered from inside the pelvic girdle of each crewmember’s skeleton will be examined for traces of their final meal, evidence of intestinal parasites, and microfossils such as phytoliths (mineralized structures from plant cells), pollen, and starch grains.

**What the Human Remains Can Tell Us**

Osteological studies by forensic anthropologists can tell us many things about *Hunley*’s individual crewmembers. Their skeletal remains reveal age, ethnicity, height, health and, occasionally, occupation. The skeletal remains discovered in the submarine are largely intact and include the small bones of the feet and hands, as well as cartilaginous elements such as the hyoid. Analysis of the osteological remains revealed that the crew was comprised of men ranging in age from their late teens to mid-forties. Carbon isotope analysis revealed that four crewmembers were American and four European born by determining whether the carbon isotope sampled shows a diet rich in corn (American) or wheat (European). Some soft tissue and hair was preserved and samples from these will undergo toxicology analyses. Dietary remains can be recovered from dental calculus and bone samples removed from elements of the crew’s skeletal assemblage will undergo stable isotope analysis. The latter is a common form of analysis for historic period skeletal remains and will provide comparative data for other Civil War-era burials and war graves. This data may also reveal the geographical origin of each crewmember.

Skeletal remains sometimes provide a detailed history of an individual’s injuries. The commander of the submarine, Lt. George E. Dixon, suffered a severe injury at the Battle of Shiloh when a Union bullet hit a twenty-dollar gold coin in his pocket and spun off into his left leg. The left femur of Dixon clearly shows this injury. The skeletal remains of other members of the crew show evidence of old injuries that had healed by the time *Hunley* set out on its final voyage. Pathologies evident in the skeletal remains include vertebral injuries, broken noses and cheeks, and broken bones in the feet and hands. Most of the crew suffered from various forms of dental disease as well. Some of the crewmembers were such prolific pipe smokers that their teeth exhibit grooves where they habitually clenched a pipe stem in their mouths.

Genealogist Linda Abrams researched each individual’s family history to the extent possible and identified possible DNA matches for two crewmembers. At this time, no photographs of *Hunley*’s crewmembers are known to exist. Facial reconstructions have been made, however, using molds taken of all eight craniums and casts were then made from these. The cranial casts were used to create the facial reconstructions of the crew. The crew is identified using archaeology and forensic anthropology. Artifacts such as LT Dixon’s gold coin clearly identified him. Likewise the confederate buttons from the German artillery identified Carlson. DNA comparisons and analysis identified two other crewmembers Collins and
Ridgeway. Carbon isotope analysis based on the difference between wheat and corn diets revealed that four Hunley crewmembers were European. This carbon isotope analysis and historic details such as age furthered the process of elimination, which allowed identification of remaining crewmembers. The facial reconstructions are accurate except for hair and eye color and the shape of the nose and ears.

Should photographs be found, one technique that can be used to match them to a specific set of skeletal remains is photographic superimposition. The technique employs the use of two photographic overlays—one of an individual’s cranium; the other a historic photograph of a person’s face—in order to see if there is a statistical match between the features exhibited by each photograph. Photographs of crewmembers, if found, would add finishing touches (such as eye and hair color, presence or absence of facial hair, and the shape of the nose) to facial reconstructions created from the craniums of the eight-crew members.

Artifacts

The aspect of archaeology that the public often finds most fascinating is a site’s artifact assemblage. There are many dramatic artifacts that have been recovered from Hunley. Perhaps the most significant artifact is the twenty-dollar gold coin found with Lt. Dixon’s remains. Queen Bennett of Mobile, Alabama reportedly gave the coin to Dixon when he left Mobile to fight in the Civil War. The coin deflected a Union bullet during the Battle of Shiloh and saved Dixon’s life. Consequently, Dixon considered the gold coin to be his good luck piece. Following his recovery from the wound, Dixon had the reverse side of the coin engraved with the following words:

SHILOH
April 6, 1862
My Life Preserver
G.E.D.

Dixon not only was lucky, but also was apparently quite wealthy. His personal possessions included a gold ring and brooch set with numerous diamonds, and a gold watch and chain with a gold Masonic watch fob. He carried a pair of leather-covered brass opera glasses, a folding rule, and a penknife.

By comparison, the remaining crewmembers had relatively few possessions. The few objects that they did carry were of little value. The complete assemblage of personal items carried by the rest of the crew consisted of four tobacco pipes, one complete folding knife, one damaged folding knife, a leather wallet may or may not have contained money, and seven canteens. One crewmember carried the dog tag of a Union soldier around his neck. This was evidently a battle souvenir since the man wearing the tag was much older than the Union soldier whose name the tag bore.
The crew also possessed the clothing on their backs. Portions of each crewmember’s clothing were preserved as small fragments. The elements of clothing that provided some of the best information about each individual in the submarine were buttons. Many buttons originated from military uniforms of both the Confederate Army and Navy.

Surprisingly, a number of the uniform buttons originated from Union as well as Confederate clothing. The use of Union clothing by Confederate soldiers was not unusual because uniforms were in short supply in the Southern states and very expensive. Additionally, at least one member of the submarine’s crew, a sailor named Wicks, was a seaman in the Union Navy at the beginning of the Civil War. The first artifact discovered in the submarine’s crew compartment was a Confederate Artillery button. It was located on the bench upon which Hunley’s crew sat. Discovery of the artillery button generated considerable excitement because the historical record indicated that at least one member of the submarine’s crew (C.F. Carlson) formerly served in a South Carolina artillery unit. As the excavation progressed, similar buttons were discovered on and below the bench.
Other artifacts discovered in Hunley’s cramped interior were associated with the function of the submarine and its mission. These items included a gimbaled compass in a wooden box, iron wrenches to work on the sub’s machinery, fragments of a mercury depth gauge, a wax candle in a crude wooden holder, and the ship’s signal lantern. The latter probably generated the blue light reported by eyewitnesses shortly before Hunley disappeared.

Elements of Hunley’s equipment were also revealed during the excavation. Water ballast tanks were found on both the forward and after ends of the submarine. A pipe and a series of valves under the bench on the port side connected these to one another. A rod located underneath the bench enabled Lt. Dixon to control the sub’s rudder in the stern. The steering device consisted of a whipstaff or joystick that could be moved either left or right to steer the sub in the desired direction. Dixon also controlled a lever connected to the submarine’s dive planes. One dive plane was located on each side of the hull’s exterior. Hunley could be safely submerged when Dixon and his crew conducted a series of coordinated actions. These included the introduction of water into the ballast tanks, forward propulsion of the submarine through the water, and controlled depression of the dive planes.

The seven men directly behind Dixon all sat on a bench located on Hunley’s port side and turned a hand crank that was located on the submarine’s starboard side. The space within the hull was so confined that the crew could not sit upright and had to allow the crank handles to pass between their open legs. It was reported that Hunley could travel at four knots under favorable conditions. The crewman located at the aft extremity of the bench manned the pump for the aft ballast tank. The crewman directly behind Dixon—nicknamed “the kid” because he was the youngest member of the crew—operated the forward ballast pump and a large wooden force bellows. The bellows were connected to two three-foot long pieces of pipe (snorkels) that that introduced fresh air into the crew compartment while the submarine traveled on the surface. A series of iron bolt heads were discovered along the bottom centerline of the hull. These were connected to iron keel weights attached to the bottom of the hull. The keel weights could be dropped in an emergency in order to lighten the sub and allow it to rise to the surface.

**Conservation: The Long Haul**

A great deal of work has gone into making the recovery and excavation of Hunley a success. However, the greatest challenge to the project—the complete conservation of the submarine and its artifact assemblage—remains to be accomplished. To conserve Hunley’s iron hull conservators must remove chlorides (corrosive salts) embedded in the submarine’s various structural components. This is typically accomplished by immersing the submarine in a solution of sodium carbonate or sodium hydroxide with a relatively high pH. Another process, which incorporates the use of a low-amperage electric current and sacrificial metal anodes, is sometimes applied to speed up the elimination of chlorides. It is estimated that this process will take approximately seven to ten years to completely remove all of the corrosive salts in Hunley’s hull. If these chlorides are not removed the submarine’s corrosion rate will accelerate, causing the metal of the hull to exfoliate. Unchecked, the process will eventually destroy the hull. Some of Hunley’s hull components (such as the wooden bench...
and glass viewing ports) will have to be disassembled in order to conserve them separately. Separate conservation of these items will prevent their destruction by the caustic solution used to treat the iron hull. Shoes, textiles, and personal artifacts will all be carefully treated so that their information potential is not lost. A team of conservators is currently developing a comprehensive plan to conserve Hunley and its unique collection of artifacts.

**Interpretation**

Many questions about Hunley remain to be answered. Although the remains of each crewmember have provided numerous clues about their lives, the identities of most have still not been confirmed. The life of Lt. Dixon, the only positively identified member of the crew, is largely unknown prior to his arrival in Mobile, Alabama in the early 1860’s. How well Hunley operated as a seagoing vessel has yet to be determined. This will be accomplished by a thorough analysis of the hull’s hydrodynamic elements and its equipment. Of course, the greatest mystery surrounding Hunley is why it and its crew never returned to shore. Presently, no positive explanation for the submarine’s loss has been found. Careful examination of Hunley and its equipment, combined with geological analyses and the forensic study of the crew’s remains, will undoubtedly solve the mystery of what happened to the submarine on that fateful night in February 1864.

The H.L. Hunley and some of its artifacts—including Lt. Dixon’s gold coin—are currently on display at the Warren Lasch Conservation Center. Tours are available to the public every Saturday and Sunday. To date, approximately 100,000 people have visited the Warren Lasch Conservation Center to view Hunley and its associated material. Ultimately, the submarine will be displayed at a major maritime museum in the Charleston area where its story will be prominently displayed and interpreted.