

DEEP SEA TREASURE HUNTING

Part II by Robert Marx

Gone are the days when divers combed shallow reef-strewn waters searching visually for shipwrecks. Space Age technology now makes it possible to locate and salvage shipwrecks at any ocean depth.

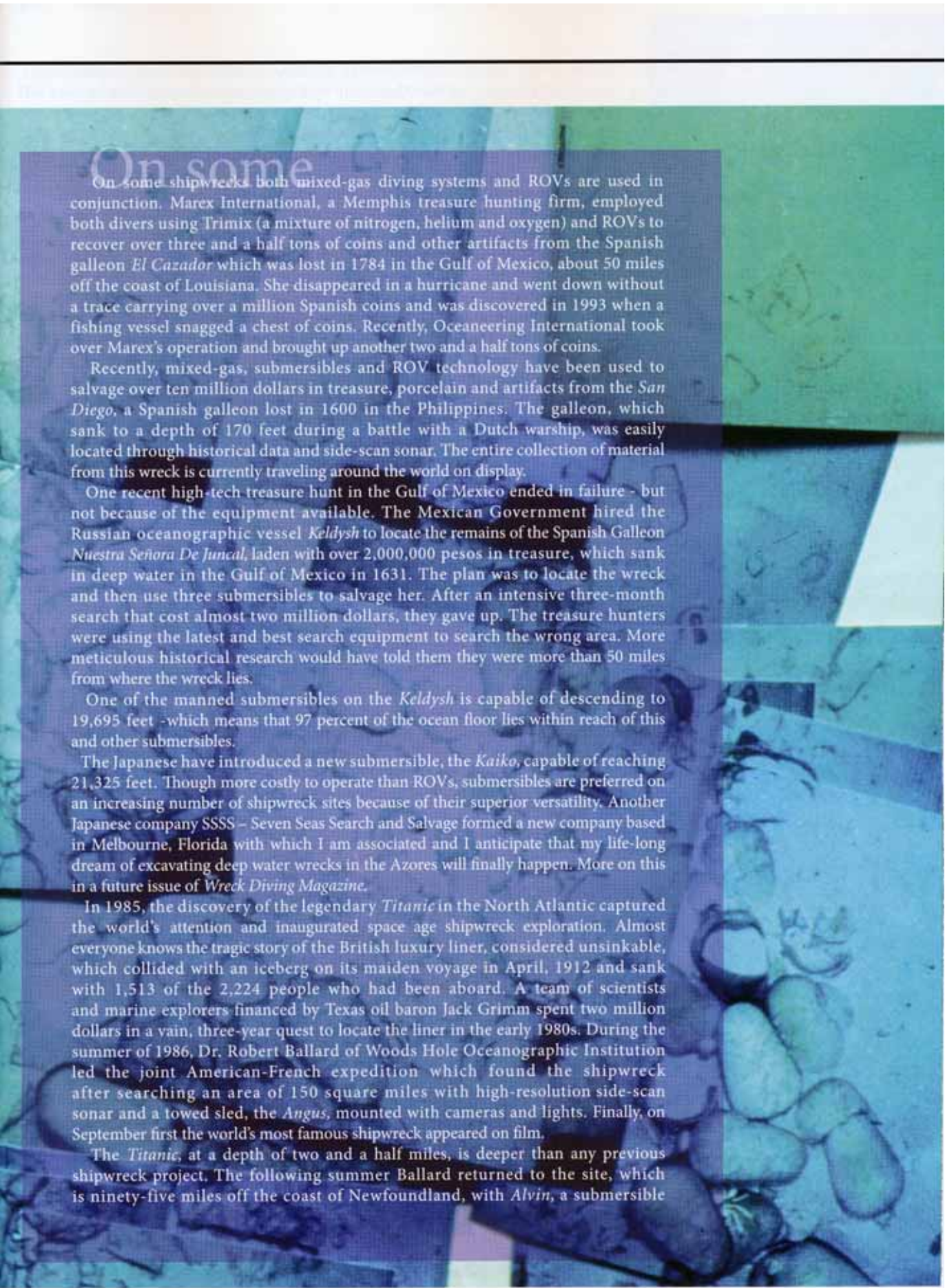
Background: Photo mosaic of one of the 1822 wrecks in Dry Tortugas showing many olive jars, ballast rocks, and ships timbers.

Inset - Clockwise: This wooden figurine survived under anaerobic conditions on a Spanish shipwreck lost in the Azores in 1591.

Diver riding research submersible *MIR* / back to the Russian Vessel *Katerjok*.

Well-preserved dinner plate recovered from the *Titanic*.





On some shipwrecks, both mixed-gas diving systems and ROVs are used in conjunction. Marex International, a Memphis treasure hunting firm, employed both divers using Trimix (a mixture of nitrogen, helium and oxygen) and ROVs to recover over three and a half tons of coins and other artifacts from the Spanish galleon *El Cazador* which was lost in 1784 in the Gulf of Mexico, about 50 miles off the coast of Louisiana. She disappeared in a hurricane and went down without a trace carrying over a million Spanish coins and was discovered in 1993 when a fishing vessel snagged a chest of coins. Recently, Oceaneering International took over Marex's operation and brought up another two and a half tons of coins.

Recently, mixed-gas, submersibles and ROV technology have been used to salvage over ten million dollars in treasure, porcelain and artifacts from the *San Diego*, a Spanish galleon lost in 1600 in the Philippines. The galleon, which sank to a depth of 170 feet during a battle with a Dutch warship, was easily located through historical data and side-scan sonar. The entire collection of material from this wreck is currently traveling around the world on display.

One recent high-tech treasure hunt in the Gulf of Mexico ended in failure - but not because of the equipment available. The Mexican Government hired the Russian oceanographic vessel *Keldysh* to locate the remains of the Spanish Galleon *Nuestra Señora De Juncal*, laden with over 2,000,000 pesos in treasure, which sank in deep water in the Gulf of Mexico in 1631. The plan was to locate the wreck and then use three submersibles to salvage her. After an intensive three-month search that cost almost two million dollars, they gave up. The treasure hunters were using the latest and best search equipment to search the wrong area. More meticulous historical research would have told them they were more than 50 miles from where the wreck lies.

One of the manned submersibles on the *Keldysh* is capable of descending to 19,695 feet - which means that 97 percent of the ocean floor lies within reach of this and other submersibles.

The Japanese have introduced a new submersible, the *Kaiko*, capable of reaching 21,325 feet. Though more costly to operate than ROVs, submersibles are preferred on an increasing number of shipwreck sites because of their superior versatility. Another Japanese company SSSS - Seven Seas Search and Salvage formed a new company based in Melbourne, Florida with which I am associated and I anticipate that my life-long dream of excavating deep water wrecks in the Azores will finally happen. More on this in a future issue of *Wreck Diving Magazine*.

In 1985, the discovery of the legendary *Titanic* in the North Atlantic captured the world's attention and inaugurated space age shipwreck exploration. Almost everyone knows the tragic story of the British luxury liner, considered unsinkable, which collided with an iceberg on its maiden voyage in April, 1912 and sank with 1,513 of the 2,224 people who had been aboard. A team of scientists and marine explorers financed by Texas oil baron Jack Grimm spent two million dollars in a vain, three-year quest to locate the liner in the early 1980s. During the summer of 1986, Dr. Robert Ballard of Woods Hole Oceanographic Institution led the joint American-French expedition which found the shipwreck after searching an area of 150 square miles with high-resolution side-scan sonar and a towed sled, the *Angus*, mounted with cameras and lights. Finally, on September first the world's most famous shipwreck appeared on film.

The *Titanic*, at a depth of two and a half miles, is deeper than any previous shipwreck project. The following summer Ballard returned to the site, which is ninety-five miles off the coast of Newfoundland, with *Alvin*, a submersible

capable of reaching the *Titanic*. The *Alvin* has an impressive record of accomplishments, including the actual recovery of the American hydrogen bomb lost in 2,850 feet off Palomares, Spain in 1966. She was launched in 1964 with an operational depth of 6,000 feet and carrying a crew of three. She was later modified to reach 13,000 feet. It took the *Alvin* two hours to travel to the bottom of the sea. Once there, the crew made excellent photographs and recovered objects by using the *Alvin's* two manipulator arms.

A small tethered robot called *Jason Jr.* was used to get inside the *Titanic*. Controlled by *Alvin's* pilot, the 250-pound, 28-inch-long *Jason, Jr.* was also invaluable in obtaining data from areas outside the immense wreck where twisted metal made other methods too dangerous. The explorers made sixty hours of video film and sixty thousand still photographs during a twelve-day period. The previous summer, when they used the relatively primitive *Angus*, they made only two minutes of video and took nine still photographs.

Ballard, feeling the *Titanic* site should not be disturbed further, ended his explorations when bad weather set in at the end of the summer. In the summer of 1987, a well-financed French expedition used a submersible similar to the *Alvin* and several sophisticated ROVs to obtain additional video and still photographs of the famed shipwreck and to recover an assortment of artifacts. Although they proved that shipwrecks in two and a half miles of water can be successfully salvaged, many regarded the removal of artifacts as plundering and there was an international outcry.

In June of 1989, Ballard scored another deep-sea coup with the discovery of the deepest shipwreck ever found, the German battleship *Bismarck*, which lies more than half a mile beyond the *Titanic*. The sinking of the *Bismarck* in 15,600 feet of water, 600 miles west of Brest, France, was the culmination of one of the most dramatic sea hunts in naval history. In May, 1941, Britain was virtually alone fighting the Germans who had firm control of the North Atlantic sea lanes. The *Bismarck* had been wreaking havoc on allied shipping and Churchill sent an armada of British warships after her. Day and night they chased their quarry across the high seas. The battle that ensued when they found her lasted three hours as salvo after salvo was fired by both sides. Finally, the *Bismarck* blew up and sank with over two thousand German seamen.

Like the *Edinburgh*, the location of the *Bismarck* was only vaguely known, and Ballard and his team combed hundreds of square miles of the sea floor using sonar before the raider was located. They had an improved ROV, the *Argo*, for exploring the German wreck and made thousands of still photographs and many hours of video documenting the warship. The *Argo* was developed by the US Navy at a cost in excess of three million dollars. Designed to hover 120 feet off the bottom, the ROV is tethered to a surface vessel by 20,000 feet of coaxial cable.

Photos Left to Right: Intact suitcase on the bottom near the *Titanic*.

Photo of the bow of the *Titanic* taken prior to her maiden voyage.

Opposite Page Top to Bottom: Gold chain found using ROV *Merlin* on a 1622 shipwreck in Dry Tortugas.

Some of the hundreds of Spanish olive jars recovered by the ROV *Merlin* off one of the 1622 shipwrecks in the Dry Tortugas.

German raider vessel, the *Bismarck* discovered by Robert Ballard.



Soon after this discovery Ballard designed a more sophisticated version of the ROV *Jason* which was more economical to operate, but limited to a depth of 6,000 feet. He initiated Project Jason to find ancient shipwrecks in the Mediterranean. His team of archaeologists followed an ancient sea-trade route between North Africa and Rome, surveying a fifty-square-mile area at a depth of 2,500 feet. They found numerous shipwrecks, the most interesting of which was a fourth-century AD Roman galley. *Jason*, which carries three high-resolution video cameras, a 35mm still camera and high intensity lights, was also used to recover amphorae and other artifacts from this wreck with its manipulator arms. Project Jason's most significant accomplishment was involving many thousands of American school children who watched the operation via satellite on television screens in their classrooms.

In June 1998, Ballard again made headlines with the discovery of the World War II aircraft carrier U.S.S. *Yorktown*. The ship lies in 16,650 feet of Pacific Ocean north-east of the Hawaiian Islands. It was sunk in 1942 by the Japanese during the Battle of Midway which changed the course of the war. The Japanese lost four of their carriers and were never able to regain the offensive. Ballard, working with the U.S. Navy and sponsored by the National Geographic Society, reported that the ship appears to be in an excellent state of preservation, resembling "a toy ship in the bottom of a swimming pool."

In 1965, the shrimp boat *Trade Winds* was dragging her nets in 1,500 feet of water about twenty-five miles off the Dry Tortugas to the west of Key West, Florida. She snagged into an obstruction which brought the vessel to a shuddering halt. When the badly damaged nets were brought to the surface, the crew was surprised at their contents: three complete Spanish olive jars (similar in appearance to Mediterranean amphorae), various metal artifacts, some bits of a ship's rigging and a considerable amount of wood, including a section of ornately carved railing. Captain Lewis described the wood as being "as good as the day the ship was made." Lewis, a veteran shrimper not particularly interested in old wrecks himself, contacted me and gave me the location.

In 1972 I teamed up with several oceanographers from California to charter the oceanographic research vessel, *Alcoa Seaprobe*, to search for the Dry Tortugas wreck. However, we were





Center: Photograph taken aboard the Seahawk of ROV image of an olive jar on one of the 1622 wrecks, taken at a depth of 1,325 feet.

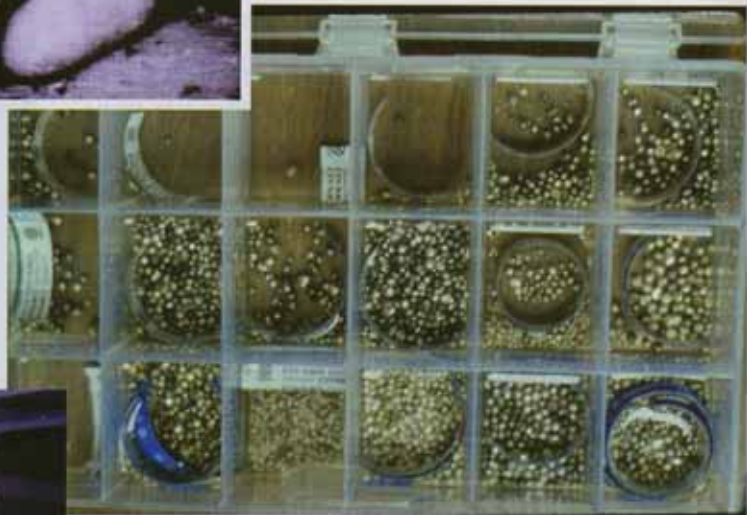
Clockwise: Chart made from the photo mosaic data of one of the 1622 shipwrecks in the Dry Tortugas.

Bronze astrolabe, a Portuguese-built navigation device used to determine latitude at sea, recovered by the Merlin off one of the 1622 wrecks.

Some of the thousands of pearls found on one of the 1622 shipwrecks off the Dry Tortugas.

The late Dr. Harold Edgerton of MIT fame, inventor of numerous types of deep water oceanographic equipment including camera strobe lights, sub-bottom profiling sonar. He is aboard the Alcoa Seaprobe.

Insert: The all-aluminum survey vessel Alcoa Seaprobe. Search equipment and a giant clamshell were operated through an open well ("Moon pool") in the middle of the ship.



frustrated by the inadequacy of current deep water technology and failed to locate it. Several months later we resorted to methods used by salvors for thousands of years. Dragging a steel cable between two shrimp boats, we snagged a huge anchor and brought it to the surface. That was before the advent of ROVs so we couldn't survey the wreck and had no idea of exactly what was hidden in the deep, although I knew from the artifacts the *Trade Winds* had recovered, that the wreck was Spanish and had sunk sometime between 1590 and 1630.

Deep water exploration had made giant strides by 1988 when I teamed up with Seahawk Deep Ocean Technology, an outfit which had been involved in deep water oceanography for the previous three years and was committed to deep water historical wrecks. We easily located the wreck in April of



1989. A sonar silhouette showed the site to be about 118 feet by 50 feet. Seahawk's ROV, *Phantom* was flown to the bottom and as it glided gracefully over the sea bed, a video camera transmitted the ghostly remains of the Spanish ship, unseen for almost four hundred years, to a television monitor aboard the research vessel. A jubilant crew watching the screen exclaimed over the images of ship timbers, an extensive mound of ballast, heaps of earthenware Spanish olive jars, ceramic objects including a Chinese porcelain plate, and bits of rope.

In June 1989 Seahawk used the *Phantom* to recover the bronze ship's bell to establish ownership of the wreck. Their commitment to archaeological procedure led them to commission the ROV *Merlin*, an even more sophisticated ROV designed by Gordon Richardson, a top ROV expert, and built by Ametek Offshore in Aberdeen, Scotland. In April 1990 the new ROV was completed at a cost of more than two million dollars. *Merlin* is a space age marvel. It contains three video cameras that furnish 180-degree underwater vision. It has three 70mm still cameras to take pictures of artifacts *in situ* and then digitize them into a computer for later mapping of the site. *Merlin* is also equipped with two manipulator arms, a finely articulated hand, suction pumps and water jets to remove bottom sediment and a number of other revolutionary devices.

The *Seahawk Retriever*, a 210-foot-long recovery vessel outfitted with the *Merlin* and a specialized crew of thirty, reached the Dry Tortugas site in mid-May 1990. It was an international project with members from twelve countries including China, whose government lent three young oceanographic scientists. They spent two months mapping the site. At a cost of \$18,000 a day, this was an expensive undertaking. By the end of the summer, they had recovered over ten thousand artifacts, including three bronze navigation astrolabes, twenty-seven gold bars, over a thousand silver coins, as well as jewelry, ceramics, cannon and musket balls and several dozen intact olive jars. The identity of the wreck was pinned down to one of three galleons lost in 1622 in deep water in the general area making the wreck a sister ship of the famed *Atocha*.

The 1991 season was as exciting as the year before. The ROV recovered additional gold bars and hundreds of gold and silver coins. The richest single find was a gold chain almost 33 feet long - one of the longest ever recovered from a shipwreck. *Merlin's* fine-tuned hand also brought up more than five thousand beautiful, small pearls. Among many pieces of ceramics found on the site is a plate bearing the coat-of-arms of the Pope, indicating that a Papal Nuncio, a Vatican official, was probably aboard the doomed ship. Among the strangest artifacts recovered are fourteen very small bird beaks; most likely someone was shipping a cage full of exotic birds back to Spain.

In 1966, the same year that Captain Lewis discovered the Dry Tortugas shipwreck,

Above Left to Right: Bronze bell recovered from one of the 1622 wrecks using the ROV *Merlin*.

Marx with some of the many gold bars recovered from the 1622 Dry Tortugas wreck.

About the Author: Robert Marx, in his many years as an underwater archaeologist, has discovered and excavated ancient shipwrecks in over 60 sites worldwide. He has written more than 50 books, several hundred scientific reports and popular articles, and produced or shot over 50 documentary films.



another shrimper dragging his nets in a depth of 1,200 feet snagged into a wreck about sixty miles east of St. Augustine, Florida. He pulled up six large copper cooking kettles, some ballast rock and three cannon balls. Early in 1990, Seahawk relocated this shipwreck with sonar. *Merlin* was committed to the Dry Tortugas site so Seahawk needed another way to survey and excavate this second shipwreck. They signed a research agreement with the Harbor Branch Oceanographic Foundation in Fort Pierce, Florida, which had earlier worked on the ironclad *Monitor*.

In October 1990 a ten-day survey of the wreck was conducted with the submersible *Johnson-Sea Link I*. I served as chief scientist/archaeologist and had one of the greatest thrills of my life working on the bottom at a depth of 1,200 feet. This was, at that time, the deepest that anyone had actually been on the sea floor and recovered historical artifacts. Each day we made two dives of three to four hours duration and in the sixty-six hours I spent on the wreck site we were able to make as comprehensive an archaeological survey of the site as if we were in shallow water. Using the *Sea Link's* manipulator arm, we first laid out a grid pattern of buoys. Then using both video and a 70mm still camera mounted on the bow of the submersible, we made a photo-mosaic of the wreck. It shows thirteen cannon and two anchors lying on or close to a large ballast pile and more copper cooking kettles, ceramics, cannon balls, ship's fittings, tools and other artifacts which were all measured, plotted and photographed *in situ*.

During the next phase, we obtained samples of artifacts and dug test holes using a small suction pump. Overall we retrieved more than one hundred artifacts including a glass rum bottle, two small iron cannon, hundreds of cannon balls, a brass telescope, a stone grinding wheel, ceramics and hundreds of lead musket balls. The most interesting item was a piece of wood with cotton fishing line still wrapped around it.

The small suction pump was unable to dig very deep, so when we returned to the site in April 1991, we had a better excavation tool - a thruster which was mounted on the bow of the submersible and worked in the same manner as the prop-washes used on shallow water sites. We were able to remove a great deal of sand from the ballast pile and were delighted to discover that most of the ship's lower hull was well preserved. We could see that the ship was of typical Spanish construction with pine planking and oak used for the structural members such as the keel and ribs. Another cannon and an anchor were recovered as well as hundreds of other artifacts such as wooden pulley blocks, fragments of rope and anchor cable, tools, brass buttons and buckles, sheets of lead and copper, a pewter spoon, animal bones, ceramic shards, leather, tools and six Spanish silver coins from the early eighteenth century. One of the missing ships from the fleet of 1715 was lost in this area and comparison of the artifacts recovered to date supports the likelihood that it may well be one of the 1715 wrecks.

The most important device used to find deep water wrecks is side-scan sonar which locates objects lying on the surface of the sea floor. Until recently side-scan could be used for locating intact shipwrecks which present a vertical profile, but was not effective in locating old ships, the remains of which were deteriorated and scattered. It was impossible to differentiate between rock or coral outcrops and cannon or other objects from a wreck. The newest side-scan sonar units are fully corrected for slant range, ship speed and amplitude. Their recorders, which can be interfaced with navigational systems, give an accurate view of the seabed topography detecting man-made objects such as

cannon, anchors and ballast piles.

Westinghouse has developed a revolutionary Underwater Laser Scanning System, effective up to a depth of 5,000 feet. It can see in sharp detail the smallest of objects at lateral distances up to five times greater than regular side-scan sonar units and displays crystal-clear images on a surface recorder.

To a lesser degree, technological advances are being used on shallow water wrecks. The proton-precession magnetometer, for almost 40 years the wreck hunters' main search tool, is being rapidly replaced by cesium and rubidium magnetometers which are much more sensitive at detecting the presence of ferrous metal. Great improvements have also been made on sub-bottom profiling, sonar which detects objects buried under sediment on the sea floor. The old units were limited to revealing the presence of a buried mass. Today's are capable of clearly defining the shape of the object and indicating whether it is man-made or rocks or coral.

Once a shallow water wreck was located, divers typically spent hundreds of hours combing the sea floor with metal detectors to locate buried metallic objects. It took so long because the small hand-held detectors located only those metallic objects lying directly under the small sensor head. Today large sensor heads mounted on sea-sleds cover large areas of the sea floor in a great deal less time. They also have deeper penetration than the smaller ones. In the past three years Marex International has used such a device in the Bahamas on several shallow Spanish wrecks and located millions of dollars in treasure. One of these wrecks was scattered along a five-mile corridor about a half mile in width. The new device accomplished in several months what would previously have taken at least ten diving seasons.

The newest differential GPS systems, which are accurate within 15 feet, signal another great advance in shipwreck exploration. Prior to the introduction of GPS, we used buoys (which drifted away in bad weather and were often stolen and always provided a marker for others) or LORAN, which in some areas only had an accuracy of a quarter of a mile. Today, with GPS, we can pinpoint deep and shallow wrecks and come back ten years later and find the sites within minutes. Some models have graphic computers that translate raw GPS fixes into a boat's position and record tracks run during a search and other data onto a real NOAA sea chart.

Mankind has explored the seas for at least sixty-five hundred years. He has gone from free diving the clear, familiar shallows for sunken dugouts to plumbing the abyss for centuries-old shipwrecks. The technology which takes men to the moon and beyond is now at our disposal to voyage to the deepest frontier of our watery planet where so much of our heritage lies. With each passing year new technological advances will enable us to bring more of the past to light through excavation and study of ancient shipwrecks.



Opposite Page - Top to Bottom: Robert Marx with ROV Phantom 2000 working a deep water wreck in Indonesia.

The two grab arms and one of the seven cameras on the Seahawk Deep Ocean Technology Submersible Merlin.

Seahawk Deep Ocean Technology ROV Merlin.

Left: Site plot of the 1715 shipwreck in 1,200 feet, 60 miles east of St. Augustine. Note the coins, cannons, anchors, ballast, and copper cooking kettles. Marx used the submersible Johnson-Sea Link / on this site.

Below Clockwise: Johnson-Sea Link / capable of working up to 3,300 feet deep. Note numerous cameras and manipulator arm in center.

Bow of the Johnson-Sea Link / with small iron cannon with conglomerate of iron cannon balls attached, recovered from the 1715 St. Augustine wreck.

Marx with some of the conglomerates and copper cooking cauldrons he recovered from the 1715 wreck off St. Augustine using the submersible.

Spanish silver coins, brass button, and pewter buckle recovered by Marx from the 1715 shipwreck off St. Augustine using the Johnson-Sea Link / submersible in 1,200 feet of water.

Copper cooking kettles recovered from a 1715 wreck off St. Augustine in 366 metres using Johnson-Sea Link / ROV.

Johnson-Sea Link / being towed back to the research vessel.

