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# *Ships from the Depths*

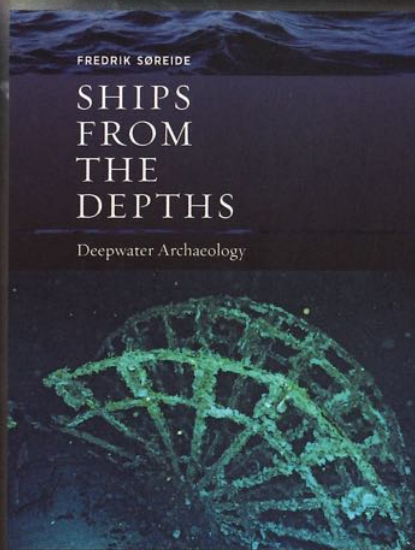
Deepwater Archaeology

FREDRIK SØREIDE

*Ships from the Depths* surveys the dramatic advances in technology over the last few years that have made it possible for scientists to locate, study, and catalogue archaeological sites in waters previously inaccessible to humans.

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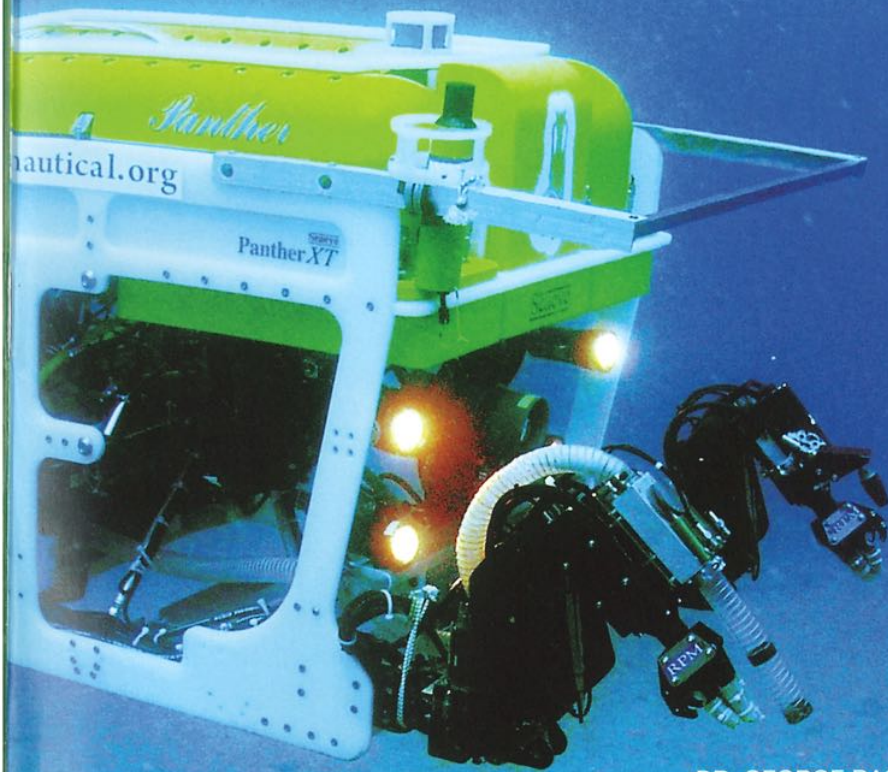


The  
**INA**

# quarterly

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MAGAZINE OF THE INSTITUTE OF NAUTICAL ARCHAEOLOGY



## **INA Founder Honored**

DR. GEORGE BASS RECEIVES THE BANDELIER AWARD FROM AIA

## **A New INA President**

DR. DEBORAH CARLSON TAKES THE HELM

## **Latest Additions**

NEW DIRECTORS JOIN THE INA FAMILY

# **Nautical Technology**

GOING WHERE WE HAVE NEVER GONE BEFORE

WINTER 2010-2011 • Volume 37 • No. 4





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Marian M. Cook Graduate Fellow: Chris Cartellone



I am delighted to greet you, and introduce myself, as the new president of INA!

For those of you who don't know me, I came to INA and Texas A&M University 15 years ago, as a graduate student in the Nautical Archaeology Program (NAP). Like so many before me, I had the good fortune to study and conduct fieldwork with INA Founder Dr. George Bass, in my case on the fifth-century B.C. Classical Greek shipwreck at Tektaş Burnu, Turkey. I completed my Ph.D. in Classical Archaeology at the University of Texas in 2004 and became a faculty member of the Nautical Archaeology Program that same year. In 2005, together with then INA President Dr. Donny Hamilton, I launched the excavation of a ship that sank off the coast of Kızılburun, Turkey in the first-century B.C. while transporting a marble column weighing more than 50 tons. Now a tenured Associate Professor at Texas A&M, I teach courses in Greek and Roman Archaeology and Classical Seafaring, and hold the Sara W. and George O. Yamini Professorship in Nautical Archaeology. Like me, my six NAP colleagues are privileged to enjoy and share the benefits of Texas A&M faculty endowments which were established by a handful of very generous INA Directors at the initiative of Dr. George Bass more than two decades ago.

One of the key figures assisting Dr. Bass with the INA-A&M endowment drive of the late 1980s, which led to the establishment of a faculty chair, four professorships, two faculty fellowships, and two graduate student fellowships, was then Vice President for Development, Dr. Robert Walker. Bob has been an active and loyal member of the INA Board for almost a quarter of a century, serving for the past six months as Interim President following the departure of Dr. James Delgado. It was Bob's composure and steady hand on the tiller that guided INA so successfully through this most recent transition. On behalf of everyone who shares a passion for old ships, maritime history, nautical archaeology, and this unique organization, I thank Dr. Walker for his

selfless guardianship of INA over these past five months, despite his numerous other duties as Texas A&M's Senior Executive for Development.

In trying to decide how best to organize my first letter as INA's president, I realized just how long is the list of reasons to be very optimistic about INA's future! As you will see in this issue of the *Quarterly*, five new directors have joined the board and we are thrilled to welcome them all to the INA family! Our Executive Committee has been reinvigorated with several new officers, including Chairman of the Board John De Lapa. John first became involved with INA in 1994, serving on the Archaeological Committee for many years. He and I agree that our primary commitment is to ensure the Institute's legacy of quality scholarship through enhanced support for INA-approved fieldwork and research projects.

Among the 20 projects approved by the INA Archaeological Committee for 2011 are ongoing projects in Spain, Bermuda, and Canada's Yukon. New projects, spearheaded by current and former NAP graduate students, will begin off the coast of Crimea, in Lake Ontario, the Caribbean coast of Nevis, and along the James River in Virginia. I myself will return to Kızılburun, Turkey with Donny Hamilton to finalize the excavation there, while various students, colleagues, and conservators gather at the Bodrum Research Center to continue their work on material from INA shipwreck excavations at Yassıada, Yenikapı, Kızılburun and Uluburun, among others.

This has proven to be a lengthy introduction, so I will close by saying that I am deeply honored to have been elected INA president and I am very excited for INA's future. I have conducted archaeological fieldwork in Turkey every summer for the better part of a decade, and enjoy an excellent working relationship with the talented staff of the Bodrum Research Center. I look forward to working with all members of the INA family to perform, inform, and transform the very best in the field of nautical archaeology.



Deborah Carlson  
President

*"Together we share a commitment to ensure the Institute's legacy of quality scholarship through enhanced support for INA-approved fieldwork and research projects."*

—DC

Debbie Carlson excavates hull remains discovered under one of the marble column drums at Kızılburun.

See the PROJECT pages on the INA website for more.

PHOTO Don Frey (INA)



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The Institute of Nautical Archaeology is a non-profit organization whose mission is to continue the search for the history of civilization by fostering excellence in underwater archaeology.

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If you are interested in submitting an article for publication please contact the Editor at [inaeditor@inadiscover.com](mailto:inaeditor@inadiscover.com)

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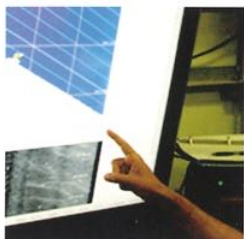


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## INA Founder Honored

Dr. George Bass to receive the 2011 Bandelier Award from AIA

PHOTO National Geographic Society

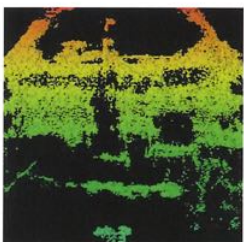


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Dr. Jeff Royal, RPM Nautical Foundation

PHOTO RPM Nautical Foundation



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IMAGE MMT/Deep Sea Productions



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## Golden Opportunity

Dr. Robyn Woodward and John Pollack report from the Yukon

PHOTO Yukon Archives

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RPM's underwater remote operated vehicle (ROV) at the Levanzo I wreck in Sicily.

PHOTO RPM Nautical Foundation



## New INA Directors

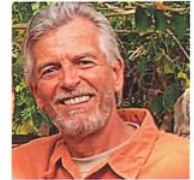
**Bob Atwater** is a former Chief of Police, and retired Federal Law Enforcement Senior Manager-Executive, as well as a former Interpol Agent and security advisor. For the past three years he has served as the Membership Director for the Washington DC Chapter of the Explorers Club, and has traveled the globe as an explorer, public speaker, educator and photographer. He sits on Executive Boards for several Boy Scout Councils, as Chapter and National Agency President for the Federal Law Enforcement Officers Association, and as a Trustee for the Archaeological Institute of America. He is a Life Fellow of the Explorers Club, a Fellow of the Royal Geographical Society, a Fellow of the World Scout Foundation, a Life Member of the Archaeological Institute of America, the National Eagle Scout Association and the American Polar Society. He has received numerous awards for community service and heroism including a Medal of Freedom, and a Medal of Merit, from the US Senate and Congress.

**Elmer L. Doty** has over thirty years of leadership experience in business, with General Electric, Black & Veatch, FMC Corporation, United Defense, BAE Systems, and Vought Aircraft Industries, Inc. Most recently he was President and CEO of Vought, and responsible for strengthening the company's performance and position prior to successfully merging with Triumph Group, Inc. He is a Director of Triumph Group, Inc., the Dallas Chapter of the American Heart Association, and the Congressional Coalition on Adoption Institute. Elmer is also a member of the Board of Trustees of the Cooper Institute, and the Board of Governors of the Aerospace Industries Association.

With a BSc in nuclear engineering, a MSc in mechanical engineering from the University of Missouri, and Executive Education at Harvard Business School and University of Chicago, Elmer also holds a USCG 50 ton Master Captain License, the FCC General Radio Operator License, and is a NAUI scuba instructor. He and his wife Sandra have four children and reside in Dallas, Texas and Nassau, Bahamas.

**Marc D. Grodman, MD** is the Chairman, President and CEO of BioReference Laboratories INC, a company he founded in 1981. With over 2700 employees BioReference is one of the largest clinical laboratories in the country. Under Marc's direction the company has introduced new technologies that are used in cancer, cardiac genetics, sexually transmitted infections and prenatal screenings while forging ahead with collaborative partnerships with institutions like Massachusetts General Hospital, Columbia University and University of Rochester.

After earning his BA from the University of Pennsylvania, Marc received his MD from Columbia University and then attended Harvard University's Kennedy School of Government. He was a Primary Care Clinical Fellow at Massachusetts General Hospital and currently serves as an Assistant Professor of Clinical Medicine at Columbia University College of Physicians and Surgeons. Marc also serves as a member and the secretary of the Board of Trustees of the Actors Fund of America.



FROM TOP  
New INA Directors:  
Bob Atwater  
Elmer Doty  
Marc Grodman



# INAnews

Events • Announcements • Celebrations • Opportunities



FROM TOP  
New INA Director  
Greg Maslow  
and Associate Director  
Jeff Morris

With a keen interest in history, archaeology, art and architecture **Dr. Greg Maslow** decided early on that he wanted to know about everything! He was named an International Honors Scholar by the University of Pennsylvania in 1966 and has been traveling and learning ever since. Greg completed his residency program at the University of Pennsylvania and is an orthopedic surgeon whose career has centered around arthroscopic knee surgery—a field which was in its infancy when he started.

For a decade Greg served on the Board of Overseers of the University of Pennsylvania Museum. He joined the Museum Applied Science Center for Archaeology (MASCA), and helped promote the development of a new surveying tool, in use now at many archaeological sites around the world. He sponsored an exhibition of Roman glass and everyday life, while also expanding his knowledge of Greek and Roman medicine. Laurie, Greg's wife of 41 years, joins him on his many travels, which tend to focus on Greece and Italy.

Sailing on Chesapeake Bay as a child with his parents had a profound influence on new Associate Director **Jeff Morris**, igniting a lifelong passion for the sea. In 2000 Jeff earned his Master's degree from East Carolina University (ECU) in Maritime History and Nautical Archaeology. Since 2003 Jeff has been the Director of Azulmar Research LLC and Geomar Research LLC. He served as the Principal Sonar Analyst for Nauticos, LLC during their 2006 survey in search of Amelia Earhart's airplane in the South Pacific. He was also the Director of Survey Operations for the Waitt Institute for Discovery (WID) during their Endymion Reef and Chinchorro Banks Surveys, as well as being one of the principal architects for WID's Catalyst Autonomous Underwater Vehicle (AUV) Program. Today Jeff lives in Maryland with his wife Sue and their four children.

*Join us in welcoming Bob, Elmer, Marc, Greg and Jeff to the INA family.*



Dr. George F. Bass  
recipient of this year's  
Bandelier Award.  
PHOTO Jonathan Blair  
© National Geographic 1977

## Bandelier Award for Service to Archaeology

INA founder Dr. George F. Bass is to be awarded the 2011 **Bandelier Award for Service to Archaeology** by the Archaeological Institute of America, North America's largest and oldest organization dedicated to promoting archaeology.

*"As a recipient of many honors such as the AIA's Gold Medal for Distinguished Archaeological Achievement, and the National Medal of Science, Bass has been widely applauded for his unique contribution to this fascinating and growing branch of archaeological research."*

Dr. Bass will be presented with the award at the 2011 AIA Annual Gala being held in New York City on April 26th. This spectacular black tie event curated and hosted by Irish Cultural Ambassador and actor, Gabriel Byrne, will celebrate the culture and history of Ireland, beginning with its origins as revealed by archaeology. Irish film, music, poetry, dance, and cuisine will combine with a special presentation on cultural history as well as with some renowned guests to weave a tapestry of Ireland from its origins to its vibrant present.

**For more information and to PURCHASE TICKETS to the Gala**  
<http://aia.archaeological.org/gala/about/the-gala-2>



# INa the **NEXT** generation

STUDENT PERSPECTIVES IN NAUTICAL ARCHAEOLOGY

A Greek mythology class my sophomore year of high school was my introduction to archaeology. The colorful stories of gods and heroes fascinated me, and from then on a hobby was born. In my free time I learned all I could about the historical and cultural landscapes of the ancient world, especially the early empires of Greece, Italy, and Egypt.

Despite my growing affinity for classical civilizations, a youthful mind told me that a career in world history would not be very practical. Taking a different route, I enrolled in an architecture program at a small private university in Michigan. This is where I took my first anthropology course and, being instantly captivated, fell in love with the field of archaeology. Ultimately, architecture did not suit me as and I withdrew from the program, instead deciding to continue my education in anthropology at the University of Michigan.

U of M is where I evolved from an eager student into a budding archaeologist. Over the course of my undergraduate studies, I became increasingly intrigued by the history and archaeology of my native Michigan. I pursued these interests further in 2004 by participating in my first archaeological field school, investigating a series of late Woodland mounds and earthworks situated in Michigan's northern lower peninsula. By day I worked beneath the unyielding sun, meticulously removing layers of stratified sediment, while at night I assisted with cleaning and analysis of prehistoric finds. The six week course challenged me both mentally and physically, but at the same time offered an extreme sense of satisfaction. The world of archaeology lay before me, now all I needed was to find my place within it.

It was during this time that my professor, Dr. John O'Shea, discussed with me the merits of underwater archaeology. The whole notion of conducting archaeology under water, especially on the Great Lakes, hit me like a ten ton freighter. Boats, ships, and shipwrecks are commonplace throughout the region, so much so that I took for granted the rich maritime heritage surrounding me. My first steps toward a career in nautical archaeology included assisting in the design and execution of an underwater survey in Lake Huron, which required me to obtain my scuba certification. Armed with the means to

traverse the sub-aqueous environment of the Lakes, my passion for Great Lakes maritime history and archaeology intensified.

After a short time working as a contract archaeologist following graduation, my desire to pursue graduate studies was stronger than ever. In the fall of 2007, I came to the Nautical Archaeology Program at Texas A&M University in order to work with Dr. Kevin Crisman and further study the nautical traditions of the Great Lakes.

I have achieved my goals since arriving in the program, having participated in archaeological investigations in Ohio, New York, Oklahoma, Vermont, Ontario, and Puerto Rico, the scope of work ranging from shipwreck documentation to pedestrian, diver, and remote sensing surveys.

In 2008 I took the reins and led my first ever field project. The result was the *Anthony Wayne* Shipwreck Survey, an historical and archaeological analysis of an early 19th century side-wheel steamboat. Lost in 1850 due to a devastating boiler explosion and found in the fall of 2006, *Anthony Wayne* is believed to be the oldest surviving steamboat shipwreck in the Great Lakes.

During this project, co-directed by Carrie Sowden, archaeological director of the Great Lakes Historical Society, and sponsored in part by the Institute of Nautical Archaeology, our team dived to the depths of Lake Erie for two summers, carefully taking measurements and recording details of the wreck. The days were long and the dives cold, but all things considered, directing this project has been one of the most rewarding experiences of my life.

My career as a nautical archaeologist is still in its early stages, but I am as excited now as when I first opened my mythology textbook. What keeps me going in this field is the desire to know more about the region where I grew up. The Great Lakes are my home, and I feel both honored and privileged to be studying its early maritime technology and traditions. Whether hunkered down in a library or diving off a rocking boat, adding to the compendium of Great Lakes nautical archaeology is extraordinarily fulfilling.

— Brad Krueger



INA Research Associate  
Brad Krueger

*“Each cultural remnant carries with it a story and it is my hope to share those stories with generations to come.”*

—BK

Over the past two years, the Great Lakes Historical Society, the Cleveland Underwater Explorers (CLUE), INA and Texas A&M have partnered to examine the archaeological remains of *Anthony Wayne*, a mid-19th century side-wheel passenger and cargo steamer.

The wreck, which rests approximately six miles north of Vermilion, OH, was discovered using side scan sonar technology in 2006 by Tom Kowalczyk, a member of CLUE.

At present, *Anthony Wayne* is thought to be the oldest surviving archaeological example of a steamboat shipwreck in Lake Erie.

For more information on the *Anthony Wayne* Shipwreck Survey, check out the project pages on the INA website.



# THE **technology** OF WHERE



RPM's Jeff Royal  
aboard R/V Hercules

## BELOW

On-screen representation  
of data being collected  
from the seafloor

All images courtesy of  
RPM Nautical Foundation

When I was asked to write an article for this issue about the use of technology in underwater archaeology, I began to think about the myriad of systems utilized in my field work each season. Between the research vessel, guidance and steering systems, the ROV, remote sensing equipment, array of video feeds, data processing systems, display graphics, etc. a wide variety of technical explanations and themes readily present themselves. What came to mind is one of the crucial questions technology is used to answer... "Where is it?"

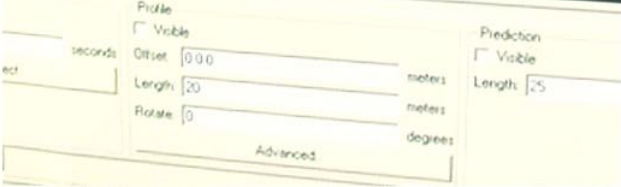
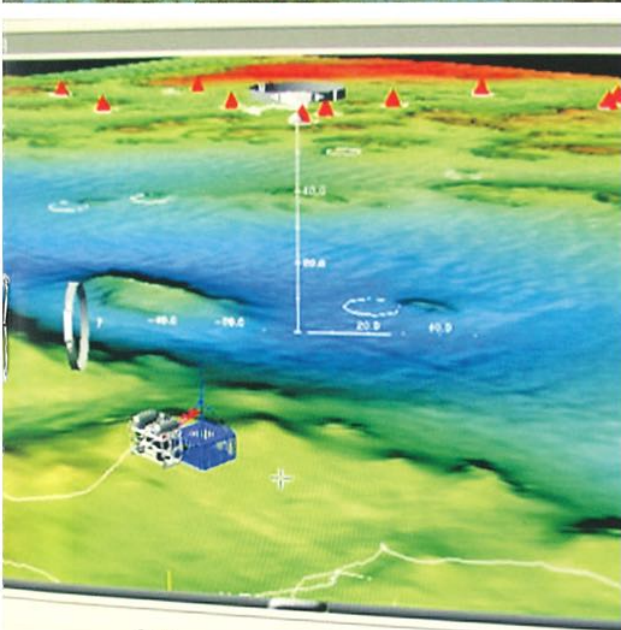
Determining the location of a site seems simple enough, however working under water increases the difficulty of doing so and is further complicated when working beyond diver depths. It is surprising how often archaeologists don't know the answer to "Where is it?" Determining the location of a site begins with one or more sets of accurate coordinates. All too often when the time comes to revisit a site an archaeologist begins divining the location on the surface from the positions of houses on shore, a point of land, or memories of nearby rock formations. Unfortunately, official reports also too often feature such location references. Without an accurate location on the surface, the location of the site on the seafloor below also remains unknown. These situations often result in a new search by systematic survey, and if the last visit was years before then the site may never be found.

Differential GPS (DGPS) is a crucial component in the technology of determining location; this system tells you where you are (your coordinates) on the earth. Although studies about the accuracy of DGPS are ongoing, it has generally been found to be accurate to within 1-2 meters. The accuracy is partly a function of distance to broadcasting stations, and given their distribution within the Mediterranean, accuracy is typically around a meter or less. A well-maintained DGPS system will very accurately provide position information for a vessel on the sea's surface; however shipwreck sites are on the seafloor, so several methods are typically used to determine position below the surface. A tried-and-true method in shallow water calls for divers to raise some form of buoy to the surface on a line where its position can be determined by the

research vessel. The accuracy of this method is determined by how straight the line between the wreck site and buoy is and how carefully the distance from the DGPS receiver to the buoy is measured. The deeper the water the more difficult it is to maintain a straight line and the greater the error. It is usually an adequate method in shallow water when coupled with a depth reading for the point and an accurate representation of where on the seafloor the point is located. Problematically the error from the buoy line's deviation off vertical is not consistent, nor is the buoy position calculation; hence, comparing multiple points, of scattered artifacts or the limits of a site for example, is less reliable. Once fixed absolute points are determined on the site, relative position data can be taken with a variety of methods that utilize measuring tapes, a compass, and datum points. These measurements are then processed in software to determine relative position information.

A more labor intensive, costly, and technical method is to produce a high-quality bathymetric map of the seafloor. It is a precise and accurate method for determining location, can be utilized far beyond diver depth, and has a variety of other capabilities that include 3-D modeling and an indication of sediment types. Bathymetric maps are produced from data gathered by multibeam echosounder sonar systems. The sonar part of the system shoots hundreds of soundings multiple times per second at the seafloor, in a fan shape from the research vessel, and records millions of depth measurements. Each individual depth measurement is coded with a position calculated from many sources including the research vessel's position via DGPS, the angle of the beam, and the beam's depth measurement. Each of the millions of individual depth measurements used to create the bathymetric map has a coordinate and a depth measurement and can be individually represented. As the maps are three-dimensional, the absolute position of any point on a site can be accurately and precisely determined. Additionally, it is possible to measure between points, which allows relative positions and absolute distances to be measured.





Another method for gathering location data in deep water utilizes an ROV fitted with a transponder beacon, as well as additional beacons placed by the ROV. A beacon on the ROV communicates with the research vessel, and systems on board calculate the beacon's position based on the relative position (coordinates) of the research vessel. As the distance of the beacon from the research vessel increases, the potential error increases; hence, keeping the beacon still over a period of time can assist in honing its location. Additional beacons can also be placed on datum poles or near artifacts, which assists in accurately mapping sites and the artifacts within them. Knowing the beacon's position relative to objects, where it is on the ROV or the pole to which it's attached assists in the depth measurement calculation. The position information from the beacon can also be integrated into the bathymetric map in order to track it, and thus the equipment carrying it, in real time so that researchers know where they are and where they have been. Using a beacon affixed to the ROV or placed on the seabed is a very good method for mapping individual finds on the seafloor, as well as taking check points on the extent of sites and specific artifacts within them. This method was used extensively during excavation with the ROV of the *Levanzo I* wreck in Sicily.

The systems that exist to aid in determining the location of wrecks and artifacts under water are numerous, varied, and highly integrated. For work in deeper water, this complex system allows us to achieve high standards in location documentation and utility. This technology makes it possible to document the position of an individual amphora lying among rocks 8 km offshore of the Egadi Islands at 80 m of depth, return a year later, and relocate the amphora in minutes for retrieval, which is both efficient and cost effective. Only through these complex technological systems working in unison to provide precise and accurate location data can we hope to attain the accuracy required for deep water archaeological research, and answer the question "Where is it?"

Jeffrey Royal, PhD  
Archaeological Director, RPM Nautical Foundation  
INA Research Associate



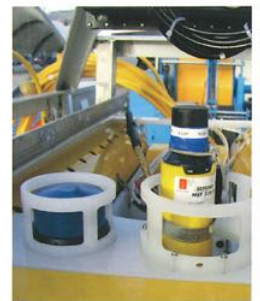
**LEFT (from top)**  
Photo-illustration of sonar soundings fanning out from the research vessel to the wreck site below.

Tried and true measurement techniques for determining relative position.

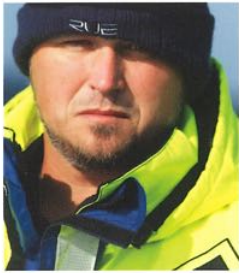
On-screen bathymetric map generated from the beacon allowing real time positional tracking.

**BELOW**  
Beacon and equipment used to accurately map the position of a wreck and the artifacts within it.

All images courtesy of RPM Nautical Foundation







ABOVE

Author, Donovan Griffin  
aboard *Icebeam*

FACING PAGE

Detailed drawing by  
Niklas Eriksson  
shows an overhead  
view of Ghost  
MARIS/Ghost Wreck Project

ROV Photo of the  
knight near Main mast

ROV view of the  
Stern section

BELOW

Multibeam data was  
used to create 3D  
models of the wreck

All Photos courtesy of  
**Deep Sea Productions**  
Multibeam images  
courtesy of **MMT**  
Drawing courtesy of  
Niklas Eriksson, **MARIS**

# Ghost in the Machine

STATE OF THE ART TECHNOLOGY USED TO SURVEY A BALTIC SHIPWRECK

*It is fair to say that many teenage boys dream of having the newest, fastest, and brightest car, phone or gaming station on the market, and as a young man studying nautical archaeology I am no different. The latest technology tempts me, and others, with endless possibilities and has the potential to expand areas of exploration in the field. Yet budgets and financial constraints time and again fail to grant us access to this level of technology. Often technology is a siren that calls to us, yet stays just out of reach.*

Since Dr. George Bass' first expedition at Cape Gelidonya, nautical archaeologists have had to make the best of what was available to them, often making do with limited resources and makeshift materials. And yet out of those less than perfect working conditions came many of the techniques that form the basis for excavation work being done today. *Improvise, Adapt, & Overcome* is the often the unofficial motto of the intrepid nautical archaeologist. And being schooled in such an environment one can imagine my surprise when I stepped aboard the *M/V Icebeam* moored in Visby, Gotland in the heart of the Baltic Sea region, and prepared to set sail to survey the "Ghost Wreck."

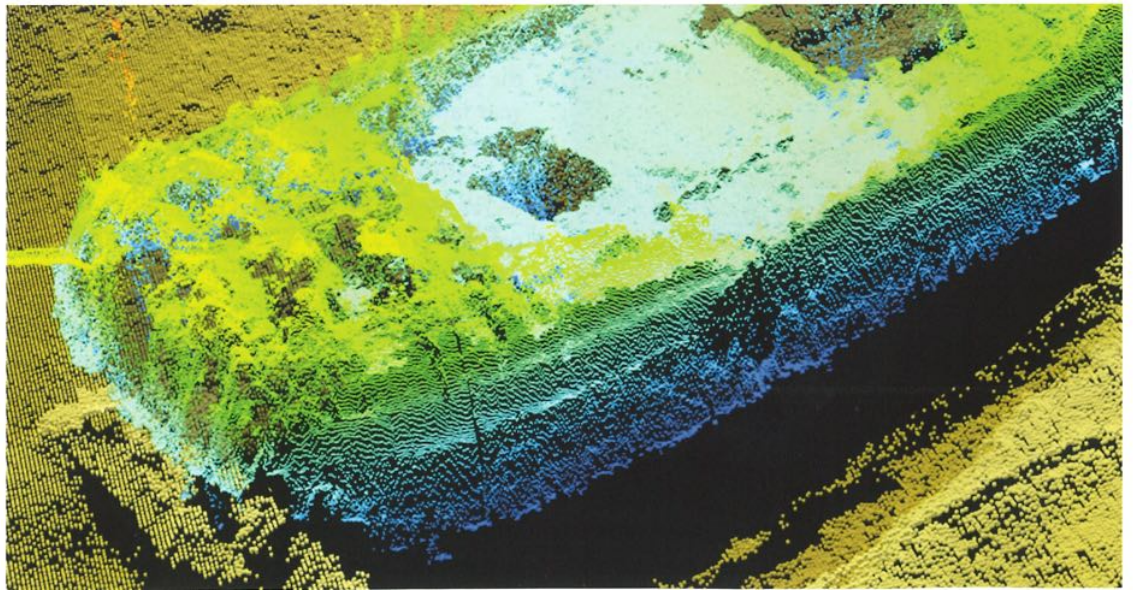
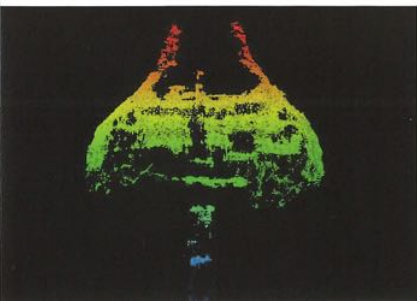
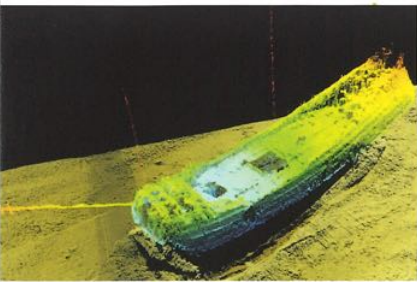
*Icebeam* bristled with all the latest and greatest oceanographic survey technology. Fresh from a job for a trans-Baltic pipeline, she was outfitted to be every nautical archaeologist's technological dream, and was accompanied by an equally impressive crew. ROV pilots, remote survey technicians, cameramen, and highly skilled ship operators were busy throughout the ship. Add in a handful of some of the best nautical archaeologists in the business and you have yourself a "dream team" for underwater maritime research. This project would set a new standard for deep submergence archaeological research and survey. Such work relies on

the cooperation of many experts from various fields, all working toward a single goal. This is what made the "Ghost Wreck" expedition such an exciting and amazing experience for me.

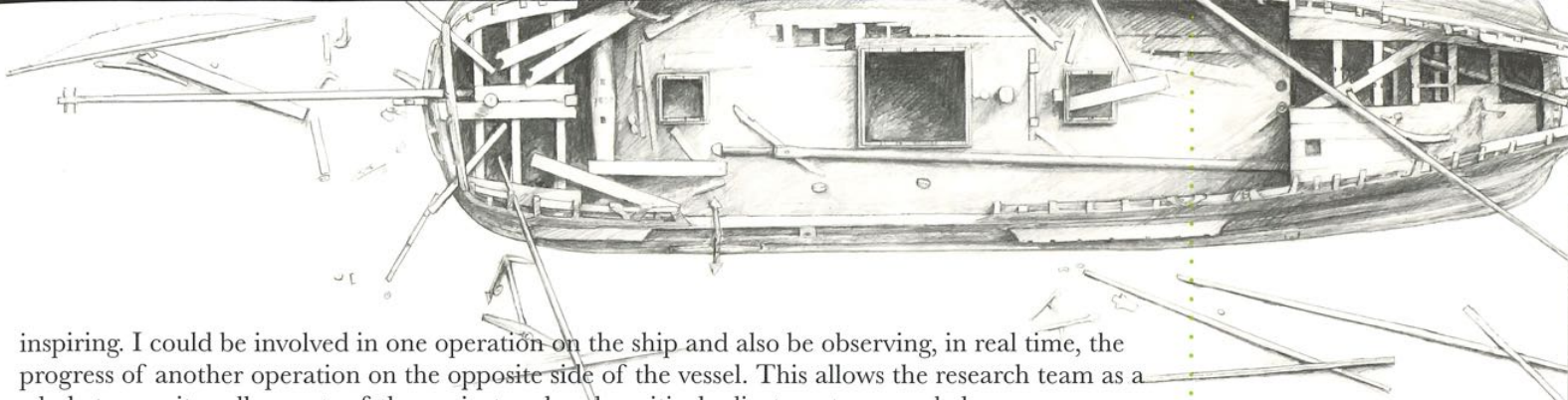
## The Ship

Under normal circumstances, the research vessel is merely a mode of transport for getting to and from the site. Technology is often towed from and hung off of the boats being used in this field, but on *Icebeam* the vessel itself is the foundation of all the high-tech survey equipment. She is like a living, breathing creature with computing power that would make many an IT expert envious.

*Icebeam* started life as ferry, the perfect platform for a research ship, as the large spaces onboard provide room for servers, monitors, and control stations that power the survey capabilities onboard. This ship is a prime example of multi-tasking, with data gathering occurring simultaneously on many levels. Every monitor onboard ship is networked and able to display any operation at any given time. One can sit in the galley and watch ROV operations as they take place, or have images and data beamed directly to a laptop. Using an iPhone, it was even possible to be in your bunk and watch display operations as they happened. This level of connectivity and data sharing was truly awe-







inspiring. I could be involved in one operation on the ship and also be observing, in real time, the progress of another operation on the opposite side of the vessel. This allows the research team as a whole to monitor all aspects of the project and make critical adjustments as needed.

Accuracy of position is of utmost importance when operating over 130 meters above an underwater site. *Icebeam* was able to maintain a specific point in space due to its dynamic positioning system. A series of bow and stern thrusters in conjunction with a centrally located azipod propulsion system used GPS and navigation computers to stay in place and maneuver during surveys.

### Multi-Beam Sonar

Sonar technology is nothing new in maritime archaeology. It uses an acoustic energy transmitter and receiver to develop a picture of the seafloor and whatever sits upon it. For years, side-scan sonar has been used by maritime archaeologists to discover and identify wrecks. This tried-and-true technology was responsible for the discovery of the “Ghost Wreck” by Marin Mätteknik’s chief surveyor Olof Nilsson. While side-scan offers a great overall view of the bottom and can be easily interpreted, multi-beam sonar can take shipwreck analysis much further. A newer technology, multi-beam produces extremely accurate digital reproductions of the ship. Several acoustic beams at varying angles are fired from the ship or ROV. That information is then received in raw form and refined by the survey experts at MMT to produce an amazing digital 3D model. These models can be rotated and viewed from any angle, allowing a wide array of precise measurements to be taken of the ship from any computer that has access to the data. One impressive side effect of this technology is the ability to penetrate wooden wrecks, resulting in an x-ray like view of the ship. These cross-sections allow researchers to see construction details and deck layouts. For the expedition team, multi-beam technology helped set a new precedent in deep survey work on shipwrecks.

### Remotely Operated Vehicles

The remotely operated vehicle or ROV, was the heart and soul of this expedition. It allowed the research group to survey the ship, recover diagnostic samples, and capture high definition video of the wreck for Deep Sea Productions, and also served as a platform for the remote survey sonar. The ROVs used in the “Ghost Wreck” expedition were normally tasked with doing commercial oceanographic survey. Their operators have thousands of hours of experience in some of the roughest working conditions on the Baltic and beyond. This combination of technology and highly skilled pilots lead to ground breaking research and amazing video of a ship lying at 130 meters under the surface of the sea. Even more impressive, the ROVs, in conjunction with tech-divers from MMT and Deep Sea Productions, successfully raised a sculpture from the stern of wreck for conservation and analysis.

### The Most Valuable Technology of All

Computers humming, cameras running, ship maneuvering, and underwater vehicles doing the work at hand, a ballet of synergy unfolded every day on the expedition. It was truly a miracle of the modern age to watch the whole operation in motion. And one constant above all kept this technological juggernaut on track. In a chair and standing just behind the operators and technicians, observant nautical archaeologists stood guard. Meticulously taking notes with the old fashioned (but still useful) pencil and paper, maritime archaeologist, Dr. Johan Rönby, and Dr. Fred Hocker, Director of Research for the Vasa Museum in Sweden, kept dedicated and knowledgeable eyes on the video monitors. It was their expertise, suggestions and observations that ensured all of the available technology was used in an efficient and effective manner. Thus allowing the research team to stay on track and the focus of the expedition to remain on the archaeology of the wreck. Years of experience taught them to keep on task and look for the vital construction clues and artifacts which would help solve the mystery of the wreck.

— Donovan Griffin

For more information on the Ghost Wreck Survey Project, please visit the INA website. There is also a project field report in the Summer 2010 issue of *The INA Quarterly*.

*For all the high tech gear at hand, it was the human component—the keen eye of the archaeologists, the steady hand of the ROV pilots, and the professionalism of the crew—that linked this ground breaking and complex operation together. And in the end, it was human interaction with technology that put our “Ghost” into the machine.*





# Golden Opportunity

## THE AUGUST CAMPAIGN



### ABOVE

INA Director  
and Vice Chair,  
Dr. Robyn Woodward,  
in the bow of *Evelyn*.

PHOTO Donnie Reid

### FACING PAGE (from left to right)

The wreck of *Klondike 1*  
at low water, June 2010.

PHOTO Donnie Reid

*Columbian's* hog chains  
protrude above the  
surface at low water

PHOTO Robyn Woodward

Nadine Kopp in the  
bow of *Julia B.*

PHOTO John Pollack

Archival image of the  
stern wheeler *Columbian*  
travelling downriver,  
circa 1903.

PHOTO Yukon Archives

The Yukon River Survey continues a multi-year mission to document the numerous and well-preserved historic steamboats of the Yukon Gold Rush, and the 2010 accomplishments represent a zenith of activity, with the involvement of no less than three graduate students on three major projects.

This year our field season involved three distinct projects - Phase One, as reported in the last *INA Quarterly*, saw Lindsey Thomas, an M.A. candidate in the Nautical Archaeology Program at Texas A&M University, together with a large team at the site of *A.J. Goddard*. This article concerns the work and discoveries made two months later, both on the river to the north of the *A.J. Goddard*, and at the West Dawson “boneyard.”

Our Phase Two project began in mid-August when John Pollack, Dr. Robyn Woodward, Jason Sturgis, Donnie Reid, and historian Robert Turner were dropped off by riverboat at the US Bend north of Lake Laberge, and used canoes to progressively move a camp downstream to Carmacks. The team was accompanied by Andreas Sawall of Spiegel-TV, whose crew shot film in preparation for a documentary on INA's work in the Yukon.

This trip required a wilderness traverse of 253 km and concentrated on three sites. Our first stop was a short one to collect a small amount of supplemental data from the bow of an intact 1908 stern wheel steamboat, the 39.6x8.7 m *Evelyn* still sitting in an abandoned shipyard on an island near Hootalinqua. These data were used to fill in a “blind spot” near the bow in an area partially obscured during the earlier LIDAR (Light Detection and Ranging, remote sensing technology) survey. Within a few hours the documentation of this vessel was completed such that a set of plans and description are now possible.

Thirteen km to the north of *Evelyn* lies the wreck of *Klondike 1*, a large (64.1x12.8m) wooden-hulled stern wheel steamboat constructed in 1926, and normally awash mid-channel in the river. It is a spectacular but difficult location to reach, and on two earlier occasions high water and current prevented any meaningful work on this site.

This time unseasonably low water had exposed most of the hull, and it was possible to perform a total station survey of the main deck, frames, hatches, openings, and longitudinal bulkheads. We inspected half-flooded compartments near the bow and stern, but gravel filled the hull amidships. A large amount of machinery was found *in situ* within the holds, including intake and exhaust steam piping, condensers, and a previously undocumented variant of a rudder-and-tiller system with four slave rudders attached to a single master pivot arm without a rudder blade.

Our third site involved an on-going search for the elusive wreck of the 1898, 44.7x10.2 m *Columbian*—from the most famous steamboat disaster in the Yukon. This large and fully-laden vessel was destroyed in 1906 by a dramatic explosion and fire, when three tons of blasting powder ignited on the bow. The captain and engineer managed to get the blazing and shattered ship to shore, where it burned to the waterline. Six crewmen died despite heroic efforts by the crew to get the word of the accident to a telegraph operator some 35 miles distant. The loss of the ship and the courage of the crew became a legend in the North.

INA searches located minor wreckage above the high water mark along the river in 2005 and 2008, and these finds helped us narrow the search area to a 1 km section. Unfortunately the strong current and shallow water prevented the use of sidescan technology in the area in 2008. Then in 2009 a chance discovery of an historic river navigation map in the Library of Congress, confirmed we were in the right area.

This year the low water presented us with a golden opportunity, and we spent a day searching for the elusive wreck. The trip was running late because of the film work, and in order to stay on schedule, we had to cover 80+ km in a single day with heavily loaded canoes, two of which were paddled solo. The trip soon deteriorated with rain squalls, and stiff headwinds, and ended with an encounter with two brown bears at the prospective camp site. A tired and soaked team finally set up a rough camp on a sodden island above the search area.

The next day we searched 4km of shoreline for wreckage, until the sharp eyes of INA Director Jason Sturgis located *Columbian* in shallow water at the head of a side channel. The majority of the hull was intact below the chines, as were





some of the side frames and lower portions of longitudinal bulkheads and keelsons. Hog chains and turnbuckles, engine beds, and a boiler feed pump were observed and an ornate white metal drinking mug was recovered during a solitary snorkeling inspection of the wreck. This vessel was loaded with cargo at the time of the disaster, and a substantial number of artifacts may be scattered downstream of the hull in the 700 m-long side channel. Precise location of the site was our sole objective for 2010, and documentation and mapping can now be organized for the upcoming field season.

Upon reaching Carmacks, our first phone call was made to Doug Davidge, the key person responsible for discovering the location of *A.J. Goddard*. Doug, a typically calm northerner, whooped with excitement over the phone, as yet another legendary Yukon site had been discovered with minimal equipment, good archival research, and simple determination.

Phase Three began following a crew change after the river trip. We once again visited the “boneyard” at West Dawson, 530 km to the north of Whitehorse, where seven large stern wheelers lie in close proximity. This year the goal was to prepare a detailed plan of a lower Yukon River stern wheel steamboat, *Julia B*. Participants included John Pollack, Dr. Robyn Woodward, Nadine Kopp (ECU MA candidate), and Chris Cartellone (TAMU PhD candidate).

The 1908, 43.3x11.6 m *Julia B* is a heavily constructed vessel containing a large number of longitudinal bulkheads, machinery and a relatively intact hull except for extensive ice damage on her port side. Most stern wheel vessels of the era have a single centerline longitudinal bulkhead combined with two truss-built side longitudinal bulkheads to provide hull rigidity fore and aft. *Julia B*'s hull contains a solid central longitudinal bulkhead comprised of a wall of heavy timbers atop a keelson plus two solid side longitudinal bulkheads. Four additional side keelsons support either hold stanchions or combinations of hold stanchions and trusses. Finally, two short truss-built engine girders are present, for a grand total of nine longitudinal strength members. On the main deck, the remains of one (of two original) engines, a heavily-constructed three rudder steering system, the paddle wheel, and two locomotive style boilers were mapped. A standard chine displayed cocked hat construction, and the boilers were supported by massive transverse carriers. Draft diagrams were prepared and hull measurements were taken using both baseline survey and total station techniques. The survey included a plan view, longitudinal and transverse elevations, and lines at the bow and stern.

The successes of this season, when combined with earlier work, suggest the Yukon effort has reached the point where a comprehensive refereed journal article or monograph is feasible. Our primary field goal for 2011 will be to prepare for that publication by gathering missing data from several known sites. Secondly, we will examine two reported sites at Rink Rapids, and assess the wreck of *Columbian*. Annual papers will continue to be given at the SHA annual conference and published in the ACUA proceedings prior to the planned journal publication in 2012.

#### SITE PROTECTION

Behind the scenes site protection efforts have continued. A February 2010 presentation by Pollack and Davidge to the Yukon Heritage Resources Board resulted in the Government of Yukon declaring *A.J. Goddard* as the first underwater Historic Site to be designated by the territory. Subsequent to this announcement, the Federal Receiver of Wreck (Transport Canada) assigned full ownership rights for the site to the Government of Yukon. Canadian INA members are actively collaborating with the Government of Yukon to afford similar protection for the wreck of *Columbian*, as well as the West Dawson “boneyard.”

—John Pollack & Robyn Woodward, PhD

The authors wish to acknowledge the following for their direct support of the 2011 field season:

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- Institute of Nautical Archaeology
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- Yukon Transportation Museum
- Vancouver Maritime Museum

Also, Jim Delgado, Gregg Cook, Jeff Hunston, Tim Dowd, Kevin Crisman, Doug Olynuik, Stockton Rush, Lee Thompson, and numerous INA members.

Finally, we thank the Ta'an Kwach'an Council and elders for their hospitality on Lake Laberge.

#### BELOW

Yukon Gold Rush Steamboat Survey Project Director, John Pollack





# NAUTICAL pathways

A JOURNEY BEGINS IN THE FIELD



INA Research Associate George Schwarz recording a Portuguese fishing vessel in the Algarve.

Photo Sam Koepnick

*“This can be a rigorous path to follow, but in my experience it is an exciting and rewarding journey and well worth the effort.”*

—GS

I did not grow up with any particular passion to study our submerged cultural resources, and was only dimly aware of the field as a first year undergraduate student, but somehow stumbled into a career in nautical archaeology. Initially, I had pursued an interest in Mesoamerican archaeology and participated in related projects in Belize while working toward a Bachelor's degree in anthropology. But I did have a strong interest in Iberian maritime history, which I focused on while completing coursework toward a minor in Spanish. By the time I started applying for graduate schools in anthropology, I had a keen interest in both Maya archaeology and the European Age of Expansion. In fact, because the developments of the Post-Classic Period of Maya Civilization were inextricably linked to the arrival of Iberian explorers, these two themes often overlapped during my undergraduate work.

In 2003 I decided to attend Texas A&M University, thereby launching my career in nautical archaeology and I continued studying Iberian seafaring and ships of discovery for my Master's thesis. While in the Nautical Archaeology Program (NAP) I participated in a range of projects in the USA, Europe, and Asia, and gained experience in project management and underwater archaeological field methods. I worked at TAMU's Conservation Research Laboratory for four years and was trained in artifact conservation, research, collections, and laboratory management. I also served as divemaster for multiple INA projects. Like other students exposed to a range of subjects during graduate studies, I developed an interest in other areas of maritime history, specifically the development of steam-propelled vessels in the United States. Currently pursuing a doctorate, I worked for the past three summers in Lake Champlain on the documentation of passenger steamer *Phoenix* (1815-1819), an early example of an American steamboat. This dissertation project involves fully recording the hull of *Phoenix* and gathering data which will allow for a reconstruction of the ship's lines and design characteristics, as this was one of the earliest vessels in the world to combine both sail and steam for propulsion.

In 2008, I began working for the Naval History and Heritage Command's Underwater Archaeology Branch (UAB) in Washington, DC, as an underwater archaeologist and manager of the branch's Archaeology and Conservation Laboratory. As a member of UAB, I am involved in archaeological research, conservation, historic preservation policy, and educational outreach. We conduct research on sunken military craft, including ships and aircraft, and plan surveys and excavations on significant examples of US Navy's submerged cultural resources. Two current projects include the search for Revolutionary War vessel *Bonhomme Richard* in the North Sea and the excavation of a War of 1812 gunboat in the Patuxent River, Maryland.

I have found that it is immeasurably important to remain aware of new or improved archaeological techniques, computer programs, remote-sensing equipment, theoretical frameworks, and conservation treatments. In addition, attending professional conferences and engaging in educational outreach initiatives not only expands our professional network, it also reinforces enthusiasm for the field. Consulting with other archaeologists or conservators working on similar projects will introduce you to new approaches, and opportunities for collaboration.

Although I began as an anthropology student with little knowledge of the field of nautical archaeology, over the past ten years I've been fortunate enough to participate in the study of ship and aircraft wrecks from eras ranging from the 1st century BC to the Second World War. As unique opportunities have presented themselves, it has been compelling to expand my knowledge of the field, as well as the historic preservation laws that have been established to protect these fragile and nonrenewable resources. Though not typically a lucrative or easy field to work in, the analysis and protection of our collective maritime past is a worthwhile contribution to the study of humankind.

— George Schwarz





PHOTOS T. Nielsen (2011)

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ABOVE (Top)  
Nicolle co-directed the 2010 INA expedition to Cape Gelidonya, Turkey, with Dr. George Bass.

(Bottom) Dr. Hirschfeld and John Littlefield after a dive to the wreck site.

PHOTOS Ryan C. Lee