Uncovering Jamestown

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The 108 English entrepreneurs who landed on the banks of the Chesapeake in 1607 had no way of knowing that the settlement they were about to found, Jamestown, would come to be known as the birthplace of America and they would surely be shocked to learn that 400 years later whole teams of skilled professionals would devote careers to studying every artifact—armor, milk pans, candlesticks, etc.—that survived them. But in anticipation of Jamestown’s 400th anniversary, that’s what’s happening as the Jamestown Rediscovery Project, begun in 1994 under the auspices of the Association for the Preservation of Virginia Antiquities (APVA), strives each day to preserve, protect and promote the original site of Jamestown, the first permanent English settlement in North America. Bordered by the James River, these first settlers made their home in what would eventually become the colony of Virginia.

Since 1994, teams of archaeologists have unearthed hundreds of thousands of artifacts dating before 1650. However, the single biggest breakthrough occurred after just two years of digging, when archaeologists uncovered the initial remains of James Fort, a triangular fortification that sits on an acre and a half of the land on Jamestown Island.

...looking for ways to more efficiently record, manage and share information”

>> By Cori Keeton Pope
Overhead view of the James Fort excavation with the cobble building foundation partially uncovered (foreground), backfilled magazine (center left), bulwark palisade trench (center), bulwark trench (center right) and town palisade trench (far center right), October 1997. Site observation deck is in the middle.
“When the project first began, we recorded everything in an analog environment, taking notes about our findings by writing it down on paper and making slides,” says David Givens, staff archaeologist. “But all of the paper notes became difficult to manage and weren’t as useful as we’d hoped, and with the discovery of James Fort we quickly learned that the scope of the project was much too large to record manually.”

In order to make better use of the collected data, Jamestown Rediscovery archaeologists began looking for ways to more efficiently record, manage and share information about their findings. The search for a better system led to Bell Laser & Surveying Equipment, located just west of Richmond, Virginia. Bell Laser has provided technology solutions to a number of archaeology departments including the Thomas Jefferson Foundation’s Monticello project, the Thomas Jefferson Poplar Forest and other historical sites in Virginia.

“The use of surveying equipment is really growing among archaeologists,” says Stewart Bell, owner of Bell Laser. “I see more and more recent graduates who are familiar with the concept of using surveying equipment instead of mapping all of their findings manually, and seeing their map on the Recon display makes the Jamestown project perfectly suited for this kind of technology.”

After researching a variety of survey and data collection options, the Jamestown Rediscovery team selected the Nikon total station and Recon with TDS Survey Pro software to digitally map and collect data at the site.

“Nikon is a top name in surveying equipment, and we were sold on the complete package with the Recon because of the ruggedness of the computer and the seamless way the two pieces of hardware work together,” says Givens. “We’re either working in really dry weather with blowing dirt and sand or in rain and mud for eight hours per day, five days a week. We needed equipment that could withstand the rigors of our work environment.”

Today, each of the eight full-time archaeologists working on the Jamestown Rediscovery project are fully trained on the Nikon total station and Recon with TDS Survey Pro software, and it is not unusual to collect 1,000 points or more in a day – a good total for any survey crew.

“As archaeologists, we had the concept of Cartesian mapping; we were used to
working with points, lines and polygons,” says Givens. “Stewart spent a day teaching us the ins and out of the new equipment and we were set. The Recon and the Nikon total station were easy to learn, so it was easy for us to migrate to this technology.”

Now, rather than walking among the delicate artifacts with a tape measure and a pad of paper, workers are able to digitally map the entire fort in three-dimensions to one-tenth of an inch.

At the end of each day, the archaeologists return to the office, where the coordinates collected in the field are downloaded to the desktop computer via Survey Pro and analyzed using AutoCAD software to check the georeferencing. Once the scale, rotation and positioning of the data is confirmed, it is exported to a Geographic Information

Jamestown Rediscovery archaeologists Mary Anna Richardson and Don Warmke use a Nikon total station and TDS Recon data collector to map a brick hearth, which has sunken into the first well in Jamestown. Because of the delicate nature of the hearth, archaeologists shot in the top point for each brick, then extruded a brick from that data.
If you’re interested in learning more about the findings at Jamestown, you’re in luck. This spring, the Association for the Preservation of Virginia Antiquities (APVA) opened the Archaearium, a $4.9 million facility designed to be the main attraction at the historical site. The Archaearium houses many of the artifacts from Historic Jamestowne’s collection, which are now on display for the public for the first time.

“The artifacts in the Archaearium tell the story America’s first settlement,” says David Givens, staff archaeologist. “The artifacts you see here were selected because they give us some insight into the way people lived in the seventeenth century. Items on display include armor and medical instruments, and we have a room dedicated to telling the story of people who lived and died in Jamestown.”

Other features include displays of ceramics, tools, coins, personal objects, food remains and musical instruments, as well as information about how DNA and forensics testing have helped uncover some of the mysteries of Jamestown. Visitors also discover how archaeologists found the fort, and interactive virtual viewers overlooking the site show visitors where objects were uncovered and what the fort looked like 400 years ago.

The Archaearium is built on top of the last Statehouse in Jamestown, which burned down in 1698. Here, visitors can see through sections of glass flooring to view portions of the excavated ruins of the building, and an outline of its foundation is represented throughout the facility in the carpeting.

The 7,000 square foot Archaearium is a key part of the preparations the APVA is making in honor of Jamestown’s 400th anniversary in 2007. Plans also include a new visitor center, a riverside restaurant, enhanced visitor transportation opportunities and outdoor exhibits.
System (GIS), where it can be mapped, analyzed, shared and utilized for many different purposes.

“The ultimate goal of the entire project is to share information about the patterns of the past and the development of one of the earliest colonies in America,” says Givens. “Now that all of the data we collect is digital and stored in a GIS, it is easily accessible and much more useful than paper records could ever be.”

For example, archaeologists studying the artifacts can now query their findings spatially or from the standpoint of a particular type of artifact, resulting in detailed maps and reports about specific findings.

“With all of the data from our findings in a GIS, we can search for armor, for example, and get maps of all of the locations throughout the site where we’ve found armor to date, including information about who found it, when we found it and precisely where it was located. We can also do a detailed search of a particular portion of the fort and pull up maps, notes and images of everything we’ve found in that particular area.”

In addition to making the information collected in the field more useful and accessible, the digital survey and data collection solution is also enabling archaeologists to complete their work while protecting the fragile state of the artifacts. For example, while the archaeologists were working to uncover the James Fort, they discovered a chimney that collapsed and sank into a well. After more than 380 years, the bricks were brittle and the entire chimney had taken on a concave shape. “Because of the condition of the chimney structure, removing it intact was not an option, and the way the bricks were now shaped made it impossible to reconstruct, even if we removed the entire chimney one brick at a time,” says Givens.

Instead, the Jamestown Rediscovery team carefully removed and mapped the surface of each brick individually, then recreated a three dimensional representation of the chimney digitally. The digital representation of the chimney is now housed in the GIS, along with the data from the rest of the artifacts.

In addition to creating three-dimensional representations of delicate artifacts like the chimney, technology also allows the archaeologists to map artifacts they can’t even touch. Givens is using a digital photo-mapping process known as close range photogrammetry to measure...
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and create maps of some of the most fragile features, such as cobble and brick work. Using a digital camera with the total station and the Recon data collector, Givens is able to recreate detailed, delicate features of the fort, which can then be linked to a master excavation grid without physically touching the artifact being mapped. “By using photogrammetry for some of the more intricate structures, we’re able to better protect the integrity of the artifacts, yet get very precise measurements and recreations,” says Givens. “Uncovering many of these relics is painstaking, slow work when done manually, so this also enables us to accomplish more in a shorter period of time.”

In addition to uncovering an important part of U.S. history, Givens and his team are also setting an example for other archaeologists. “The solutions we’ve come up with for mapping and digging are making our work much more efficient, and we’ve started sharing more of our processes with colleagues on other archaeological projects,” says Givens. “We’ve learned that we can map a grave, for example, in 45 minutes where it takes our peers a week.”

Without a data collector and total station, archaeologists would map a grave by pulling a centerline across the middle of the remains, then use a folding ruler or pull tape to measure it, sketching their findings on paper.

“The manual method is much more time consuming and far less accurate, and there’s a certain amount of danger involved with crawling around in a 400 year old grave,” says Givens. “Aside from that, we also have a responsibility to the resources we’re excavating that requires us to use the best technology available to us.”

For the Jamestown Rediscovery project, the responsibility to the artifacts doesn’t end once the items are excavated. A painstaking team of conservationists goes to extremes to protect the integrity of the artifacts once they are unearthed. Organic material, such as a recently discovered pair of leather shoes, is preserved in a bag of water and then refrigerated, and metal artifacts are housed in a room that has less than 13 percent humidity to halt the rusting process. Copper and gold are typically conserved using a chemical mixture, and bone is washed in a solution that helps prevent further deterioration.

While working quickly may not seem like a priority when uncovering a settlement nearly 400 years old, the entire Jamestown Rediscovery team is working feverishly to complete as much of their work as possible in preparation for an influx of tourists from around the world celebrating the 400th anniversary of English America in 2007.

“The entire Jamestown Rediscovery project will take years to complete, even with the advances in technology,” says Givens. “But we’re trying to get as much done as possible in preparation for next summer, when we anticipate record-breaking numbers of tourists to Jamestown Island, our museum, and the site of James Fort.”

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