

Computer scientist to 'unroll' papyrus scrolls buried by Vesuvius

May 24 2009, By Jim Warren

On Aug. 24, 79 A.D., Italy's Mount Vesuvius exploded, burying the Roman towns of Herculaneum and Pompeii under tons of super-heated ash, rock and debris in one of the most famous volcanic eruptions in history.

Thousands died. But somehow, hundreds of papyrus scrolls survived -- sort of -- in a villa at Herculaneum thought to have been owned at one time by Julius Caesar's father-in-law.

The scrolls contained ancient philosophical and learned writings. But they were so badly damaged -- literally turned to carbon by the volcanic heat -- that they crumbled when scholars first tried to open them centuries later.

The remaining scrolls, stored away in Italy and France, haven't been read -- or even unrolled -- since 79 AD.

Now, a computer scientist from the University of Kentucky hopes that modern digital technology will allow him to peer inside two of the fragile scrolls -- without physically opening them -- and unlock secrets they have held for almost 2,000 years.

Brent Seales, the Gill professor of engineering in UK's computer science department, will use an X-Ray CT scanning system to collect interior images of the scrolls' rolled-up pages. Then, he and his colleagues hope to digitally "unroll" the scrolls on a computer screen so scholars can read

them.

"It will be a challenge because today these things look more like charcoal briquets than scrolls," Seales said. "But we're using a non-invasive scanning system, based on medical technology, that lets you slice through an object and develop a three-dimensional data set without having to open it, just as you would do a CT scan on a human body."

The two scrolls that Seales and his team will work on are stored at the French National Academy in Paris. The UK group will spend July working there.

Their system was developed at UK through the EDUCE project, or Enhanced Digital Unwrapping for Conservation and Exploration, which Seales launched through a grant from the National Science Foundation.

Experts say that if the UK system works as well as hoped, it could provide a safe new way to decipher and preserve more scrolls from Herculaneum, as well as other ancient books, manuscripts and documents that are too fragile to be opened.

"No one has yet really figured out a way to open them," says Roger Macfarlane, a professor of classics at Brigham Young University who also has worked on scrolls from Herculaneum. "If Brent is successful it would be a huge, potentially monumental step forward."

Seales admits that there are hurdles, the biggest being the carbon-based ink thought to have been used on the scrolls. He says that since the papyrus in the scrolls was turned to carbon by the fury of Vesuvius, it might be impossible to visually separate the writing from the pages, even with powerful computer programs.

"The open question is, will we be able to read the writing?" Seales said.

"There is a chance that we won't be able to do it with our current machine, and that we'll have to re-engineer some things. But if that's the case, that's what we will do."

Seales, who is from Buffalo, N.Y., grew up with two passions: computers and the humanities. His double major in undergraduate school was computer science and violin. While working on computer imaging in graduate school, Seales became interested in how that technology might be used to digitally preserve old manuscripts and documents.

By the early 1990s, he was developing systems to read old records that were crumpled and wrinkled with age. As a result, he joined an international computer team that digitized the oldest known complete text of Homer's Iliad, which is stored in Venice, Italy. The project, ultimately completed at UK's Center for Visualization and Virtual Environments, produced new digital images, bringing to life sections of the text from the 10th century B.C. that previously were little more than ink smudges.

Developing a method to virtually unroll and copy ancient documents too delicate for normal handling was the next step. This is the system that Seales and his colleagues will use on the Herculaneum scrolls.

If it works, what will they find?

The best guess is that the scrolls contain writings by Philodemus, a Roman writer and Epicurean philosopher born about 110 B.C. Philodemus is not considered a classical thinker of the first rank, but he was a contemporary of Cicero. He taught Virgil and is thought to have influenced the Roman poet Horace.

Philodemus also was a friend of Lucius Calpurnius Piso -- the father-in-

law of Julius Caesar -- who at one time owned that luxurious villa at Herculaneum.

The mansion had passed to other hands, however, when it and Herculaneum were buried during the eruption of 79 A.D. Afterward, Herculaneum lay hidden for 1,600 years, until excavators stumbled upon it in 1709.

The villa itself was not uncovered until the mid-1700s. Inside its library, investigators found what they first thought to be lumps of coal but that turned out to be papyrus scrolls -- about 1,800 in all -- fused into blackened cylinders by furious volcanic heat. The building became known as the Villa of the Papyri.

According to Seales, the scrolls did not burn because the building so was completely encased in ash and lava that no oxygen was available to feed any flames.

Ironically, experts say that the papyrus, made of plant material, almost certainly would have decomposed over the last 2,000 years had it not been sealed in what amounted to an airtight vault.

What survived was incredibly fragile. Many scrolls simply crumbled when early researchers tried to open them. A Vatican priest eventually developed a way of opening a few scrolls, but it was slow and produced mixed results. Most were never unrolled.

The majority of the scrolls ultimately went to a library in Naples. But Napoleon had several shipped to France when he took over Italy after 1800. Among these scrolls are the two that the UK team plans to investigate.

Seales describes the process as resembling a "virtual colonoscopy," a

medical test for colon cancer.

"In a colonoscopy, you're interested in whether there's cancerous activity on the wall of the colon," he said. "So you can imagine locating that in a scan, then flattening it out and manipulating it to see what you can see. We'll be doing a similar sort of thing."

According to Seales, many experimental scans probably will be necessary, plus much additional computer work afterward, to produce clear images.

Members of the UK group won't touch the fragile materials. All handling will be done by conservators at the French National Academy.

Macfarlane, the Brigham Young University scholar, predicted that if Seales' team is successful, other Herculaneum scrolls probably also will be made available for scanning. Those could contain works by other ancient writers, more important than Philodemus, perhaps by Epicurus, who founded one of the major philosophies of ancient Greece, Macfarlane said.

"If Brent does unlock the door to reading these scrolls that are still hiding text, there will be a lot of excitement," he said.

Seales sees other potential applications for the system, including deciphering otherwise unreadable written materials for homeland security purposes. But, he also admits that there are other ancient tests he'd like to examine.

"There are pieces of the Dead Sea scrolls that still haven't been opened yet," he said. "I've talked with some members of teams that work with those materials, and I'd love to see what more we could wring out of them."

"I guess I just like solving mysteries."

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