

## Science & the shroud

### Microbiology meets archaeology in a renewed quest for answers

- [High magnification close-up of a shroud fiber \(108k\)](#)

By Jim Barrett

**H**oax or holy grail? The argument about the Shroud of Turin spans centuries. No one has proven it is the burial cloth of Jesus of Nazareth, but its haunting image of a man's wounded body is proof enough for true believers.



Researchers from the Health Science Center now appear to have the clue to resolve a scientific contradiction: If the shroud is authentic, why does radiocarbon dating indicate that the cloth is no more than about 700 years old?

The shroud is unquestionably old. Its history is known from the year 1357, when it surfaced in the tiny village of Lirey, France. Until recent reports from San Antonio, most of the scientific world accepted the findings of carbon dating carried out in 1988. The results said the shroud dated back to 1260-1390, and thus is much too new to be Jesus' burial linen.

Now the date and other shroud controversies are under intense scrutiny because of discoveries by a team led by Leoncio A. Garza-Valdes, MD, adjunct professor of microbiology, and Stephen J. Mattingly, PhD, professor of microbiology. Dr. Garza is a pediatrician from San Antonio, and an archaeologist noted for expertise in pre-Columbian artifacts. Dr. Mattingly, president of the Texas branch of the [American Society for Microbiology](#), is widely respected for his research on group B streptococci and neonatal disease.

After months examining microscopic samples, the team concluded in January that the Shroud of Turin is centuries older than its carbon date. Dr. Garza said the shroud's fibers are coated with bacteria and fungi that have grown for centuries. Carbon dating, he said, had sampled the contaminants as well as the fibers' cellulose.

Such startling findings ordinarily would be published in a scientific journal, but the team has waited. The shroud's ultimate custodian, the Catholic Church, has declined to designate the San Antonio fibers as an official sample. Dr. Garza received them in Turin, Italy, in 1993 from Giovanni Riggi di Numana, who took the official shroud samples for the carbon dating in the '80s.

Dr. Garza's hypothesis, however, transcends the shroud, and it is being taken seriously by archaeologists, microbiologists, and even those most

closely associated with carbon dating.

"This is not a crazy idea," said Harry E. Gove, PhD, co-inventor of the use of accelerator mass spectrometry for carbon dating. Dr. Gove is professor emeritus of physics at the University of Rochester in New York.

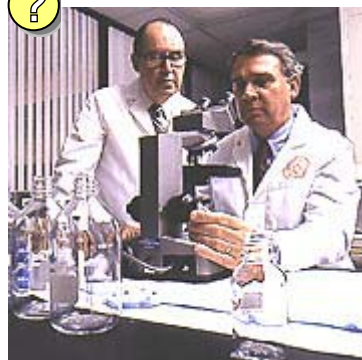


This site was awarded a Times Pick by the Los Angeles Times on May 8, 1998.

"A swing of 1,000 years would be a big change, but it's not wildly out of the question, and the issue needs to be resolved," he said.

Toward that end, the University of Arizona in Tucson is preparing carbon dating procedures to test the hypothesis on an ibis bird mummy that stylistically would date back to about 330-30 BC. Physicists will sample collagen from bone, which is relatively unaffected by bacteria and fungi, and compare its date to wrappings from the mummy. Textiles contain large quantities of bacteria and fungi because they have much more surface area by volume than a smooth object of similar size, therefore the mummy wrappings are important for comparison.

Two samples of mummy wrapping will be tested; one that is cleansed of contaminants with conventional methods, and another sample cleansed with a method developed by Drs. Garza and Mattingly. Dr. Garza has said the conventional method fails to remove the bacteria and fungi.



"I'm a bit skeptical, but I don't want to dismiss the theory. It is possible that contaminants could throw off the

dates somewhat, but by how much?" said Douglas J. Donahue, PhD, physics professor at the University of Arizona and principal investigator at the National Science Foundation/Arizona's Accelerator Mass Spectrometry Laboratories, where the tests are planned in the coming months. The site performed parts of the 1988 carbon dating of the shroud.

The unfolding events have engrossed museum curators, antiquities dealers, and scholars.

"This could be a great breakthrough in understanding the ancient world," said A. Rosalie David, PhD, keeper of Egyptology at the [Manchester Museum](#) in England.

"If the theory is correct, and there seems to be a lot of evidence it is, this would be a spot check to tell if artifacts in museums or for sale on the market are genuine or fakes," Dr. David said. She has joined the project, and supplied samples from a museum mummy to the Arizona laboratories.



The San Antonio discovery goes back to the '80s when Dr. Garza discovered "biogenic varnishes" on an ancient Mayan carved jade called the Itzamna Tun. The artifact had been labeled a fake by two art connoisseurs in New York, he said. Carbon dating failed to come close to the carved stone's true age, and Dr. Garza identified masses of varnish that prevented accurate dating, thus upholding the jade's authenticity. The varnishes, he learned, are a plastic-like coating that is a byproduct of bacteria and fungi. In the Itzamna Tun's case, this bioplastic coating threw off the carbon date of ancient blood on the artifact by about 600 years.

Could this be true of the Shroud of Turin?

In May 1993, Dr. Garza traveled to Turin, and examined a shroud sample with the approval of Catholic authorities. "As soon as I looked at a segment in the microscope, I knew it was heavily contaminated," Dr. Garza said. "I knew that what had been radiocarbon dated was a mixture of linen and the bacteria and fungi and bioplastic coating that had grown on the fibers for centuries. We had not dated the linen itself."

Dr. Garza returned to San Antonio with a few threads from the lower right corner of the shroud. He enlisted Dr. Mattingly. Together they applied the principles of microbiology to the evaluation of several archaeological specimens. "Archaeomicrobiology," as they describe their discipline, had never been used before on the shroud or almost any other artifact.

At the Health Science Center and elsewhere, they examined samples using optical and electron microscopes and sophisticated viewing techniques, and photographed them under high magnification using special dyes and lighting. The researchers delicately sliced fibers to expose cross-sections of the bioplastic coating, and are working with an enzyme process to cleanse contaminated samples.

**B**ecause Egyptian mummies appear to have the same contamination on their wrappings, Egyptologists such as Dr. David are eager to learn whether the mummies are correctly dated. The Manchester Museum, for example, has supplied samples from its mysterious mummy No. 1770 for carbon testing using the Garza-Mattingly cleansing technique. British experts cannot fully explain why carbon dating of No. 1770's wrappings indicate they are 1,000 years younger than the bones.

Until now, archeologists attributed the discrepancy to the ancient Egyptians themselves. "The suggestion was that the body was found in a very damaged condition perhaps 500 years after it was first wrapped. The thinking is that the embalmers were uncertain who this was, but the spot where the mummy was found indicated it might be somebody of importance so they re-wrapped it to give it another chance at eternity. And that is where it was left until this discovery by Dr. Garza," she said.



In his discoveries about Mayan artifacts, Dr. Garza challenged orthodox thinking and relentlessly pursued his theory, which yielded significant results, said a longtime associate, George E. Harlow, PhD, curator of minerals and gems at the [American Museum of Natural](#)

[History](#) in New York. "Many of us in science wander down a low-energy trough, studying the things we want to study, but Dr. Garza doesn't know or regard conventional wisdom very highly so it is stimulating to find out what he is doing. He deserves much credit for his willingness to challenge authority, pursue investigations and try to be objective."

**P**racticing science with the Shroud of Turin puts Drs. Garza and Mattingly in a charged atmosphere. Moving the shroud's origin back several centuries would place it closer to the time of Jesus' death, and certainly energize debate about whether the cloth is a hoax or holy grail.

Adding to the atmosphere, a third member of their team has identified a part of the shroud's markings as that of blood from a human male. No one has conclusively determined how the markings got on the linen, but they appear in bas relief in a perfect negative image. Experts have entertained theories that the markings came from paint, scorching, or accelerated aging. Victor V. Tryon, PhD, assistant professor in microbiology and director of the university's Center for Advanced DNA Technologies, examined the DNA of one so-called "blood glob" from two separate microscopic shroud samples. He reported isolating signals from three different human genes by employing polymerase chain reaction, which can detect pieces of double-stranded DNA.

**A**mid the debate, Drs. Garza and Mattingly cannot escape the fundamental question of whether they have real shroud fibers. A transfer of papal authority in Turin and a turn of events three years ago there further cloud the issue.

Turin's Cardinal Giovanni Saldarini has publicly questioned the authenticity of the sample. On Italian television in January, he was quoted as saying: "There is no certainty that the material belongs to the shroud so that the Holy See and the custodian declare that they cannot recognize the results of the claimed experiments."

Cardinal Saldarini rejected Dr. Garza's request in April 1993 to perform tests on shroud fibers. But his refusal came days after Dr. Garza had arrived in Turin, and obtained a sample that remained from the 1988 cutting for radiocarbon dating. He received the sample from Riggi, a scientist appointed by Saldarini's predecessor, Cardinal Anastasio Ballestrero, to do the cutting. Ballestrero retired in 1990.

Where the new testing and other events will lead is uncertain, but few people deny the work of the Health Science Center team has expanded the scope of microbiology. In the process, the researchers have developed methods that promise to enhance the accuracy of radiocarbon dating. They also have given archaeologists a new tool to evaluate antiquities. And perhaps they have even opened a path that leads to an explanation of the enduring mysteries of the Shroud of Turin.



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