

Controversy builds as shroud tests near

While the Catholic Church has agreed to let scientists attempt to date the Shroud of Turin, a linen relic that many believe once wrapped the crucified body of Christ, officials have not publicly announced when. However, people familiar with the radiocarbon-dating tests believe they will begin soon—and amidst considerable controversy.

The controversy erupted last year when Cardinal Ballestrero, the Archbishop of Turin and pontifical custodian of the shroud, announced the Church had chosen three labs to date the textile (SN: 11/7/87, p.302)—half the number a scientific consortium had recommended one year earlier. The scientists' protocol (SN: 4/25/87, p.265) also would have employed two different types of carbon-14 test procedures—the conventional proportional-counting technique (which measures emissions from radioactive carbon) and tandem-accelerator mass spectrometry (which can directly measure carbon-14 without waiting for its decay). But since accelerators need only a third as large a sample as the counter tests, Ballestrero decided to limit testing to accelerators. He further limited participating labs to those routinely dating archaeological samples.

The process winnowed the field of researchers down to those at the University of Arizona in Tucson, the Federal Technical Institute in Zurich, Switzerland, and the University of Oxford in England. It also reduced by two-thirds—to about 40 milligrams—the quantity of shroud allowed to be sacrificed.

Some scientists express concern about the three-lab decision. Among them are Harry Gove of the University of Rochester (N.Y.) physics department—whose lab developed the accelerator carbon-14 dating technique—and Garman Harbottle of Brookhaven National Laboratory in Upton, N.Y. According to Harbottle, there “appears to be about a one in five chance for any given measurement” that the answer will be very wrong. If there are only three labs, he says, it may be difficult to identify whose is the spurious reading.

Geoscientist Paul Damon, co-director of the Arizona tests, downplays that concern, pointing out that “we hope to get a number of [carbon-14] analyses from the 1 square centimeter of [shroud] being sent us”—perhaps as many as seven.

Harbottle and Gove, whose lab does not routinely date archaeological samples, are just unhappy their labs were eliminated because they didn't meet the archbishop's requirements, says Robert Dinegar, a retired Los Alamos National Laboratory physical chemist and the Episcopal priest who, along with Harbottle, has been a co-coordinator of the Shroud of Turin Research Project.

“Though I would like to see a counter laboratory [like Harbottle's] included,” Dinegar says, “we can certainly get a viable answer from the accelerator method.”

Archaeologist Paul Maloney, vice-president of the Garnerville, N.Y.-based Association of Scientists and Scholars International for Shroud of Turin Ltd., is not so sure. For a report he sent to Ballestrero last month, Maloney interviewed a number of prominent members of the radiocarbon-dating community, many of them unconnected with the shroud project. He

says he found that they tend to share a “grave concern . . . that accelerator technology is not yet ready to do what the Church wants it to do”—largely because of the frequency of spurious readings from small samples. Maloney says he hopes the Church will postpone the upcoming tests to reconsider its decision to use just three labs and the accelerator technology.

Even if the tests do begin soon, don't expect an immediate announcement of results. Damon says final results should be issued toward the end of the year in an announcement by the archbishop and in a refereed journal by the scientists.

— J. Raloff

Soviets visit U.S. for mock nuclear blasts

Nine Soviet scientists and a private U.S. group plan to detonate a pair of simulated nuclear explosions later this month aimed at laying the scientific foundations for a ban on underground nuclear testing. The visiting scientists and their U.S. colleagues are currently at field stations in Nevada preparing for the chemical blasts that are part of an agreement between the Soviet Academy of Sciences and the Natural Resources Defense Council (NRDC), a Washington, D.C.-based environmental group.

The explosions, located at two spots in Nevada, will help detail how high-frequency seismic waves travel away from the official U.S. nuclear weapons testing site in the southern part of the state. The scientists involved in the project also will be assessing state-of-the-art seismometers that may be the watchdog instruments used to monitor a future ban or limitation on nuclear testing.

“The objective is to do some good science,” says Thomas B. Cochran, an NRDC staff scientist. Last September, he and a team of U.S. experts visited the Soviet Kazakh testing site, where they witnessed similar chemical explosions.

In the 1970s, the United States and the Soviet Union negotiated two treaties that limit the size of underground nuclear tests to the explosive equivalent of 150 kilotons of TNT. Both countries signed these agreements, but they have yet to ratify the treaties, primarily because they have failed to agree on how to verify compliance with the testing limits. The verification issue also stands in the way of any future total ban on testing.

To measure the size of nuclear explosions, scientists have traditionally relied on seismometers—instruments that record waves traveling through the earth from explosions and earthquakes. U.S. officials, however, have suggested certain evasion scenarios by which a country might “fool” a seismic system.

Some have suggested that it would be possible to hide an explosion by detonating the device during an earthquake.

Another scenario involves setting off the explosion in a hollow underground cavern. This technique, called decoupling, would muffle the blast.

Seismologists now believe, however, that by monitoring high-frequency seismic waves, they can reliably protect against both evasion scenarios.

“The decoupling effect is weaker at high frequencies,” says James Brune, director of the seismological laboratory at the University of Nevada at Reno, which is participating in the NRDC experiments. Moreover, says Brune, scientists are now confident that they can distinguish between earthquakes and explosions by using high-frequency seismometers. These devices can measure waves up in the realm of 20 to 50 hertz. Traditional earthquake seismometers record at about 1 hertz.

The experiments in Nevada will involve a 10-ton and a 15-ton explosion, which the scientists will monitor from three permanent seismic stations located approximately 100 to 120 miles from the test site. The NRDC and Soviet Academy built these stations and similar ones in the Soviet Union during an earlier phase in their agreement (SN: 7/4/87, p.6). The Soviets also have brought with them a ton of their own seismic equipment for an additional temporary station.

The federal government has criticized the NRDC agreement in the past. But now, for the first time, the State Department has granted unrestricted visas to Soviet scientists connected with the project, which allow them to travel to the field stations. “We're really pleased with that because without that permission, we could not carry out the experiment,” says S. Jacob Scherr, an NRDC attorney.

Officially, the two governments are preparing for a set of experimental nuclear explosions expected this summer (SN: 1/30/88, p.71). The countries will compare several monitoring techniques in an effort to agree on a verification scheme for the unratified treaties.

— R. Monastersky