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## The Shroud of Turin

Earlier this year, Dr. Raymond Rogers of the Los Alamos National Laboratory, (University of California, in *Thermochimica Acta*, 2005, vol. 425:189-194) published an article on the shroud of Turin which dates the shroud's origins at about 2000 years ago. His is the most recent study to confirm what many already believe, in spite of earlier studies which claimed that the shroud was a hoax.

The shroud of Turin continues to be the subject of controversy, with claims and counter claims all based on scientific research. Unfortunately, good science is too often used to bolster flawed reasoning. Last year, David Stoney listed the debunking of the shroud as one of Dr. McCrone's greatest achievements in a memorial tribute in the *Journal of Forensic Science* (2004). Stoney referred to McCrone's work in 1978 in which he claimed to have found particles of paint on sticky tapes he applied to the shroud. In more recent study on the shroud, (2005), Dr. Rogers referred to his previous (1982) study with sticky tape samples which demonstrated that there was *no* evidence of paint or other applied materials.

Perhaps the most anticipated and widely reported study of the shroud was the radiocarbon test published in *Nature* in 1989. Scientists from New York, Arizona, Zurich Switzerland, Oxford England, and the British Museum, announced that the shroud of Turin originated sometime between the years 1260 and 1390, identifying the shroud as a pious icon rather than the burial shroud of Jesus. Their conclusion was based on Carbon 14 analysis (C-14) following a protocol agreed to by the Vatican, with research performed in three laboratories chosen by the Archbishop of Turin. Although proclaimed to be the final word on the shroud's age at the time, many scientists thought that the judgment was premature, citing evidence based on botanical, forensic, and historical research, that is incompatible with the dates established by the C-14 study.

A brief review of Carbon 14 analysis will explain why the authors could make such claims. In the atmosphere, a small proportion of Carbon is radioactive, created by the sun's rays striking nitrogen atoms and converting them into Carbon 14 (C-14); the common stable form of Carbon being C-12. Since Carbon is a main constituent of carbohydrates and protein, it is found in all living things. Carbon is taken from the atmosphere in the form of Carbon dioxide (CO<sub>2</sub>) and converted into starch, sugar, and tissue by green plants, forming the base of the food chain. Therefore all living tissue including textile plants such as flax and cotton will have the same ratio of C-14 to C-12 that exists in the atmosphere — about 1:1 trillion. Once an organism dies, the radioactive C-14 present gradually decays to become Nitrogen. Knowing the rate of decay of C-14 (half the C-14 present every 5730 years), and the proportion of C-14 to C-12 in a specimen such as cloth, its age can be determined, assuming that the proportion of C-14 in the atmosphere has not changed over time.

There is no reason to doubt the results of the C-14 analysis done in 1989, and, given the established assumptions of the method, the conclusion of a medieval origin of the

shroud does certainly appear reasonable based on the C-14 evidence alone. Yet, while the C-14 levels detected by the three laboratories are incontestable, conclusions based on the assumptions of the method are not as definite. Scientific critics of the '89 paper have pointed out that there could be biological contamination by either bacteria or fungi on the shroud, throwing the C-14/C-12 balance awry. Some have suggested that large amount of still-living bacteria and fungi they observed could have contaminated the C-14 composition of the samples (e.g. Drs. Leoncio A. Garza-Valdes and Stephen J. Mattingly, 1993, Abstract of Paper delivered to the Texas Medieval Assoc., San Antonio, Texas. September 11, 1993: Scientific Analysis of the Shroud of Turin). Since linen fibers are hollow (made up of flax), it might be possible for biological contaminants to remain undetected in spite of the extensive preparative cleansing done in the '89 study.

Dr. Rogers recent study has revealed that the C-14 analysis was performed on a repaired piece of cloth along the edge of the shroud. Based on comparing the amount of vanillin in the fibres of cloth of known medieval origin with older cloth, Rogers concluded that the material used in the C-14 study of 1989 "...was thus not part of the original cloth, and is invalid for determining the age of the shroud." This sample tested by carbon dating came from a single sample cut from the edge of the shroud in a section where the cloth was dyed, evidently as part of some medieval repair to match the colour of the original cloth: "The combined evidence from chemical kinetics, analytical chemistry, cotton content, and pyrolysis/ms proves that the material from the radiocarbon area of the shroud is significantly different from that of the main cloth."

Scientifically, the authors of the *Nature* paper were speaking beyond their competence when they claimed that "These results therefore provide conclusive evidence that the linen of the shroud of Turin is medieval." While Rogers' research does not discredit the C-14 results, it does point out the danger of extrapolating beyond the data, a constant danger for scientists. Contrary to the original authors' extravagant claims, their results only suggested that the piece of linen they examined from at the edge of the shroud has a medieval origin.

Perhaps the most convincing evidence for the shroud's origins comes from botanical analysis. Based on pollen samples taken from the Shroud, Drs. Avinoam Danin (The Hebrew University of Jerusalem, department of Evolution, Systematics, and Ecology) and Uri Baruch (The Antiquities authority, Jerusalem) identified plants that are commonly found near Jerusalem. In a 1999 paper delivered to the 3<sup>rd</sup> International Congress on the Shroud of Turin (June 6, Turin Italy), Danin and Baruch identified images of the crown chrysanthemum (*Chrysanthemum coronarium*), the rock rose (*Cistus creticus*), the bean caper plant (*Zygophyllum dumosum*), and the blooms of the tumbleweed (*Gundelia tournefortii*). These last two are important, as they only coexist in the Holy Land, both blooming in the spring. Pollen, previously removed from the place on the Shroud where floral images were subsequently found by Dr. Whanger (1978), and matched the identification of the floral images themselves. Further, pollen found on the Shroud matches that found on the Sudarium of Oviedo.

The Sudarium of Oviedo is a small (21 by 32 inches) linen cloth which, according to tradition, was placed over the face of Jesus after he died on the cross. Unlike the shroud, the Sudarium has a well documented history that extends at least as far back as the 7<sup>th</sup> century, when it is recorded that it was brought from Jerusalem to Alexandria in 614 to protect it from a Persian invasion. It was reportedly examined by King Alphonso IV in 1075 on his

visit to Oviedo, where it has been housed ever since. It has massive stains that have been identified as blood and fluid from facial features in a manner consistent with the death by strangulation that accompanies crucifixion. At an area on the Sudarium which would have been at the back of the head, there are blood stains consistent with small punctures (Recent Historical Investigations on the Sudarium of Oviedo, by Mark Guscin, BA, M Phil, member of the Investigation Team of the Centro Espanol de Sindonologia and the British Society for the Turin Shroud, 1999).

In terms of the shroud, what is important is that Danin reported finding tumbleweed pollen on the Sudarium of Oviedo, the same species of pollen that he identified on the shroud. This evidence points to a common place of origin for both the shroud and the Sudarium — that of the Holy land, with a written record at least as old as the 7<sup>th</sup> century.

For us as Catholics, beyond the science, important as that is, the real issue is that the shroud allows us to understand the profound mystery of our salvation. In the words of the Holy Father:

"The One who is the Beauty itself let himself be slapped in the face, spat upon, crowned with thorns; the shroud of Turin can help us imagine this in a realistic way. However, in his Face that is so disfigured, there appears the genuine, extreme beauty: the beauty of love that goes "to the very end"; for this reason it is revealed as greater than falsehood and violence. Whoever has perceived this beauty knows that truth, and not falsehood, is the real aspiration of the world." Joseph Cardinal Ratzinger, August 2002.