Who's Who in the Shroud World

Ray Rogers

Raymond N. Rogers was born 21 July 1927 in Albuquerque, NM. He was group leader of an explosives research-and-development group at the University of California, Los Alamos National Laboratory, was elected Laboratory Fellow in 1981, and retired in 1988. He was appointed Director of Chemical Research for the Shroud of Turin Research Project in 1978, applying rigorous scientific methods to the study of the relic. He took part in the Shroud of Turin Research Project (STURP) studies in Turin in 1978. He served on the Department of the Air Force Scientific Advisory Board from 1987 until 1992 with the equivalent rank of Lt. General, providing scientific inputs to the Air Force.

Major research interests were explosives safety, super-energy explosives, low-intensity conflict (non-violent war), energy resources, agricultural chemistry and soils, applications of chemical methods to the study of archaeological samples, and applications of chemical science to intelligence operations. A short summary of his work on explosives safety can be found at the following web site: http://home.att.net/~rnrogers. A partial description of his work on the Shroud of Turin can be seen at http://www.shroud.com/pdfs/rogers2.pdf and several short comments at the same location.

He has published popular articles on dogs and firearms as well as many technical papers on chemistry, archaeology/anthropology, soil science, and energy. He has served as an expert witness on several legal actions, and he has been consulted in many accident investigations.

Could you tell us something about how became involved in STURP? Had you heard about the Shroud before that time?

I had never heard of the Shroud of Turin before the fall of 1976. I had taken many courses in anthropology and archaeology, and I worked on several archaeological

projects. I believe that initiated the invitation to join STURP. I gave a paper at the March 1977 organizational meeting. Fr. Rinaldi and Fr. Otterbein convinced me to take part in the project, although I believed that it was a good way to destroy my scientific credibility. It nearly was.

After STURP's work wound up, why did you decide to maintain a low profile in the Shroud world? Did you "retire" from the subject?

I insisted on a rigorous application of Scientific Method to the Shroud project. My results did not agree with others' preconceptions. I was told among a group of witnesses: "Ray, you are not a soldier for Christ." That is the kind of goal-directed approach I had feared. I quit communicating with any of the "true believers." Too much utter nonsense has subsequently been published, and it has destroyed the credibility of "Shroud science." I am not comfortable being associated with the pseudoscience surrounding the Shroud.

What has brought you back into the world of publishing Shroud papers and getting involved in debates?

I had been reading some of the lunatic-fringe publications. I had borrowed laboratory space from Paul Damon during my 1968-1969 sabbatical, and I had great respect for his scientific rigour. When persons who knew little about radiation effects started proposing ridiculous "theories" for the "error" in the date, I started building up a file of documents. When Benford and Marino made their claim about the radiocarbon sample, I was motivated to test it. I have appropriate samples for testing whether or not the sample was valid. I worked for much of two years on those samples. I was amazed to find that Benford and Marino were correct. The sample used in 1988 is not valid, and I can prove it through several rigorous approaches. The pseudoscience claims of Garza-Valdes and Mattingly have sadly confused the issue, but they are easy to refute. There was a limit to the amount of time I was willing to spend refuting pseudoscientific nonsense, but someone needed to do it.

How far can chemistry take us along the "authenticity" path, if at all?

You must define "authenticity." Some people interpret authenticity to mean that the Shroud proves the resurrection. They talk about "the physics of miracles." Authenticity can also mean that it was the true Shroud of Jesus. Or it can mean that it is a real shroud. Chemistry can eliminate impossible claims, but it can not prove theological beliefs. We proved that the Shroud is not a painting, but some people still claim it is. We can prove that the date was wrong, but some people would rather use the erroneous age to prove a miracle. They will never accept a simple answer to the dating problem. We can make a strong case for an age between 1300 and 3000 years that is based on the chemical composition of the cloth, but some people need a calendar date and time of day. The uncertainty of the chemical age could be reduced, but it would take cooperation and significant work (both unlikely). Carefully run radiocarbon analyses of multiple samples of the charred material saved from the "restoration" of 2002 could provide a cluster of dates; however, the officials of Turin will never allow another series of tests. A lack of faith is as bad as poor science. Science can reject impossible hypotheses: it can not provide absolutes. Science provides estimates of probabilities: people want revealed absolutes. We can give some people what they want: others will never be happy with scientific reports. I believe that the overall evidence from chemical analyses strongly suggests that the Shroud is a real shroud. The evidence from chemistry and physics strongly suggests that the Shroud is much older than the published radiocarbon date (AD 1260 - 1390). Without cooperation from Turin, nothing else can be confirmed.

Chemistry can give reliable answers only when the framework used is part of reality. Many improbable postulates have been taken as the starting points for involved "theories." Image formation has been the most difficult problem. I believe that the following list must provide the basis for all discussions on the subject:

SPECIFIC IMAGE-FORMATION FACTS FOR TESTING HYPOTHESES:

Any hypothesis for image formation must agree with the laws of physics and chemistry and explain all of the different types of controlled and/or quantitative scientific observations. "I-think-I-see" observations are not acceptable. A list of confirmed facts follows.

1) Reflectance spectra, chemical tests, laser-microprobe Raman spectra, pyrolysis mass spectrometry, and x-ray fluorescence all show that the image is not painted with any of the expected, historically-documented pigments.

2) No painting pigments or media scorched in image areas or were rendered water soluble at the time of the AD 1532 fire.

3) Direct microscopy showed that the image colour resides *only* on the topmost fibres at the highest parts of the weave.

4) The colour density of any specific image area depends on the batch of yarn that was used in its weave. The cloth shows bands of slightly different colours of yarn. A very thin impurity layer that is devoid of proteins can be observed on the Shroud. It is this impurity layer that coloured during image formation.

5) The image is not soluble in polar or non-polar solvents, and it does not hydrolyze in acids or bases.

6) The uv/visible spectrum of the image indicates that the colour is a result of a complex, chaotic system of conjugated carbon-carbon double bonds.

7) Adhesive-tape samples show that the image is a result of concentrations of coloured fibres.

8) The image does not fluoresce under ultraviolet illumination.

9) The non-image area of the cloth fluoresces with a maximum at about 435 nanometers.

10) The image of the dorsal side of the body shows the same colour density and distribution as the ventral, and it does not penetrate the cloth any more deeply than the image of the ventral side of the body.

11) Thermography proved that the emittance of the image was the same in all areas. The entire image formed by the same mechanism. Spectra and photography confirmed this observation.

12) According to Ghiberti, the only image colour visible on the back side of the cloth is in the region of the hair. The image is less visible on the back side of the cloth.

13) No image formed under the blood stains.

14) The image-formation mechanism did not damage, denature, or char the blood. The blood can be removed with a proteolytic enzyme.

15) Image colour can be chemically reduced with diimide, leaving colourless cellulose fibres. All image colour resides on the outer surfaces of the fibres.

16) The medullas of coloured image fibres are not coloured: *Th*e *cellulose was not involved in colour production.* The cellulose of image fibres is not coloured.

17) The colour of image fibres was often stripped off of their surfaces, leaving molds of the fibres in the adhesive. Growth nodes can be seen in the molds. All of the colour is in very thin layers on the surfaces of the fibres.

18) Chemical and mass-spectrometric tests showed that there is no protein painting medium or protein-containing biogenic coating in image areas. It follows that microbiological activity did not produce the image.

19) Microchemical tests with iodine detected the presence of starch impurities on the surfaces of linen fibres from the Shroud.

20) There is no evidence for tissue breakdown (formation of liquid decomposition products of a body). Body fluids (other than blood) did not percolate into the cloth.

21) Any radiation that is energetic enough to cause the initial dehydration reactions of cellulose decomposition would penetrate into a fibre to a distance determined by its

energy. Energetic radiation produces defects in flax fibres. Image and non-image fibres show identical populations of aging defects. The image fibres could not have been coloured by energetic radiation of any kind.

22) Natural radiation and cosmic rays produce defects in the cellulose crystals of flax fibres. Defects accumulate with age.

23) Rapid heating, as when linen is scorched with a torch, leaves characteristic, small balls of solidified melt at the ends of fibres. There are no such balls on the Shroud.

24) The cloth does not show any phosphorescence.

25) The blood on the cloth is still largely red. Old blood is normally black.

Lateral neural inhibition.

Many observers look at the image for such a long time that they begin to see things that others do not. They attempt to use these observations to prove the resurrection of Jesus or some other belief.

The ability to see structure in amorphous bodies is responsible for our ability to see figures in clouds. Physiologically, the effect is explained in terms of "lateral neural inhibition": the human eye enhances edge contrasts. The mind plays games with what we think we see. Some devoted observers see images of flowers, teeth, bones, etc. on the Shroud. A statement like "I think I see" is totally unacceptable in a scientific discussion. These images are sometimes best seen after multiple contrast enhancements reduce the image to a pattern of dots. Shroud science has been confused by such claims.

Many claims have been based on pollen grains that have been identified on adhesive tapes that were taken from the Shroud. The custodians of the samples have adamantly refused to share information or distribute photomicrographs of known provenience. This is abominable science. The problem is exacerbated by photomicrographs that have been published that show transparent nuclei in "Shroud" grains. Old grains do not have transparent centers. I must propose a hypothesis that

samples have been manipulated. It is possible that some claims are fraudulent. Fraud would badly damage the search for truth.

What are your views on the Shroud world at the beginning of the twenty-first century? Where do you see Shroud studies going from here?

Future operations must be carefully planned and executed, and they can not involve management by dilettantes. The secretive "restoration" illustrates the problem. It was one of the most poorly planned and executed disasters that has ever befallen the Shroud. It did much more damage for future scientific studies than did the fire of 1532. Actually the fire of 1532 provided an excellent chemical test that was easy to read. That information is now largely gone. It is a good illustration of why rigorous, competent scientists open their plans and preliminary results to comment. All existing knowledge should be assembled before pursuing such a project: The persons involved with the restoration hid their plans from peer review. The "restoration" removed many opportunities for cogent chemical analyses in the future. The thymol application in 1988 may have done similar damage: it certainly eliminates cloth samples from consideration for dating work. Charred samples now exist that could be used to provide an accurate age for the cloth, but I doubt anyone who knows how will be allowed to prepare them for radiocarbon analyses. Too many people who know nothing about kinetic isotope effects believe that heating changed the age of the cloth, further confusing the issues. As long as such doubts exist, and they can not be discussed in a scientific forum, it will be impossible to get Turin's approval for new radiocarbon analyses. Poorly advised officials are afraid to move. Nothing new may ever be learned about the Shroud, and the officials in Turin take no cognizance of previous scientific work. I can not even get responses from the cardinal's scientific advisor. I can not communicate with Luigi Gonella or Giovanni Riggi, persons I thought were my friends. I believe that competent scientific efforts to understand the Shroud have a bleak future.