

SOME COMMENTS ON STEPHEN MATTINGLY'S WORK BY RAY ROGERS

I would like to make some general observations on Shroud science and some specific ones on Professor Stephen J. Mattingly's paper on skin bacteria (BSTS, Nov. 2001). I communicated my objections to Professor Mattingly before his paper was delivered.

When a paper claims to be "scientific," it should make use of Scientific Method. Shroud science, being highly controversial, is always under scrutiny: It should make the most rigorous possible application. Anything less than that degrades the entire field and all of its workers. The following steps are critical in Scientific Method.

Identify and clearly state the goal:

The goals of different Shroud studies are not always clearly stated, and goals were never agreed upon by all STURP scientists. Goals I heard expressed covered the range from science to religion, as follows: 1) test whether the image was a hoax that used known methods for producing an image; 2) estimate the probability that the shroud is an "authentic" shroud; 3) prove that the cloth had been the shroud of Jesus; and 4) test whether the shroud proves the resurrection of Jesus. The goal of the first version of Professor Mattingly's paper that I saw was to prove that the 1988 date was wrong. The same thesis is now directed at proving an image-formation method. The goal should give focus to the research.

Assemble all pertinent data:

The most damaging thing a "scientist" can do during the development of an hypothesis is to include speculations on an equal basis with tested facts and exclude observations he does not like. Mattingly's paper does not include any references to technical papers, and it does not mention the large collection of observations by previous researchers. Previous information proves that his proposal is greatly flawed. Observation is critical to science; however, Mattingly said: "-- the Turin Shroud is completely coated with both live and dead microorganisms. It is not necessary to examine the Shroud linen to make this observation." Observations should always be confirmed, especially when there is published information that contradicts the desired hypothesis. That statement defines "poor science."

Hypothesize and innovate:

An unproved statement that is intended for study and testing is called an "hypothesis" (not a "theory"). Mattingly said: "---regarding the mechanism of image formation, the presence of an unusually large number of bacteria on the skin is responsible for image formation on a linen surface that has attributes of a photograph." He also said: "---to deny this mechanism of image formation requires a microbiological explanation that specifically rules out the role of skin bacteria in image formation." Mattingly's paper is an hypothesis masquerading as a fact. The Method of Multiple Working Hypotheses (Chamberlain, T. C., 1897, "The Method of Multiple Working Hypotheses," *Journal of Geology*, 5(8):837-848) requires an ethical scientist to state as many credible explanations for an observation as possible. Mattingly does not attempt alternate-hypothesis formulation or even consider the possibility of other hypotheses.

Test and confirm:

The rigorous application of Scientific Method requires that all hypotheses be tested equally against the same set of observations and facts. Mattingly has completely ignored facts that do not support his thesis.

Occam's Razor:

Competing hypotheses should be tested with Occam's Razor. We usually state it as, "The hypothesis that includes the smallest number of special assumptions has the highest probability of being closest to the truth." Many special assumptions must be made to support Mattingly's hypothesis; e.g., why were no autotroph pigments or cell-wall elements detected by STURP?

In the end, the Fallacy of Composition is even older than Scientific Method. Producing something that "looks like" the image does not prove that is how it was formed.

Information excluded by Mattingly:

The primary emphasis by STURP before Turin was testing whether the image had been painted, as claimed by Bishop d'Arcis. That emphasis made it necessary to search for all possible vehicles/media and pigments that could have been added to the cloth. We tested for all of them.

We considered the changes that would have occurred in all vehicles, pigments, and additives as a result of the fire of 1532, and we looked for reaction products. We tested for surface

contaminants with UV, IR, and visible reflectance spectroscopy; direct microscopy; soft-x-ray transmission photography; x-ray fluorescence; photography by UV, visible, and transmitted illumination; and direct superficial sampling with specially-prepared, pure-hydrocarbon tape (made for us by Ronald Youngquist of Minnesota Mining and Manufacturing, Inc.). Samples were available for more complex testing over several years, and some still exist. Hypotheses can still be tested by observing authentic samples.

After our return, Joan, my wife (also a chemist), hand-carried fibril samples to the NSF Center of Excellence in Mass Spectrometry at the University of Nebraska for pyrolysis-MS and to Metuchen, NJ, for laser-microprobe Raman analysis. Joan, Al Adler, John Heller, and I did a battery of sensitive chemical spot tests on the fibril samples from the Shroud. Other detailed tests were run and appeared in the open literature: Heller, J. H. and Adler, A. D., 1981, "A Chemical Investigation of the Shroud of Turin," *Canadian Society of Forensic Science Journal*, 14:81-103. Results of all of the earlier tests were published in the open, refereed scientific literature: Schwalbe, L. A. and Rogers, R. N., "Physics and Chemistry of the Shroud of Turin, a Summary of the 1978 Investigations," *Analytica Chimica Acta*, 135, 3-49 (1982). STURP observations do not agree with Mattingly's thesis, and he should have addressed and explained those disagreements. He did not test his hypothesis against all pertinent data.

Luigi Gonella of Turin brought us several threads from the Raes samples and what was left of a Zina thread. The Raes samples are significantly different from the main part of the shroud. Most importantly, they have a coating of polysaccharide gum on them, and the gum is the vehicle for at least one dye. The gum swells in water, and it can easily be hydrolyzed in HCl. Nothing like this appears on the main part of the Shroud. It would be hard to miss.

Biological materials, e.g., proteins, contain elements other than C, H, and O. Spot tests with iodine-azide reagent showed sulfur compounds in the blood areas on the shroud, but there were none in non-image areas. None of us ever saw a coating on any shroud image or non-image fibril. We did not detect any of the elements you would expect to find in an autotrophic organism, although the x-ray fluorescence runs were sensitive enough to detect the iron in the blood. Porphyrins and other pigments would have appeared clearly in the reflectance spectra.

Pyrolysis-MS was the most sensitive test used. It detected polyethylene oligomers at ppb levels. They came from bags that had been used as sample containers. We would certainly have

detected the "N-acetyl groups and several amino acids" mentioned by Mattingly; however, pyrolysis-MS did not find any nitrogen or sulfur compounds in pure image on non-image fibrils.

Laser Raman is another extremely sensitive analytical method, and it did not detect any spurious materials. STURP concluded that the image could not be a painting, because nothing had been added to the cloth. That was the major finding of STURP. There is no "bioplastic polymer" on the surface of the Shroud.

Mattingly received a "Shroud sample" from Al Adler. It was from the Raes threads, and it does have a coating. It is not, however, representative of the main part of the Shroud. The coating is a plant gum, but it could easily be confused with a "bioplastic polymer" without adequate investigation. I told him about the coating, and the subsequent paper had a different tacit goal than the original version. It still did not have any observations.

If the coating on the Raes threads had been present on fibrils from the main body of the cloth, we would have detected it by several different methods. It was not there, and no nitrogen-, phosphorus-, or sulfur-containing bacterial cell-wall peptidoglycan was either.

There is no confirmed evidence in the literature that supports Mattingly's thesis. There is considerable evidence that contradicts it. Professor Mattingly's paper should not be included in future references as a "scientific" study.