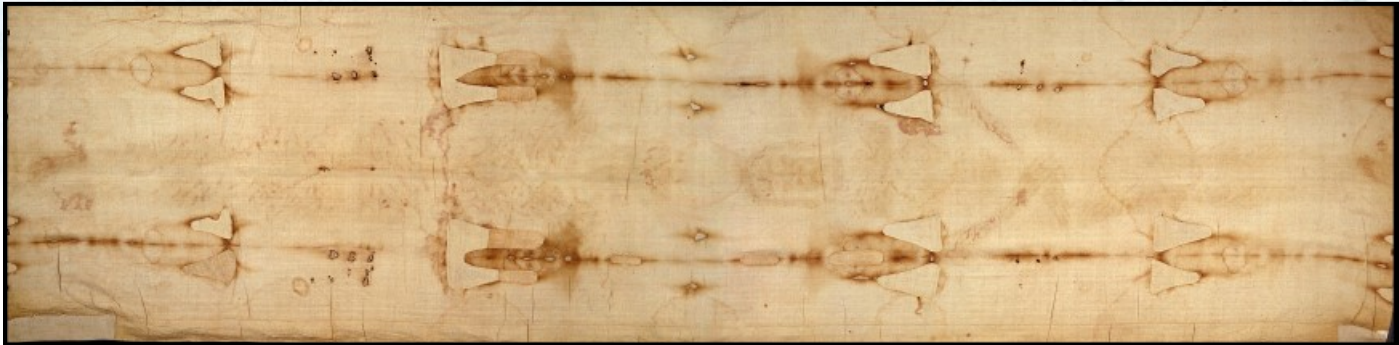


SCIENCE Meets The SHROUD



©1978 Barrie M. Schwartz Collection, STERA, Inc.

The Shroud of Turin is a very old piece of linen measuring 14'3" X 3'9" and bearing faint images of the front and back of a crucified man. The body would have been laid on the left half, face up towards the viewer; the right half would then have been folded up over the head and covering the body. Note that in this picture there are heavy burn lines framing the front and back of the body, and this damage obscures similar-appearing blood marks sprinkled over the cloth. The Shroud was originally white but acquired blood stains, body images, oxidation, and considerable fire damage over the centuries. It has been kept in a cathedral in Turin, Italy since 1578, and has an undisputed history back to about 1355. Growing but controversial historical research traces its origins into antiquity. The Catholic Church has never "officially" declared it (or any other relic) authentic, but encourages the faithful to respect its authenticity. Shown publicly only once or so each generation, before the 20th century there was neither opportunity nor means of making a technical study. It was almost unknown outside European Catholic circles before the first photograph in 1898. The June, 1980 *National Geographic* includes more image description on pages 737–740.

By John Long

(The author wishes to thank Chris Heizer, Joe Marino, and Barrie Schwartz for reviewing earlier versions of this paper—Barrie was very helpful with advice and pictures.)

I was pleased to see Gary Gromacki include the Shroud as a possible witness to the resurrection of Jesus in *Bible and Spade* Vol. 29, No. 2. With serious research beginning after 1898, when the first photographs of the relic were taken, by the end of the 20th century the claim could be made that it had become the most intensely studied artifact in history. Dr. Gromacki mentions English researcher Ian Wilson's thesis which identified the Shroud with the most famous Christian icon of the early Middle Ages (6th–11th centuries, and possibly earlier), the Image of Edessa. Wilson may have done as much to raise interest in the Shroud as any other author; his last offering was the book *The Shroud* in 2010. Those interested in his theory might wish to study English linguist Mark Guscini's 2009 book *The Image of Edessa*, or his more recent book, *The Tradition of the Image of Edessa*.¹ Here Dr. Guscini is not concerned with the "Icon equals Shroud" identification (to which he is sympathetic), but rather with providing the most comprehensive analysis of the historical texts related to the Edessan Image. Nevertheless, Guscini reveals that two 19th-

century authors, including the great German scholar Ernst von Dobschütz, believed old texts had identified the Image as a burial shroud;² these two historians wrote 70 years before Wilson finally developed that historical reconstruction.

However, it is *science* that most accounts for the continuing interest in this old linen. Put simply, is what is to be seen on the Shroud the work of a late medieval artist, or could it be directly due to the death and resurrection of Christ? What follows is an introduction to three readily available sources for what modern science has learned about the Shroud.

John Heller and the Report on the Shroud of Turin

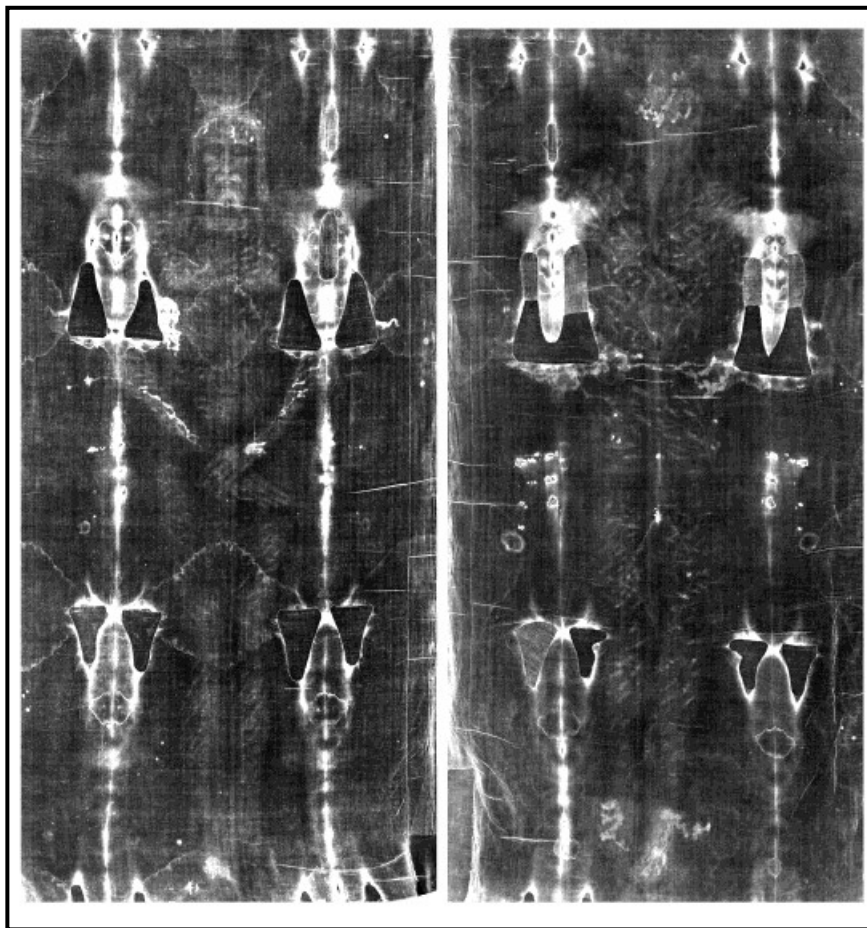
The turn of the 20th century found the Shroud kept as it always had been, secluded and inaccessible for technical study. Many believed, since it appeared to have no prior history, that it was just another false relic from the late Middle Ages. More perceptive observers, however, had feelings similar to those of the astonished Temple police of John 7:46—no human art had ever looked like the images on the Shroud. The cloth's images were their own strong evidence for authenticity.

But how could its actual nature be explored? Early in the new century photography became the first scientific tool to

allow greater study, and a few scientists and medical doctors made detailed cases favoring authenticity. By the last quarter of the century the tools of “hard science,” principally physics and chemistry, finally were available to make a stronger determination: art or something else? These tools were directed at it by a group of American scientists, the Shroud of Turin Research Project (STURP), from the mid-1970s into the 1980s. Their story is well told by what I consider the most enjoyable read in all sindonology (study of the Shroud), the late John Heller’s *Report on the Shroud of Turin*, filled with much insight and even humor, and still easily acquired in the used book market.

Who were these 30–40 STURP scientists? Why were they interested in the relic? How did they obtain 120 hours of hands-on time with it in October 1978? What was the nature of the raw data they extracted and brought back to their labs for close study? Especially, what were the conclusions they announced in a news conference three years later? Dr. Heller was a distinguished biophysicist employed at the New England Institute in Connecticut, where he performed medical research requiring expertise related to blood chemistry. When he read a July, 1978 article in *Science* magazine about the Shroud mentioning “the physics of miracles,”³ he overcame a strong reluctance to what he feared might be just an attempt to validate an old religious fraud, and volunteered his services. Like all the other STURP scientists, he found the technical issues too intriguing to ignore. However, he remained skeptical and 95% certain it had to be a forgery.⁴

John Jackson was 14 years old in 1960 when his mother showed him a picture of the Shroud.⁵ Later in the 1960s he saw the amazing pictures from the Mariner spacecraft program, and wondered if similar technology could be used to explore Shroud images. In 1967 he read John Walsh’s book *Shroud* (1963), deepening his knowledge. Walsh recounted Shroud research from the first photographs in 1898 until about 1960. Earlier researchers, like French zoologist Yves Delage, biologist Paul Vignon, and medical doctor Pierre Barbet, had performed major studies from pictures and concluded the images were not art, but somehow produced from a traumatized corpse. Jackson made his Shroud interest the subject of a master’s thesis. A few years later he obtained his doctorate in theoretical physics, and was assigned as an Air Force captain to the Weapons Laboratory in Albuquerque, New Mexico. The numerous scientific personnel and labs nearby provided ample means to use emerging technology for image study. Beginning in 1973 he also established regular

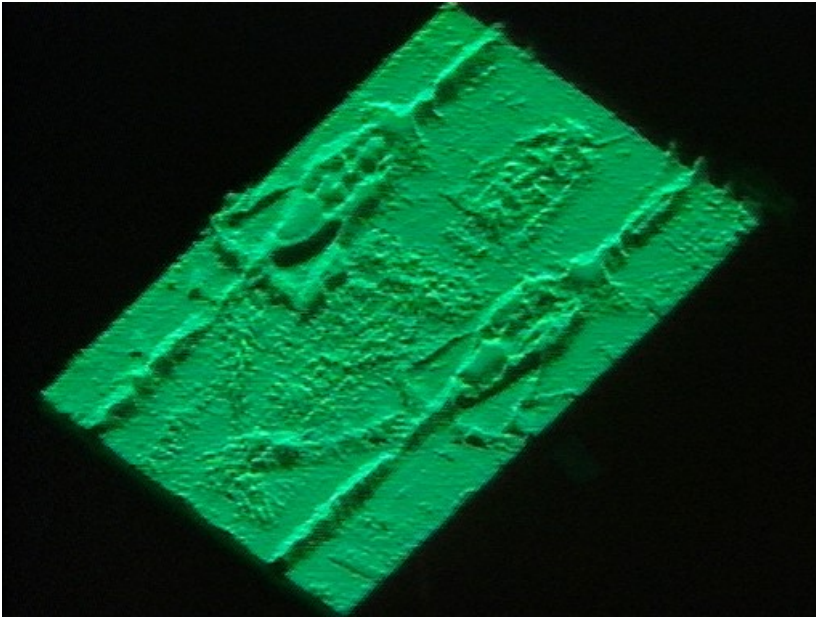


©1978 Barrie M. Schwartz Collection, STERA, Inc.

The Shroud’s apparent absence from mainline Christian traditions made it a major surprise when, in 1898, the first photographs were taken (these pictures are from a later date). Although the natural images are faint and indistinct, the negatives revealed very easily seen positive images, making the Shroud a sensation. No medieval art has this characteristic to such a serious degree. Some critics even accused the photographer of trickery to produce this effect. Photographs also made technical studies possible in a range of disciplines, but not until late in the 20th century were the major physical and chemical tools available, along with hands-on access, to make possible in-depth scientific study.

communication with the Holy Shroud Guild in New York; there, Fathers Adam Otterbein and Peter Rinaldi were trying to broaden interest in the Shroud, especially among technically competent scientists. Jackson’s attention was undoubtedly an answer to long-offered prayers.

Over the next five years, Dr. Jackson was able to use the intrinsic fascination of his subject and his persuasive personality to attract interest from a variety of technically gifted colleagues. Volunteers were found not only at the Weapons Lab, but at nearby Sandia Laboratories and eventually the Los Alamos Scientific Laboratory, and even the Brooks Institute of Photography and Jet Propulsion Laboratory (JPL) in California. These included thermodynamicist Eric Jumper, image analysts Don Devan, Rudy Dichtl, Don Lynn, Jean Lorre and Bill Mottern, physicist Larry Schwalbe, photographers Vern Miller and Barrie Schwartz, and thermal chemist Ray Rogers. Jumper, soon to be a co-director of



©1997 Barrie M. Schwartz Collection, STERA, Inc.

On February 19, 1976, scientists John Jackson and Bill Motern placed a Shroud photo into a VP-8 Image Analyzer, and were startled to see the computer display an accurate 3-D body depiction, not possible with ordinary art or even photographs. Apparently, how close the naturally draping cloth was to a real body form determined how much or little image was imprinted on the cloth. This event greatly encouraged and accelerated scientific interest in the Shroud (note that improvements in image technology make possible better 3-D images today).

STURP, was very reluctant to join in the project: “I thought it was totally bizarre that anyone would even fantasize that this might not be a painting.”⁶ Dr. Lynn, a prominent JPL scientist in the Mars Viking Landing Mission, remembered, “Relics have always turned me off...I was extremely skeptical.”⁷ But just using a better quality photograph provided by Fr. Otterbein, a variety of analyses made it apparent that the Shroud was not an ordinary work of art. Researchers led by Lynn could deduce no directionality in the image (as a painter’s brush moving over a canvas).⁸ There also was a real relationship between image intensities and how close a naturally draping cloth over an underlying body would be. The closer the cloth to corresponding parts of the body, as the face and hands, the darker the image. So good was this relationship, that a computer scan stunned Jackson and others by producing an amazing 3-D picture from just a 2-D photo,⁹ not possible with conventional art or even photographs. And why didn’t the body image change color (degrade) as it approached areas of the Shroud that had been burned, as ordinary paintings would? These early observations were joined by proposals for future testing and discussed at a conference in Albuquerque in March 1977, attended by a wide variety of interested parties as far away as Europe. The conference papers were published in a book, *Proceedings of the 1977 United States Conference of Research on the Shroud of Turin*.

Many believed that it was just another false relic from the Late Middle Ages. However, no human art had ever looked like the images on the Shroud. The cloth’s images were their own strong evidence for authenticity.

Fathers Peter Rinaldi and Adam Otterbein had dropped a bombshell just before the Albuquerque conference: it might be possible to convince Turin authorities to allow STURP to actually test the Shroud during an exhibition in September next year. This suggestion seemed ludicrous, considering how sacred and jealously guarded the cloth was, but Jackson and Jumper flew to Turin and, using the *1977 Proceedings*, impressed influential but cautious Catholic parties. Father Rinaldi’s tactful, skillful, but relentless diplomacy succeeded and amazingly, early in 1978, tentative approval was given by the Church. STURP discussed preliminary plans in a May meeting, but quickly discovered numerous daunting, almost impossible problems: there was no money, no equipment, no idea how much time authorities would allow with the Shroud, and only a few months to resolve these.¹⁰ But for the next few months a surprising series of odd circumstances and fortuitous events occurred. Tom D’Muhala, who owned a nuclear engineering company, volunteered to raise funds and create an administrative structure to tackle other problems. Eventually he succeeded in obtaining nearly \$2.5 million in donated equipment.¹¹ He also created a tax-exempt corporation, STURP, receiving the tax-exempt status in only two months when two years was

the normal waiting time. When the Turin hotel that was to house the scientists demanded an immediate advance payment of \$5,000, D’Muhala just happened to receive at that moment that exact amount from a commodity investment. These remarkable circumstances were also true for other team members; they had to pay much of their own expenses, but often found themselves the recipients of unexpected monies.¹² A rehearsal among the STURP scientists was held over the Labor Day weekend at Amston, Connecticut, and at this point Heller officially joined the team; although he would not go to Turin, he later was to receive Shroud blood samples for testing. Just before leaving for Italy, D’Muhala surveyed the religious affiliations of STURP: “six agnostics, two Mormons, three Jews, four Catholics, and all the rest [a very wide variety of] Protestants.”¹³

When STURP arrived in Turin in September 1978, numerous new problems arose but with similar fortuitous results. While the scientists waited for their equipment to be shipped from Milan’s airport, custom officials placed a 60-day impoundment on it.

Father Rinaldi eventually had to threaten the commerce minister in Rome with the negative publicity of sabotaging the endeavor, on which the world’s press was now focused, to obtain release.¹⁴ But when the equipment arrived in Turin, custom officials there demanded a bond of millions

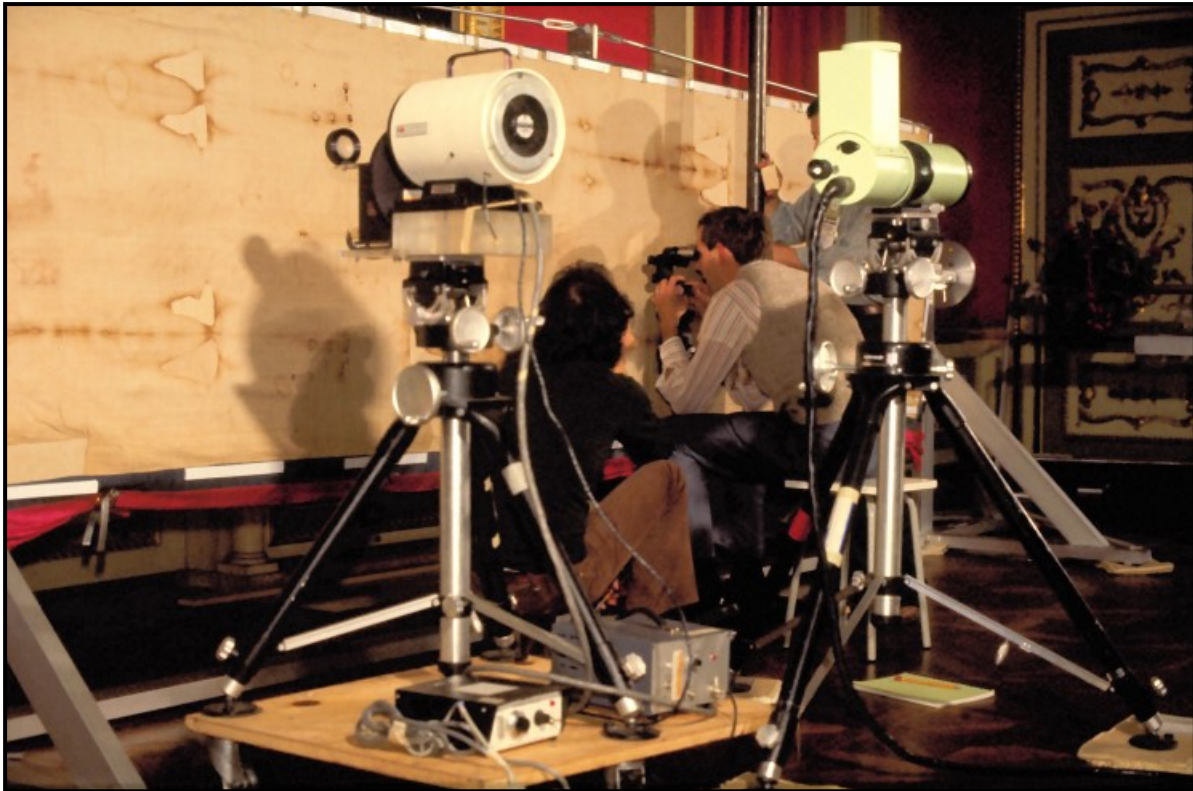


©1978 Barrie M. Schwartz Collection, STERA, Inc.

Dr. John Heller was an accomplished biophysicist who volunteered his services to test Shroud blood samples. Here he is shown at the “dry run” (practice) the Shroud of Turin Research Project (STURP) conducted over the Labor Day weekend of 1978 at Amston, Connecticut. Ironically, he almost walked away from participation at that meeting until he gradually realized that his newly-met fellow scientists were first-rate professionals. Later Heller and his colleague, biochemist Dr. Alan Adler, were to make major contributions to understanding the Shroud’s body and blood images. Heller’s book, *Report on the Shroud of Turin*, is a masterpiece of Shroud literature.

of lire, money STURP had no hope of raising. When news of this reached the archbishop-cardinal of Turin, he essentially posted the cathedral where the Shroud was kept as collateral!¹⁵ Attempts by a semi-official Italian Shroud organization to limit STURP’s time and restrict the publication of results were stopped by the sensible, knowledgeable cleric and his science adviser appointed by the Church to oversee testing.¹⁶ The electrical power supply at the royal palace (adjoining the cathedral) where the testing was to be done was very inadequate. Herculean efforts were made by team members Dee German, Rudy Dichtl, and D’Muhala to acquire on short notice replacement parts, and surprisingly the jury-rigged modifications worked well enough.¹⁷ And team spokesman Kenneth Stevenson had to fight off a hungry press corps wanting more information than STURP was prepared to discuss.

STURP scientists finally set to work and mined a mountain of diverse data. The 26 team members performed five days (October 8–13) of round-the-clock data collection on the Shroud, sometimes even sleeping on cots near the cloth to maximize their time.¹⁸ These tests included photography (5,000 visible, ultraviolet, and infrared pictures), low energy X-radiography, X-ray fluorescence, reflectance spectroscopy, and macroscopy (lower-power optical magnification)—all designed to understand just what was producing the images, like paint. Although by today’s standards some of the equipment might be considered outdated, useful results nevertheless were obtained. Of special importance were 32 sticky-tape removals by Ray Rogers on all Shroud features, with the plan to examine thread



©1978 Barrie M. Schwartz Collection, STERA, Inc.

STURP scientists Sam Pellicori, John Jackson, and Don Devan examine the cloth on a special, purpose-built table. Various tools for infrared experiments are in the foreground, which produced no evidence that Shroud body images were due to oil or watercolor painting. A variety of other physics-based tests agreed and, additionally, found multiple reasons to believe that genuine blood was on the Shroud.

fibers and debris at a later time; this would permit chemistry and microscopy (higher power magnification) not possible at the testing site. All this data was brought back to the States for detailed study over the next three years. Rogers loaned the tapes to Dr. Walter McCrone, a famous microscopist volunteering as a STURP consultant, for close inspection,¹⁹ but Rogers instructed him to send blood samples to Heller. All these scientists had full-time jobs and performed their Shroud research in spare hours and on weekends. Team members kept informed through newsletters, telephone calls, and two group meetings in 1979, one in March at Santa Barbara and the other in October at Los Alamos. However, during this early time none of the evidence studied suggested any definitive answer to what was producing the images or how they got on the cloth. Their raw data could identify no organic or inorganic substances that might cause the images, prompting Dr. Jumper to wisecrack, “I’ve got it—we’ve just proved the Shroud doesn’t exist,” to the laughter of other researchers. But there was one scientist who was certain he did have the answers.

By early 1979, Dr. Walter McCrone was starting to believe that the Shroud images were, in fact, a painting! STURP scientists were puzzled by McCrone’s conclusions, as their tests, at that time largely physics-based, provided no support.

Dr. Walter McCrone had a worldwide reputation as a particle expert with his own company in Chicago. Using his favorite tool, the microscope, he could recognize tiny substances by their size, shape, color, and special optical properties. By early 1979 he was starting to believe that the Shroud images were, in fact, a painting! In the March team meeting, McCrone explained that through his microscope he could see many red particles on the sticky tapes which he identified as iron oxide, a common medieval paint pigment.²⁰ If an ordinary painting, the artist would have used a binder (collagen or gelatin glue—often an animal protein) to cement the particles onto Shroud fibers; but at this time McCrone could find none, so he believed the pigment was spread by fingers—a finger painting. There was no blood on the Shroud. As the red particles had the optical property of birefringence (light passed through the particle was split in two—consistent for iron oxide but not blood²¹), they could not be real blood. McCrone was 90% certain the images were a painting. In the October meeting he modified his conclusions. There may have been an earlier faint image that was touched up with a finely ground iron oxide pigment only available after 1800 (but he was soon to drop that possibility). He suspected the pigment was cemented onto the image with a gelatin binder,²² and was able to confirm this with a chemical test in early 1980.²³ At a later date he also identified vermilion, an undoubted artistic pigment, in the image area.²⁴



©1978 Mark Evans Collection, STERA, Inc.

The Shroud body image consists of straw-yellow fibers (almost brown) located only on the tops of threads, and showing no evidence of paints, dyes, stains or any applied coloring matter. The actual image layer is only on the surface of each body fiber. It appears similar to a natural, advanced stage of simple aging. This photo is contrast-enhanced and from the nose area. There is no sign of the kinds of capillary movement (into the thread depths) or cementation between fibers as would be expected from paint. There is so little contrast between image and non-image areas over the full Shroud that an artist standing adjacent to the cloth wouldn't be able to see the image. The imaged fibers are distributed so as to produce an accurate 3-D picture when analyzed by a computer. STURP scientists could find no method to produce an image with all these (and other) characteristics.

STURP scientists were puzzled by McCrone's conclusions, as their tests, at that time largely physics-based, provided no support.²⁵ For instance, the X-ray fluorescence tests found inorganic elements like calcium, strontium, and iron—but spread evenly over the cloth and not concentrated in image areas, except for a slight increase in iron within blood spots. X-radiographs and spectrophotometry also should have been able to identify iron oxide used to create images, but did not. Infrared photography indicated the images were not conventional oil or watercolor paintings. Reflectance spectroscopy revealed the body images to be similar to a light scorch. Image analysis noticed an elliptical lesion (spear point entry?) at the top of the side blood wound and, curiously, greater densities (darker) over the eyes (objects to keep the eyelids closed?); no brush strokes or accompanying directionality were detected. Direct macroscopic observation clearly revealed that the body image consisted of individual straw-yellow fibers resting only on the thread surfaces. There was no capillary movement of image into the thread interior or cementing of fibers, as would happen if a typical paint were applied. Although image intensities varied over the cloth, all the body fibers had about the same hue—it was the number of yellowed fibers in each area that accounted for intensities, much like old newspaper photos made with just white and black dots in different concentrations. But it took sophisticated tools and processes to make those photos, so how were image densities seen on the Shroud made? Even dirt particles were



©1978 Mark Evans Collection, STERA, Inc.

The blood images are very dissimilar to the body images. A liquid substance has obviously soaked into the thread depths and cemented many fibers together. Drs. Heller and Adler found 13 different tests or indications proving that the substance was old blood, almost certainly human. Adler explains the red appearance after so many centuries as the result of huge quantities of orangish-yellow bilirubin, a bile pigment produced by a severely traumatized body. Is there any record of an artist using blood to paint wounds? Art professionals told Heller, “no.”

found in the Shroud feet, knee, and nose areas, suggesting a real victim had fallen badly during his ordeal. Thermal analysis by chemist Ray Rogers could not find changes in the images as they approached burn areas, arguing against organic compounds, as might be found in paint. Finally, John Jackson had developed his cloth-body research to demonstrate a “single global mapping function” as proved by accurate 3-D computer pictures of the face and body, not likely within the capacity of a medieval artist, and urging that a real body form was involved in the image-making mechanism. To many of these observations McCrone claimed STURP was wrong, or perhaps their equipment and methods just not sensitive enough to see what he did through his microscope. And there was a very small chance he could have been right. But what of the blood marks which McCrone was sure were also iron oxide pigments?

Even dirt particles were found in the Shroud feet, knee, and nose areas, suggesting a real victim had fallen badly during his ordeal.

Blood evidence could be gleaned through a number of STURP observations. Unlike the superficial body image, the blood spots soaked all the way through the fabric, as expected of a liquid. More iron in blood areas was consistent with the iron known to be in blood chemistry. The ultraviolet photos STURP took often showed what appeared to be blood serum

deposits at wound margins.²⁶ Medical doctor and team member Robert Bucklin saw what many pathologists before (and after) had—that the anatomy, and especially blood wounds, were all convincingly correct. But STURP was counting on Dr. Heller’s testing of sticky-tape blood samples for a definitive opinion. Ray Rogers had instructed McCrone to send the blood samples to Heller in late 1978, but Heller received none.²⁷ After numerous requests, McCrone finally sent Heller four tapes in early 1979, but bearing so few red particles no chemical testing could be done. When Heller asked if there were any more tapes, McCrone replied “no”²⁸ (although over a year later this was proven untrue). Heller then recruited biochemist Dr. Alan Adler, a colleague at Western Connecticut State University in Danbury, to help concentrate the suspected blood particles, but it still was not enough for chemical testing. At the first team meeting in March at Santa Barbara, Heller could only say that the samples looked like blood, but he couldn’t be sure. However, after the

meeting Heller was able to find a seldom-used microspectrophotometer (another physics device) to measure the red particles’ light absorption. When he observed a huge spike at the 410 nanometers wavelength—the so-called Soret band, unique to some blood components—he exclaimed, “Oh, my God, it really is blood!” and realized Shroud research was even more intriguing than he originally suspected. But how were all the differences with McCrone to be resolved?

STURP co-directors Jackson and Jumper realized more in-depth chemical analyses were needed to resolve the conflict between STURP’s physics and McCrone’s microscopy.²⁹ Complicating the issue was the problem that McCrone had kept most of the sticky tapes throughout 1979, hindering testing by other team members. Chemical answers were on those tapes. Finally, in early 1980, Jackson led a small group to McCrone’s offices in Chicago and repossessed the tapes.³⁰ Afterwards a date was set for McCrone to meet with other STURP scientists at the Air Force Academy in Colorado, where Jackson and Jumper had been transferred and were employed as instructors. There the debris on the tapes could be chemically analyzed in the Academy’s well-equipped laboratories and a decision made as to what was causing the Shroud’s images. Unfortunately McCrone backed out at the last minute, but other team members attended, with Heller bringing Adler in tow. An initial microscopic glance at debris on the tapes convinced Heller there were “microacres” of blood. Adler’s initial reaction: “If that isn’t blood, I’ll eat this microscope!”—but he was spared that embarrassment. STURP member Joan Janney carefully removed fibers from the difficult sticky tapes and passed them on to Adler and Heller for more exacting tests than McCrone

had done. Most of the red particles were chemically confirmed by two or three more methods as blood, and the body image fibers showed no signs of a paint binder.³¹ Critical to these conclusions was the detection of protein: many of the red particles tested positive (blood is

protein), while the straw-yellow body fibers did not. At this time the team learned that McCrone had used a poorer reagent to test for protein, producing false positives. This was especially important, as the team also learned that McCrone was considering attributing the straw-yellow body color to the protein binder itself. However, these tests indicated McCrone was likely wrong; but if not paint or perhaps an old collagen binder, then what was causing the body image, and how did it get there? Heller and Adler were given custody of the tapes, and took them home to Connecticut for more chemical testing.

Over many months, well into 1981, Heller and Adler performed over 1,000 additional tests on both the blood and body image fibers. As McCrone was publicizing “it’s a painting,” the press was pressuring STURP for a definitive reply. With many more samples that could now be tested, the duo was able to add chemical work to their microspectrophotometer results, and quickly submitted a brief paper, “Blood on the Shroud of Turin,” to *Applied Optics* in May 1980. Other team members also were beginning to publish their results in a variety of peer reviewed journals,³² but McCrone’s submissions could not pass STURP’s rigorous peer review. He resigned from STURP in June (some sources state he was never a formal STURP member), and reported his interpretations in his company’s periodical, *The Microscope*. Heller and Adler continued to find other tests confirming the presence of blood,³³ and even determined it was from a high primate, almost certainly human. More tests on the body-only fibers again showed no indication of a protein paint binder.³⁴ Later they also learned that McCrone had compromised his optical (birefringence) testing of the red particles by not removing the fibers from sticky tapes, as Heller and Adler did, before testing.³⁵ Heller wondered if real blood was ever used by medieval artists in their paintings. Art history academics told him “no.”³⁶ Some background elements distributed evenly over the cloth, like calcium, strontium, and especially iron, were found to be the normal result of retting flax for linen production,³⁷ and not associated with an applied pigment. What particles that were actual iron oxide (not blood) found on the cloth were very pure, unlike medieval pigments which were always contaminated by other elements.³⁸ But they also confirmed that there were very minute traces of real paint, although “not enough...to account for one painted drop of blood, let alone all the gore on the Shroud.”³⁹ It was undoubtedly there because many dozens of artists (especially in the 17th century) made painted copies of the Shroud; they mixed their paints near the cloth, and even laid their freshly painted canvases on the Shroud for sanctification. But the key questions remained: what had colored the body fibers, and how?

Most of the red particles were chemically confirmed by two or three more methods as blood, and the body image fibers showed no signs of a paint binder. But if not paint or perhaps an old collagen binder, then what was causing the body image, and how did it get there?

Heller and Adler finally reached a partial but unexpected conclusion. More tests showed no fats or oils⁴⁰ and no paints, pigments, dyes, and stains were present;⁴¹ no applied substance of any kind seemed responsible for the straw-yellow color. But if nothing had been added to the

fibers, could a change in the linen’s actual cellulose structure have occurred? By oxidizing non-imaged fibers in concentrated sulfuric acid, those fibers were made to look identical to the straw-colored body image and had the same surface texture.⁴² But no artist could paint in sulfuric acid—it would destroy his brush and was inconsistent with other image characteristics.⁴³ At this point Heller and Adler performed a “thought experiment” about the problems an artist would face trying to produce an image with **all** of the unusual characteristics STURP had thus far identified.⁴⁴ No known artistic method would work. Although until now the two were still assuming the Shroud was a forgery,⁴⁵ by the time they met with other STURP scientists in May 1981, “Adler and I had reached the conclusion that the images could not have been made by artistic endeavor.”⁴⁶ Jackson and other team members also reached the same conclusion through other means, that no “eye/brain/hand” artistic method would have succeeded.⁴⁷ Even radiation from a body was considered, but too many problems persisted.⁴⁸ Physicist Samuel Pellicori demonstrated that perspiration and burial spices could have accelerated normal oxidation, producing imaged body fibers similar to those on the Shroud,⁴⁹ but couldn’t reproduce other image characteristics.

Heller and Adler wrote a second, more comprehensive paper in 1981, what Heller considered the most difficult of his career, appearing in the *Canadian Society of Forensic Science Journal*.⁵⁰ In it they reported, “We have further shown that the body image, in fact, is not produced by any pigments, stains, or dyes and is specifically not accounted for by ‘aged yellowed’ protein.”⁵¹ Heller and Adler could not determine any image making mechanism that could produce it. They also concluded, “Any applied pigment is incapable of rendering all of the image characteristics found on this cloth. It is highly improbable that any 14th century artist would produce a ‘reversed’ image or could encode the degree of three dimensional, computer readable information found in this image and leave no other surviving historical evidence of his evident genius.”⁵² The next year they joined with Jackson, Jumper, and other researchers and authored “A Comprehensive Examination of the Various Stains and Images on the Shroud of Turin,” published a year later in *Archaeological Chemistry* (1984). Once again the researchers admitted no success in finding how the image got on the cloth, “underscored by the fact that to our knowledge no other image on any cloth—grave cloth or art form—like the body image on the Shroud is known to exist today.” Acknowledging “that science is really not in a position to ever prove categorically that the Shroud is authentic...We have, however, examined the probability that the Shroud was artistically produced and find it improbable.”⁵³



©1978 Barrie M. Schwartz Collection, STERA, Inc.

Dr. Alan Adler was described as a “Renaissance Man” with a wide range of interests, but foremost he was an accomplished biochemist specializing in porphyrins, an essential part of blood chemistry. He quickly became very knowledgeable about Shroud studies and a respected speaker. Researcher and author Joe Marino remarks, “Adler could talk about the Shroud for an hour and a half without taking a breath—and did.” His friend John Heller described him as “exuberant and unflappable” with “the subtlety of a tank,” but extremely kind and self-sacrificing. Listen to two of his talks on YouTube.

STURP scientists had what they hoped would be opportunities to debate McCrone at a Canadian Forensic Society conference in Hamilton, Ontario (August 1981), and again in New London, Connecticut (October 1981), but on both occasions only a McCrone assistant appeared to read a paper. This last occasion was STURP’s final team meeting, and was covered by considerable press. When reporters asked if STURP’s work either confirmed or denied the Shroud’s authenticity, the answer was “no.” But when asked if anything they discovered precluded authenticity, the answer was again “no.” Essentially, STURP had concluded there was no other known image as that on the Shroud, no known way to make such an image, and there was very old blood on the cloth. From the standpoint of science, “The Shroud remains, as it has over the centuries, a mystery.”⁵⁴

Dr. Heller stumbled a little when he strayed into aspects of the Shroud’s earlier history,⁵⁵ not recognizing some of the subtle strengths in historian Ian Wilson’s “Edessa Icon equals Shroud of Turin” reconstruction. His book would have been more useful with an index, and he also may have taken liberties with a few incidental details. However, his lively “you are there” descriptions of how the major scientific questions—“what does the image consist of?” and “how did it get on the cloth?”—were tackled are engrossing; read the book and discover how much better it is than this poor article. Unfortunately, some of STURP’s papers (e.g., the aforementioned “A Comprehensive Examination of the Various

Stains and Images on the Shroud of Turin” and “Physics and Chemistry of the Shroud of Turin” in *Analytica Chimica Acta* 135 [1982], and a few others) do not appear to be freely accessible online, but still are available in good university libraries. Heller might have been a casual Christian before joining STURP, but, like a few of the other scientists, could not help sensing an unseen Presence making STURP’s impossible project possible. He observed, “The team itself—its formation, cohesion, diversity, collaboration, as well as its sacrifice of time, talent, and treasure—is unique in scientific annals.”⁵⁶ Heller passed away in 1995, but Adler continued to be a great favorite among “shroudies,” sharing his knowledge with much wit and wisdom for another five years. He was interested in most areas of Shroud research, but was especially focused on the image’s chemistry.⁵⁷ A year before his untimely death in 2000 Adler produced a paper, “The Nature of the Body Images on the Shroud of Turin,”⁵⁸ summing up his conclusions on proposed mechanisms to produce the images; he also explained some of the unusual blood characteristics, consistent with Jesus’ crucifixion, but highly unlikely within the capabilities of an artist.

Heller’s *Report* was published in 1983, and although much has happened since then, it still remains a compelling narrative of “Science meets Faith.” The work STURP performed is the bedrock of scientific understanding of the Shroud. STURP’s research had a profound effect on many of the team members, although probably none had even heard of the relic before meeting John Jackson. When addressing some of his fellow scientists and other interested “shroudies” at a conference in 1998, image analyst Don Lynn spoke briefly about the newly emerged discipline of sindonology: “I can speak from experience when I say you will personally get far more out of this experience than you put into it. It can literally change your life, and it will if you let it.” Dr. Lynn, who also passed away in 2000, undoubtedly mirrored the feelings of other STURP scientists.

However, one researcher still strongly disagreed. McCrone did not allow his failure to convince STURP of his interpretations to end the controversy. He predicted and had the satisfaction of enjoying the 1988 radiocarbon dating results (with 95% confidence, the linen was manufactured between 1260 and 1390) bolstering his views. McCrone wrote a book, *Judgment Day for the Shroud of Turin* (1996), in which he discussed Shroud scientific research before and after STURP’s data collection in October 1978, and particularly his role in advocating that it was a “beautiful medieval painting” and had no blood whatsoever. The book is well written, interesting, and would persuade anyone not familiar with other Shroud research; but McCrone’s principal conclusions are so frequently (and successfully) contested by other experts that it must rank

Researchers admitted no success in finding how the image got on the cloth, “underscored by the fact that to our knowledge no other image on any cloth—grave cloth or art form—like the body image on the Shroud is known to exist today.”

among the most misleading of all Shroud literature. His conclusions also are explained in a 1999 paper in the journal *Accounts of Chemical Research*.⁵⁹ There he again advocated “that the image was applied as a liquid suspension of red particles, that is, paint. Paint media and varnishes commonly yellow with time.”⁶⁰ Interestingly, he observed, “red particles are found on the fibers of all image tapes” whereas STURP found at least a third of the yellowed fibers had none⁶¹ (actually, very tiny numbers are probably on all the tapes, but have nothing to do with the body image color). He reported that his company had confirmed the pigment by performing their own electron microprobe and X-ray diffraction tests.⁶² Through his microscope he could see paint residues and believed his chemical tests provided confirmation.⁶³ To prove Heller and Adler’s blood observation wrong he performed a “catalytic decomposition” test with negative results for true blood.⁶⁴ STURP’s problem, McCrone believed, was that “They are not microscopists...trained in the study of pigments and paintings.”⁶⁵ Had they used more powerful magnification and were familiar with the “appearance and behavior of tiny samples,” STURP would have come to different conclusions. McCrone lamented the loss in the last few decades of the microscope’s use “to the solution of chemical problems,” and saw Shroud studies as “an excellent opportunity to gain wide publicity” for its capabilities.⁶⁶

Choosing between McCrone’s or STURP’s methods and conclusions for the average layman is difficult, but there are key points favoring the latter. The appearance of substances through McCrone’s microscope was his decisive method, while physics and chemistry were means to confirm those observations. For STURP, optical examination also was important, but physics and chemistry played a much larger role. One wonders if there aren’t good reasons why scientists came to depend more on chemical tests than microscopy. McCrone’s complaint that Heller and Adler were deficient in microscopy seems very unreasonable, given their scientific resumes and the enormous hours spent studying Shroud debris as documented in Heller’s book.⁶⁷ One point unfavorable to McCrone is certain—he had an excellent opportunity to study and discuss the data with STURP at the early 1980 Air Force Academy chemistry conference, with the date adjusted specifically to allow his attendance.⁶⁸ His failure to attend that meeting or have a “sit down” with his opponents afterward is suspicious. Perhaps then he could have learned why the results of his birefringence tests were mistaken. Even McCrone’s two meetings with the STURP team in 1979 were compromised by his failure to return the sticky tapes beforehand, delaying STURP’s final conclusions by about twelve months.


The informed layman will probably find the best means to decide between McCrone and STURP will hinge on the nature of those red particles, McCrone’s paint or STURP’s blood. The proper identification is complicated by the particles’ migration from blood areas every time the Shroud was rolled or folded up;⁶⁹ many blood particles would transpose to body image areas, complicating the determination of what was actually responsible for the color on the fibers. Heller and Adler eventually found 13 tests or indications proving blood,⁷⁰ of which any one of a half dozen “is proof of the presence of

blood, and each is acceptable in a court of law.”⁷¹ Other analysts have agreed.⁷² Many *Bible and Spade* readers likely will have access to a 1986 article in the *Biblical Archaeology Review* where crystallographer Joseph Kolbeck performed a test, with pictures, demonstrating that the particles are organic and probably blood.⁷³ Ironically, McCrone may have aided the case for the Shroud’s authenticity—skeptics had an acclaimed expert with ample opportunity to prove it was just a painting, human art (initially, a reasonable assumption), but failed to convince almost anyone else who had intimate knowledge of the data.⁷⁴

And there are numerous other science resources in our second and third sources. These will be discussed in the forthcoming Part 2 of this article, in which we will look in detail at the contributions made by STURP photographer Barrie Schwartz to Shroud research and scientist Dr. John Jackson’s Turin Shroud Center of Colorado.

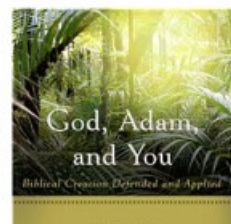
Endnotes for this article can be found at www.BibleArchaeology.org. Type “Endnotes” in the search box; next, click the “Bible and Spade Bibliographies and Endnotes” link; then page down to the article.

John Long is a graduate of Towson State College (now University) outside Baltimore, MD, and has been interested in Shroud research for the last 40 years. John has seen the relic, met many leading Shroud experts, and has written a number of articles for *Bible and Spade* and the ABR website; he also gives occasional lectures on the Shroud at churches and conferences. He is a retired parole and probation agent/supervisor.



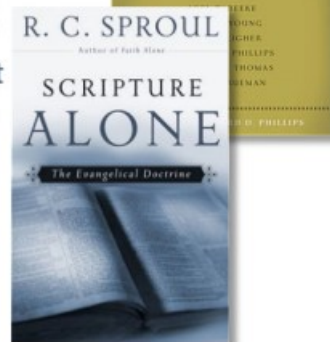
God, Adam and You

What difference does the historical Adam make to us as followers of the second Adam, Jesus Christ?



SCRIPTURE ALONE

Examine why it is important to know where we stand on the doctrine of Scripture.



Available at the
ABR Bookstore
EACH ONLY \$9

www.biblearchaeology.org