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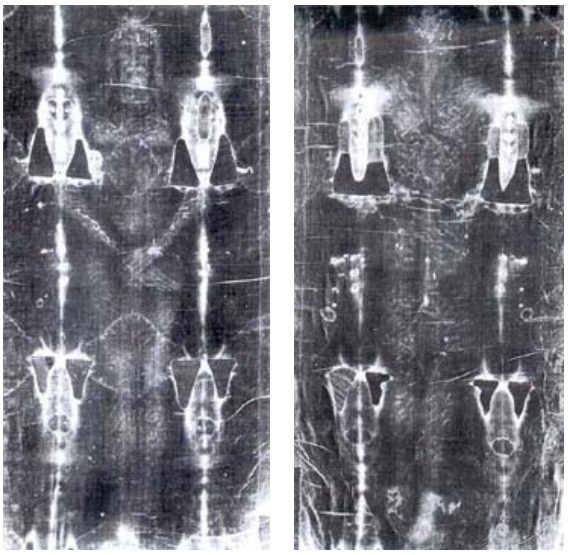
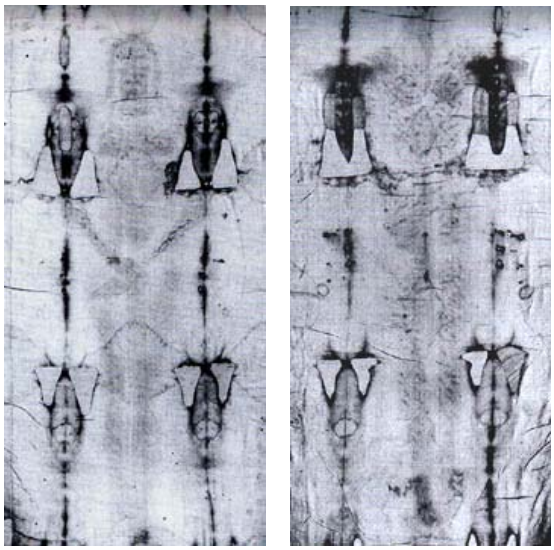
Shroud of Turin Is Between 1,300 and 3,000 Years Old, Based On New Chemistry Evidence



Left top is front negative image on Shroud of Turin; **Right top** is back negative image on Shroud.
Left below is front positive image on Shroud of Turin; **Right below** is back positive image on Shroud.

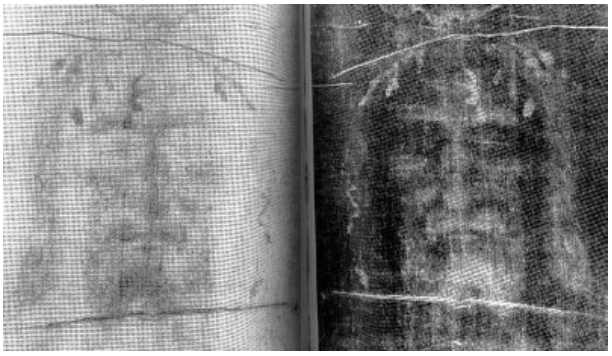


The Shroud is a linen cloth that for centuries has been purported to be the burial shroud of Jesus Christ. The linen measures 14 feet 3 inches long and 3 feet 7 inches wide. There are two faint brownish-yellow images, those of the back and front of a 5-foot 7-inch man. The Shroud has been preserved since 1694 in the royal chapel of the Cathedral of San Giovanni Battista in Turin, Italy. Positive and negative photographs were taken in 1898 by Secondo Pia.

January 27, 2005 Los Alamos, New Mexico - The Shroud of Turin is a linen cloth alleged to be the burial shroud of Christ. It has pale brownish-yellow stains front and back that form the image of a man as if the linen had been wrapped around the body from the feet up over the head and back down to the feet, leaving complete front and back images. There are also many reddish-colored bloodstains that indicate the man was repeatedly whipped and there are rivulets of blood on the face and back of the head. Many people believe the linen was used to wrap Christ's body after his crucifixion on the cross approximately 2,000 years ago.

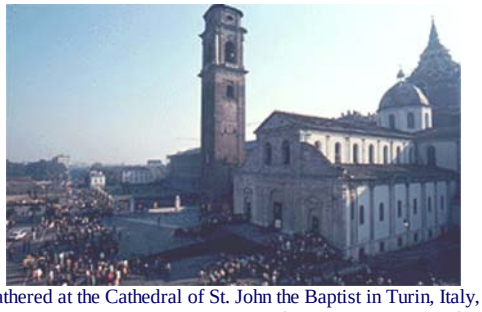
The Shroud was first displayed at Lirey in France in the 1350s and subsequently passed into the hands of the Dukes of Savoy. Kept secret and away from the public, the Shroud was finally brought to Turin, Italy in 1578. One hundred sixteen years later in 1694, it was placed in the royal chapel of Turin Cathedral in a specially designed shrine.

Photography of the shroud by Secondo Pia in 1898 indicated that the image resembled a photographic 'negative.' Subsequently the shroud was photographed in 1931 and 1978 made available for scientific examinations in 1969, 1973 and 1978. The age of the linen Shroud remained unknown.



Left: Positive photograph of head image created by pattern of brownish-yellow color *only* on tiny surface fibers
of Shroud. **Right:** Negative photograph of same Shroud image. The Shroud was photographed
in 1898, 1931 and 1978; reprints were in *The Blood and The Shroud* © 1998 by Ian Wilson.

The 1978 research team was composed of thirty U. S. scientists (See More Information below), many from the Jet Propulsion Lab in California, who came together for the Shroud of Turin Research Project known as STURP. Photographic and spectroscopic examinations were made, and 32 sticky-tape fiber samples were collected from the body images, blood stains and non-image areas. The STURP team concluded that the Shroud is not a painting.



Crowds gathered at the Cathedral of St. John the Baptist in Turin, Italy, in 1978,
to wait in line to see the Shroud displayed for the STURP scientific study.
Photograph © 1978 by Barrie M. Schwortz.

Nine years later by October 1987, the newly advanced radiocarbon dating technique of accelerator-mass-spectrometry (AMS) required only a few square centimeters of the Shroud to determine its age. Offers from three AMS laboratories in Arizona, Oxford and Zurich were selected by the Archbishop of Turin, acting on instructions from the Pope, to date the Shroud.

The threads were collected from a border area that many scientists now agree was a re-weaving, as if a patch had been made where the Shroud was deteriorating. Those threads contain cotton, while *none* of the linen threads in the image areas have cotton in them.

The 1988 announcement about the dating research stated: "The results of radiocarbon measurements at Arizona, Oxford and Zurich yield a calibrated calendar age range with at least 95% confidence for the linen of the Shroud of Turin of AD 1260 - 1390 (rounded down/up to nearest 10 yr). These results therefore provide conclusive evidence that the linen of the Shroud of Turin is medieval."

However, one of the chemists from Los Alamos National Laboratory who had collected the 32 sticky-tape samples from the actual Shroud images and blood stains back in 1978, could not reconcile the Medieval date with the way the Shroud linen had been produced. He read the famous text by Pliny, the Elder, about the ancient Roman method of washing flax with a soapy water made from the Soapwort plant, or *Saponaria officinalis*.

Soapwort *(Saponaria officinalis).*

The plant left starch on the flax threads which produced many subtle variations in the colors of the linen threads. This was completely different than the Egyptian linen production which used a strong bleach to remove most color from the flax fibers. The Shroud of Turin linen matched the Roman method of creating linen, not the Egyptian.

Pliny, the Elder, a Roman scholar, 23-79 A.D.

> [Editor's Note: Pliny the Elder (23-79) was a Roman encyclopedist. His greatest and only surviving work, the *Natural History*, has been called one of the most influential books ever written in Latin.
>
> Pliny whose full name was Gaius Plinius Secundus, was born at Comum in the region north of the Po River and was educated in Rome. After the military career normal for his social rank, during which he served as a cavalry officer in Germany (47-57), he practiced law. During Nero's reign (54-68), Pliny found it prudent to concentrate on literature. Pliny's most famous work, his one surviving book, *Historia Naturalis* (*Natural History*), was published in A.D. 77. *Natural History* consists of thirty-seven books including all that the Romans knew about the natural world in the fields of cosmology, astronomy, geography, zoology, botany, mineralogy, medicine, metallurgy, and agriculture.]

The Los Alamos National Laboratory chemist, now a retired research Fellow, is Raymond N. Rogers. Mr. Rogers worked at Los Alamos from 1951 until 1988, when he retired as a Research Fellow who could continue to work in his Los Alamos laboratory. He was curious about discrepancies between the type of linen in the Shroud that should be much older than the announced Medieval age. This year on January 20, 2005, in the latest issue of the chemistry peer-reviewed scientific journal, *Thermochimica Acta*, Volume 425, Issues 1-2, Pages 189-194, the result of his work was published as: "Studies on the radiocarbon sample from the Shroud of Turin."

Raymond N. Rogers, M. S., Research Fellow in Chemistry, Los Alamos National Laboratory, Los Alamos, New Mexico. Photograph © 2004 by Barrie M. Schwortz.

Chemist Ray Rogers concluded in his paper: "... the sample used to test the age of the Shroud of Turin in 1988 was taken from a rewoven area of the Shroud. Pyrolysis-mass spectrometry results from the sample area coupled with microscopic and microchemical observations prove that the radiocarbon sample was *not* part of the original cloth of the Shroud of Turin. The radiocarbon date was thus not valid for determining the true age of the Shroud."

What Mr. Rogers did look for was the amount of lignin in the Shroud of Turin. Lignin is a polymer in the cell walls of woody plants and flax that help to strengthen and stiffen the plants. Lignin are the dark rings in a tree trunk. He found there *was* lignin in the Shroud linen, but not any evidence of vanillin a substance that emerges from lignin over time. And it takes a very long time for all the vanillin in lignin to disappear. In fact, Mr. Rogers concluded this new chemical analysis indicates the Shroud of Turin must be between 1300 and 3000 years old.

Mr. Rogers is now quite ill and very weak in the last stage of prostate cancer that has spread throughout his body. But he talked with me this week about his important final research about the age of the linen in the Shroud of Turin.

Interview:

Raymond N. Rogers, M. S. Chemistry, Univ. of Ariz, 1950; hired in December 1951 at what was then the Los Alamos Scientific Laboratory to research high explosives and do work for Enrico Fermi on graphite-moderated reactors; retired as Research Fellow in 1988 with continued access to his lab at the Los Alamos National Laboratory, Los Alamos, New Mexico:

"The rate of evolution of vanillin and the fact you don't find it in the Shroud indicates an age much different than the radiocarbon age (announced in 1988). But the 1988 age determination, I think, was perfectly accurate for the samples that the laboratories were given. They were given samples of linen. They determined the age of them and the age was perfectly accurate probably good to within plus or minus 50 years of the completely accurate age of that particular sample.

BUT THE SAMPLES WERE CLEARLY WOVEN ON THE EDGES OF THE SHROUD BECAUSE APPARENTLY THAT WAS WHERE IT HAD BEEN CARRIED AND WAS WORN AND THE PATCHES WERE SOMETHING WOVEN IN LATER AND WERE NOT REPRESENTATIVE OF THE ACTUAL LINEN SHROUD IN WHICH THE IMAGE IS.

That's the whole point! These samples that were given for analysis and age determination were spurious. They were not part of the original cloth. The age determinations were accurate for the samples. The samples were NOT valid for determining the date at which the flax was grown that was used to produce the main part of the Shroud.

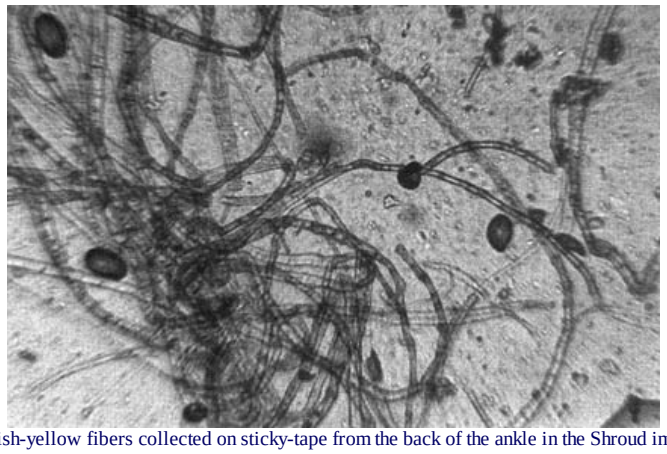
Measuring Amounts of Lignin and Vanillin in Shroud Linen

WHAT YOU HAVE BEEN ABLE TO DO IS ESTABLISH AN OLDER DATE HOW?

That was by looking at the rate of degradation of the lignin and also you can make some pretty good estimates by looking at the technology. But my estimate of 1300 to 3000, that you mentioned, was strictly based on the rate at which lignin decays.

Lignin, in woody plants and textiles, is a very large, complex molecule. Upon heating the long-chain lignin
molecules break-down into simpler phenolic-type compounds. These phenols are highly aromatic - you can smell it when you go up to a Jeffrey pine tree that's standing out in the sun. You smell vanilla! It smells like a vanilla milkshake. That's the stuff. This indicates that the lignin is changing composition as a function of time and it does.

As chemists, we can produce models where the rates of aging of the lignin and do predictive things: How long does it take to eliminate vanillin at a certain temperature? And it turns out, it's a long time to get it down to the place you can't detect it! So, I was amazed to find that I could not detect any vanillin in the lignin deposits on the Shroud fibers. I could on the Holland cloth and lots of other linen samples from lots of different ages. But I could *not* (find any vanillin) on the Shroud.



Pale brownish-yellow fibers collected on sticky-tape from the back of the ankle in the Shroud image (400X) that are still embedded in the sampling tape's adhesive. Dark lignin deposits are easily visible at the growth nodes.
Samples sticky-tape collected in 1978 from the Shroud in Turin, Italy, by Raymond N. Rogers, who also produced the
photomicrographs. This image by Mr. Rogers was reprinted in "Studieson the Radiocarbon Sample from the Shroud
of Turin, published on January 20, 2005, in *Thermochimica Acta*, Volume 425, Issues 1-2, Pages 189-194.

The fact is that the lignin that was quite visible on the fibers from the Shroud did not give a test for vanillin. It was all gone! And it takes a long time for it to be all gone and the chemical rate process that we measured predicted it would take at least 1300 years for it to be gone to the point you could not find it by the chemical spot test. And it could have taken as much as 3000 years. Somewhere between those limits would be the most probable age for the original, main part of the cloth.

YOU WERE DOING THIS WORK AS A FELLOW WITH THE LOS ALAMOS NATIONAL LABORATORY YOU HAVE BEEN APPLYING YOUR CHEMISTRY KNOWLEDGE THAT YOU'VE ALSO USED ON GOVERNMENT PROJECTS OUT OF CURIOSITY ABOUT WHAT EXACTLY IS THE NATURE AND AGE OF SHROUD OF TURIN?

That's exactly true. I have to make it quite clear that the government did not support the time or materials or anything like that that we used for this. We did use government ovens to age those lignin samples. But we did not steal time from our jobs to do the work while we were employed at the laboratory. And a very large amount of what was in that article in *Thermochimica Acta* was done in my own home laboratory.

So, I think that for probabilities and possibilities, the 1300 to 3000 is a pretty good guess. It's an estimate. A lot more work can be done on both chemistry and history. But I'm not the guy to do it now because I'm done!

WHICH IS VERY SAD. BUT AT LEAST YOU HAVE CONTRIBUTED SOMETHING EXTREMELY IMPORTANT ON AN HISTORIC ARTIFACT THAT MAY VERY WELL HAVE WRAPPED THE BODY OF JESUS CHRIST.

Reddish Blood Spots On Shroud Contain Hydroxyproline (Amino Acid)

There's another thing here about determining the age and that's the blood spots. A lot of those blood spots were never significantly heated and they have just aged naturally and that's what happened to the lignin.

AND YOU ARE CONFIDENT THAT THEY ARE BLOOD SPOTS?

Well, I was at Al Adler's (Alan D. Adler, M.D.) lab when he was doing the fluorescence testing on the porphyrins and they also did protein testing and I know that it has to be an animal product. Hydroxyproline (amino acid) does not come from anything else. It comes from things like body fluids and blood. So, from my own analyses, the probability that it's blood is very high. And the x-ray fluorescence analysis showed anomalously high iron content in the blood areas, which agrees with its having porphyrin there and the most probable thing from distribution of it and color and chemistry is that it's blood."

> [Editor's Note: Porphyrins are pigments found in animals and plants. They are involved in the formation of many important substances in the body including hemoglobin, which carries oxygen in the blood.]

Shroud Linen's Crystalline Cellulose Heavily Irradiated Over Long Time

One of the things I noticed years ago actually in looking at the tape samples I brought back from Turin was that the Shroud fibers were birefringent in a rather peculiar way.

> [Editor's Note: Electric birefringence has been used to investigate the microscopic electro-optical properties closely related to the conformation and polarization of molecules, such as molecular rotation, deformation and polarization.]

I never really thought about the structure of flax that much. But it's mostly crystalline cellulose. One of the things that we used in the nuclear and x-ray business was dosimeters to tell how much radiation we had absorbed. That was based on physical changes sometimes chemical changes that were caused by radiation.

It turns out that when I got a bunch of old linen samples and started looking at the fibers with a petrographic microscope that's a polarizing microscope that the fibers had changed. They were no longer like new flax fibers. They were all full of defects and biofringence that should not be there. It made sense that they had been absorbing radiation through all that time and you could see it.

It turns out that I got some samples of flax fibers that had been irradiated with 1.47 MeV protons by a guy named Rinaudo in France (J.B. Rinaudo, F. Barbesino, G. Fanit, M. Moroni: "Experimental results obtained through protons and neutrons irradiation," The Orvieto Worldwide Conference "**Sindone 2000.**") Lo and behold, they were loaded with ion tracks - the defects that were caused by the passage of protons. I got hold of some samples that had been neutron-irradiated by a guy named Moroni and sure enough neutrons are not ionizing particles, but they hit hydrogen atoms in organic materials. Like billiard balls, they shoot these protons all through the material and do leave ion tracks. I could see these recoil proton ion tracks in the neutron-irradiated materials.

The same sorts of things happened with cosmic radiation and electromagnetic radiation and gamma rays, x-rays, U-V light any light that is more energetic than green light. Blue light is very effective in causing defects in flax fibers. So, I could look at these things and say, 'Yeah, this is an old sample because it has a lot of defects in it.'

Sure enough, samples from the Dead Sea Scrolls and I have one that is 4,000 years old and another is 3,700 years old. There are some that are a few hundred years old. One that is Coptic age in Egypt. The gross amount of defect in these things is pretty much possible to correlate with the age of the Shroud sample. The Shroud shows an age that is - the defect population and types of defects that appear in Shroud fibers agree completely with the assumption that this is about a 2000-year-old piece of cloth.

AND IS ALSO CONSISTENT WITH THE VANILLIN.

Yes.

WHAT IS IT THAT YOU THINK COULD HAVE OCCURRED 2,000 YEARS AGO THAT WOULD HAVE LEFT THIS IMAGE ON THIS LINEN?

A very important fact is on my tapes I put them on with a pressure applicator so I knew how much force was applied. I pulled them off with it and watched how easily the tape came off.

The tapes came off easily from image areas. When we got them back and started really studying them, we found that in many cases, the adhesive on the tape had pulled a colored layer off of the fibers in image areas and these colored layers had the same chemical properties as the surface of the image fibers themselves. When you look with phase contrast microscopy and various kinds of microscopy, you can tell that the entire image color resides in a very thin colored layer on the surface of colorless flax fibers. This is tremendously important because if X-rays or something like that had interacted with those fibers, the x-rays penetrate and they are going to affect the fibers.

Rinaudo did his thing and said, 'The only way that the image could be produced was by protons emanating from the body as it dematerialized.' Well, protons go right on through these fibers and they are going to color it all the way through and it was not. It was not scorched because scorches go all the way through. I am talking about these fibers that are about 13 micrometers in diameter. A human hair is maybe 30 to 45 micrometers in diameter. So, these things are maybe a third of the diameter of a human hair. These are little! They were not affected by any kind of radiation that produced the image color. It's a

very thin layer.

Rogers Hypothesis About How Image Was Created

If you want an hypothesis, I'll drop one on you. This is still in testing stage, but the spectrum that the Gilberts (Roger and Marriot Gilbert, Oriel Corporation) took shows that the color was the result of a chaotic structure composed of carbon-carbon double bonds. This is really definite.

It's not a pigment. It's not a lot of things, but it is a chaotic organization and all of that chaotic organization of carbon-carbon double bonds occurs on the very outer surface of these fibers.

THE REASON THAT MIGHT OCCUR IS WHAT?

Remember Pliny said the warp was painted with starch during weaving. then the whole thing was washed in soap plant suds which is not a very efficient detergent. So, it could not have possibly removed all the starchy material. The cloth should still have starch impurities in it and we detected them years ago. Even McCrone admitted that he had observed starch granules as microscopic structures on the cloth.

OK, so here is this starch impurity. Are you familiar with a Maillard reaction?

Was the Shroud Image Produced By A Maillard Reaction?

> [Editor's Note: The **Maillard reaction** is a chemical reaction between an amino acid and a reducing sugar, usually requiring the addition of heat. Like caramelization, it is a form of non-enzymatic browning. The reactive carbonyl group of the sugar interacts with the nucleophilic amino group of the amino acid, and interesting but poorly characterized odor and flavor molecules result. This reaction is the basis of the flavoring industry, since the type of amino acid determines the resulting flavor.
>
> Although used since ancient times, the reaction is named after the chemist Louis-Camille Maillard who investigated it in the 20th century.]

When you bake bread, the reason it goes brown on the crust, when you roast green coffee beans and go brown, when you broil meat, the reason you get a brown crust on the outside these are reactions between the carbohydrates, the sugars and starch that are in the material, with the proteins or amino acids or amines that are produced by the other part of the food and they produce this color. And this brown color is *exactly the same structure and spectrum* as the image (on the Shroud of Turin.)

Is it logical? Well, you've got these carbohydrates they are starch impurities from the production of the (linen) cloth and you wrap a dead body in it and one of the things that it is notable about a dead body is that it very, very quickly medical investigators will tell you it's within *four minutes* you start producing some amines. Those can get up to the carbohydrates and react with them and ultimately produce this yellow-brownish color that is a result of chaotic double bond structures (of carbon).

There isn't any other cloth that sees to appear anywhere in the world that would accept an image like this (on the Shroud from starch and amine interaction. One thing, if you could prove that the (Shroud images) were Maillard products, one thing it would prove conclusively is that the Shroud was a *real* shroud. As far as I can see from a rigorous scientific basis, that's about as far as you can take it because never are you going to find any proof that it was Jesus. We don't have any samples of DNA from Mary or from any of his siblings or anything like this.

So, we can't tell it was used on Jesus, but we can sure put up a strong case that it was a *real* shroud, it was not hoaxed, it was the right age, and the image and the blood spots certainly appear to agree more with Gospel accounts than they do with anything else."

More Information:

1978 Researchers who took part in the "Shroud of Turin Research Project" (STURP). Asterisk (*) indicates direct participation in 1978 STURP examination of Shroud in Turin, Italy.

1. Accetta, Joseph S., Lockheed Corporation

2. Adler, Alan, M. D., Western Connecticut State University
3. Baumgart, Steven, U. S. Air Force Weapons Laboratories*
4. Brooks, Ernest H., Brooks Institute of Photography*
5. Bucklin, Robert, Harris County, Texas, Medical Examiner's Office
6. Devan, Donald, Oceanographic Services, Inc.*
7. Dichtl, Rudolph J., University of Colorado*
8. Dinegar, Robert, Los Alamos National Scientific Laboratories*
9. D'Muhala, Thomas F., Nuclear Technology Corporation*
10. Drusik, Jim, Los Angeles County Museum
11. Evans, Mark, Brooks Institute of Photography*
12. Gambescia, Joseph, St. Agnes Medical Centre
13. German, John D., U. S. Air Force Weapons Laboratories*
14. Gilbert, Roger, Oriel Corporation*
15. Gilbert, Marriot, Oriel Corporation*
16. Haverty, Thomas, Rocky Mountain Thermograph*
17. Heller, John, New England Institute
18. Jackson, John P., U. S. Air Force Academy
19. Jumper, Eric J., U.S. Air Force Academy*
20. Janney, Donald, Los Alamos National Scientific Laboratories*
21. Janney, Joan, Los Alamos National Scientific Laboratories*
22. Lorre, Jean, Jet Propulsion Laboratory*
23. London, Ronald, Los Alamos National Scientific Laboratories*
24. Lynn, Donald J., Jet Propulsion Laboratory*
25. Miller, Vernon D., Brooks Institute of Photography*
26. Morris, Roger A., Los Alamos National Scientific Laboratories*
27. Mottern, Robert W., Sandia Laboratories*
28. Pellicori, Samuel, Santa Barbara Research Center*
29. Rogers, Raymond N., Los Alamos National Scientific Laboratories*
30. Schwalbe, Larry, Los Alamos National Scientific Laboratories
31. Schwortz, Barrie M., Barrie Schwortz Studios*
32. Soran, Diane, Los Alamos National Scientific Laboratories
33. Stevenson, Kenneth E., IBM*

Websites:

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