

# NASA's contribution to the research on the Shroud of Turin

by Umberto Cavallaro<sup>1</sup>

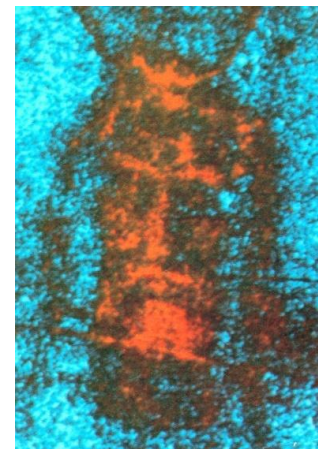
At the time of this writing the Shroud of Turin, one of Christianity's most visible and most controversial relics, is on display in Turin until June 24<sup>th</sup>, 2015. Starting from 1898, the year when the lawyer Secondo Pia snapped the first photographs of the relic, the Holy Shroud has undergone countless tests in an attempt to answer the question that the silent image continues to ask the viewer: «*But who say ye that I am?*».

To date the Shroud is perhaps the most-studied historical document in the world: it is estimated that between 100,000 and 150,000 hours have been employed in its scientific analysis, using the most advanced technologies.

Among the most interesting investigations of recent years certainly must be mentioned the detailed analysis performed by two NASA scientists, James Donald Lynn and Jean Lorre, who were called into question in 1976 and involved in the project STURP (Shroud of Turin Research Project), the international and interdisciplinary research programme that in the years 1976-78 completed the most comprehensive and systematic study ever performed on the Shroud<sup>2</sup>.

Although the "Shroud of Turin" investigation by JPL scientists is not a NASA enterprise, the image enhancement techniques used there originate from space technology. The work, therefore, has a NASA connotation<sup>3</sup>.

In 1976 the New York-based Holy Shroud Guild of America – HSGA, the oldest American organization of this kind – was preparing for the project STURP and decided to contact the two NASA researchers and ask for their contribution.

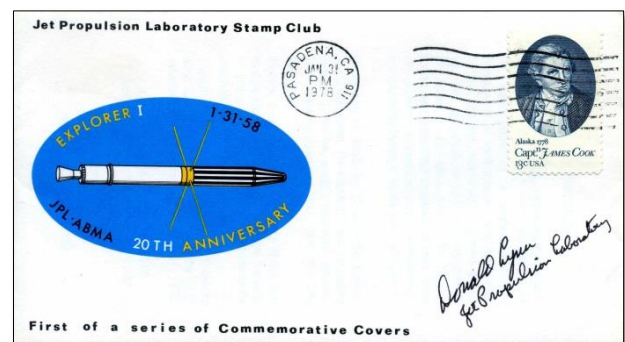


*Image produced by Lynn with the color classification analysis technique (1977)*

At that time Don Lynn was leading the Image Processing Laboratory at the NASA JPL in Pasadena where, with his colleague Jean Lorre, had developed very sophisticated technologies for the analysis and interpretation of the images that Viking was sending back to Earth from the surface of Mars.

At HSGA hoped that those advanced image processing techniques might be applied to negatives and color slides of the shroud obtained in 1973 and could answer to many questions that remained unanswered<sup>4</sup>:

- was the body image formed by ammonium vapors absorbed by the linen threads, as was thought in earlier times ("vaporographic")



<sup>1</sup> This article was first published on "Filatelia Religiosa Flash" (March 2015) – the quarterly Journal of the "Don Ceresa Religious Philately Club" and is contained in the book "Terra Buona..." ("Good Ground ...") dealing with the history of Turin and its peculiarities. The book prepared by the Club will be presented to Pope Francesco during his visit to the Shroud on June 21<sup>st</sup>, 2015.

<sup>2</sup> Approx 40 scientists took part in the STURP project, bearing different specific skills in different sectors of physics, chemistry, biology, photography, archaeology or textiles from prestigious institutions such as Lockheed, U.S. Air Force Weapons Laboratories, Brooks Institute of Photography, Oceanographic Services Inc, University of Colorado, Los Alamos National Scientific Laboratories, IBM, Nuclear Technology Corporation, Los Angeles County Museum, Rocky Mountain, .S. Air Force Academy, NASA Jet Propulsion Laboratory, ecc.

<sup>3</sup> See <http://er.jsc.nasa.gov/seh/shroud.html>

<sup>4</sup> "How Image Enhancement May Explain Past Events", first published in "JPL Universe," July 5, 1977; see <http://er.jsc.nasa.gov/seh/shroud.html>

hypothesis) or was originated by radiation, as more recent analysis seem to indicate, or may it have been imprinted by processes of which scientists are still unaware?

- Are the dark spots at the wrists and feet direct-contact blood stains?

- Is the image, as some would claim, a painting?

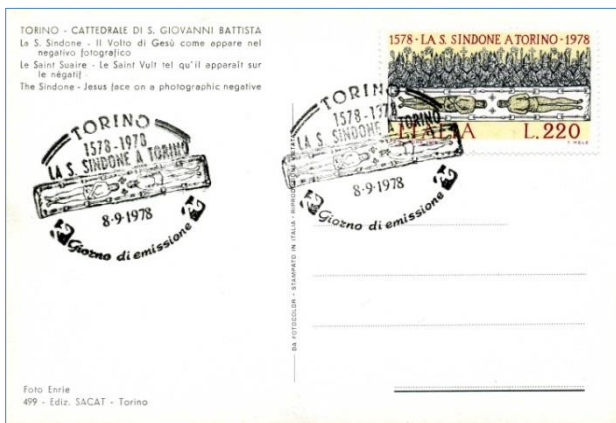
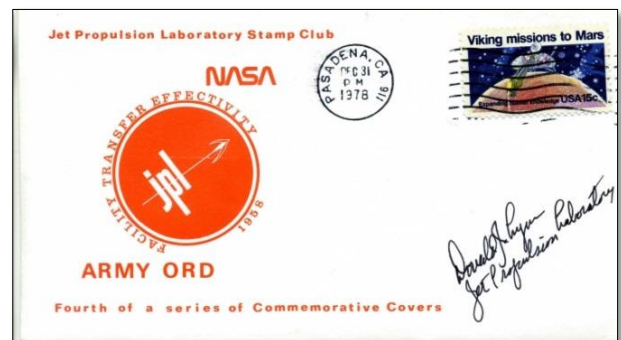
Lynn and Lorre accepted the assignment, and NASA agreed to the use of the equipment in its laboratories for these studies, with the only condition that they were conducted outside of working hours.

By applying their mathematical and contrast enhancement techniques to the scanned images of the Shroud, they separated the original image from the extraneous markings or "artifacts" and "overlapping", such as wrinkles, burns, stains the water used at the fire of Chambery in 1532 and patches, in an attempt to reveal a more distinct picture of the figure on the shroud.

The first results, illustrated by Don Lynn in the Shroud conference held the following year (1977) in Albuquerque, New Mexico, immediately made clear that the examination of the Fourier transform image excluded any trace of "directionality" that should necessarily be there if the Shroud had been painted with a brush<sup>5</sup>. «We didn't feel we made any major findings – concluded Lynn – partly because of the poor quality of the negatives we worked with.» And he expressed the desire to further study the relic by applying the analysis of color classification, as was done for the NASA photographs taken by satellites. «To separate the different markings and determine their nature – explained the two scientists – we would need to take high resolution photographs of the shroud in many colors, with proper calibration controls to allow intercomparison between the various photographs. Then very sensitive color variation maps could be produced, which might allow one to separate marks by their chemical composition.»

The video of his speech, and his comments during the conference of Albuquerque was inserted in the concluding part of a famous documentary "The Silent Witness" by David Rolfe (1977).

In October 1978<sup>6</sup> Lynn was invited to join the international group of forty scientists who were permitted to examine the controversial Shroud, at the conclusion of the Exposition organized from

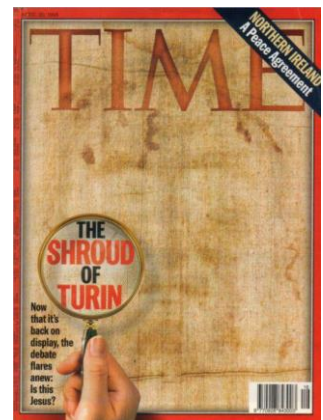


*The first Italian stamp featuring the Shroud of Turin was issued in 1978, to commemorate this exhibition.*

campaign and supervised the taking of more than two thousand photos that under his leadership were then computer-analyzed at Jet Propulsion Laboratory.

Lynn and his colleagues were unable to prove that the image was that of Christ but did conclude that it was not a forgery.

August 27 to October 8, to celebrate the 400th anniversary of the transfer of the Shroud to Turin. Many Christians believe the image is that of Jesus Christ, but skeptics – after the debatable carbon dating – say the cloth dates only to the Middle Ages and not to the 1st Century, when Christ was crucified. Lynn organized a well-structured photographic



<sup>5</sup> J. J. Lorre e D. J. Lynn, "Digital enhancement of images of the Shroud of Turin", in *Proceedings of the 1977 United States Conference of research on the Shroud of Turin*, Colorado Spring 1977, pp. 154-181.

<sup>6</sup> At the time, the shroud was owned by Umberto II, former king of Italy then living in Portugal..

The results of studies of Lynn and Lorre came together in the final report of the project STURP which was released officially in 1981<sup>7</sup>.

The study's conclusions were that:

- In the fibers of the fabric there is no type of pigment, paint, dye or coloring: the color of the image resulting from oxidation, dehydration and changes in the structure of the polysaccharides of the same fibrils flax;
- The computerized image analysis shows that it is encoded in three-dimensional information;
- It is clear that there has been direct contact of the Shroud with a body and the blood stains are composed of hemoglobin and albumin contain;
- No known physical or chemical method is able to explain the totality of the features of the image.



In science, as Galileo taught, explaining means to be able to play. All results obtained confirmed that the image was produced by a complex of phenomena due to oxidation processes, dehydration that have affected the structures of the polysaccharides that constitute the microfibers of the cloth the shroud it is made of. Many of these transformations can be reproduced in the laboratory, through given physical or chemical processes. But there is no known method that, through a combination of physical, chemical, biological and doctors at a time can make all the changes necessary to reproduce the image.

Despite their efforts, the 40 scientists were not able to reproduce the image. Essentially this ambitious scientific effort failed to give an answer to the main question: "how originated the Shroud?"

In 1981, in its final report, STURP wrote<sup>8</sup>: «We can conclude for now that the Shroud image is that of a real human form of a scourged, crucified man. It is not the product of an artist. The blood stains are composed of hemoglobin and also give a positive test for serum albumin. The image is an ongoing mystery and until further chemical studies are made, perhaps by this group of scientists, or perhaps by some scientists in the future, the problem remains unsolved.»



Donald Lynn was born in 1932 in Cicero, Illinois and passed away in Los Angeles on October 2000, at 68. A former scientist of the NASA Jet Propulsion Laboratory, was responsible of the *Image Processing Laboratory*.

After studying nuclear engineering at UCLA, Los Angeles, he began working with aerospace companies while studying for his master's degree, starting with Douglas Aircraft. After obtaining his degree he entered in NASA as consultant and participated in the design of many space instruments, including the devices that

Apollo astronauts used and left on the Moon.

Later he spent 20 years working with the Jet Propulsion Laboratory on projects for the National Aeronautics and Space Administration, including the Voyager project, Viking, Mariner and Galileo.

Lynn's particular expertise was computer enhancement of photographic images obtained in outer space of such subjects as the moons of Jupiter.

<sup>7</sup> The report is summarized in the official site of STURP <http://shroudstory.com/2013/12/12/mystery-as-proof/>

<sup>8</sup> "A Summary of STURP's Conclusions" are found in [www.shroud.com/78conclu.htm](http://www.shroud.com/78conclu.htm)