



Figure 1. Front and Back Images on the Shroud of Turin 7-29-19

1. Rigor mortis in the feet. This indicates the victim was dead.
2. Two nails through one foot, one of them through both feet.
3. Fire in 1532 resulted in scorch marks and water stains.
4. Areas badly damaged in the fire were patched in 1534.
5. The Hungarian Pray manuscript (1192-1195) has a painting of a famous burial cloth that had long been in Constantinople. It shows the same L-shaped burn holes that are on the Shroud, so the Shroud must have existed significantly (more than 2 sigma) before the C¹⁴ date of 1260 to 1390 AD. Thus, this C¹⁴ date must be flawed.
6. The Shroud appears to show a flow of blood and clear blood serum from a wound in the side. Blood serum is mostly composed of water. Compare this with "blood and water" in John 19:34.
7. The Shroud shows 100 to 120 scourge marks from Roman flagrum. Resulting blood marks show blood serum rings (visible only under UV) around the blood particles. Compare with Mk. 15:15.
8. Abrasions on both shoulders from carrying a rough heavy object.
9. Puncture wounds from sharp objects pierced his scalp.
10. Pollen on the Shroud unique to the area around Jerusalem. Pollen from a plant with long thorns found around his head.
11. The images are negative images and contain 3D information that indicates the distance of the cloth from the body. Only the top 1 or 2 layers of fibers in a thread are discolored. The discolored fibers in the image result from the carbon atoms that were already in the cellulose molecules in the flax fibers being changed from single to double electron bonds, yet this produced the image of a naked crucified man.
12. Swollen cheeks and damaged nose from a beating or a fall.
13. Side wound shows a hole the size of a Roman thrusting spear.
14. Blood running down arms at the correct angles for crucifixion. Blood is real human blood, male, type AB. The blood with high bilirubin content and nanoparticles of creatinine bound to ferritin indicate he was severely tortured. Blood from the side wound is post-mortem.
15. Paintings from the Middle Ages show nails through the palms, but this will not support enough weight since there is no bone structure above this location. The Shroud shows the correct nail locations - through the wrist instead of the palm.
16. Shroud correctly shows thumbs folded under due to contact of the nail with the main nerve that goes through the wrist. This is also contrary to paintings from the Middle Ages.
17. Abrasions on one knee show a microscopic amount of dirt.
18. Three-inch wide side strip sown on with a unique stitch very similar to that found at Masada, which was destroyed in 73-74 AD.
19. Microscopic chips near the feet of travertine aragonite limestone containing impurities that closely match limestone in Jerusalem.

Summary of Shroud Research

by Robert A. Rucker, June 10, 2019

In 1988, samples from the Shroud were carbon dated to 1260-1390 AD. Every measurement can have two sources of errors: random errors and systematic errors. Before scientific measurements can be believed, a statistical analysis must be performed to determine whether the measurements have been affected by a systematic bias. This is done by mathematically determining whether the range of the measured values are consistent with the measurement uncertainties. In the 1988 carbon dating of the Shroud, when the measured dates for the Shroud were compared to the measurement uncertainties, they found that the range of the dates was not consistent with the measurement uncertainties. Based on this, they should have rejected the measured values as “heterogeneous” due to the probable presence of a systematic error/bias. Instead they assumed that the measurement uncertainties were wrong so that they could assume that the measured values were correct. Thus, the root cause of the conclusion that the Shroud dated to 1260-1390 AD was a very inadequate statistical analysis that failed to recognize that a systematic bias had affected the measurements. This means that the ratios of C^{14} to C^{12} in the samples, from which the dates were calculated, were correctly measured, but this ratio in each sample had been increased by something. The best explanation is that neutron absorption had created new C^{14} in the Shroud. This is the only explanation that is consistent with everything that we know about carbon dating as it relates to the Shroud. This is the neutron absorption hypothesis.

The front and back images of a crucified man can be seen on the Shroud of Turin because the information that defines the appearance of a crucified man has been encoded into the pattern of discolored fibers that make the image on the Shroud. This information was only inherent to the body and was not in the limestone or air in the tomb. Thus, this information had to be transported from the body to the cloth, where it had to be deposited. It had to be deposited on the cloth to control the mechanism that discolored the fibers, i.e. to control which fibers were discolored and the length of the discoloration on the fibers. Of the various ways that information can be communicated, only radiation could have transported the focused information from the body to the cloth required to form the good resolution front and back images on the Shroud. This radiation was probably emitted in a very brief powerful burst from within the body to create the good resolution images on the Shroud, with their very unusual characteristics.

If neutrons were included in this burst of radiation from the body, a small fraction of them would have been absorbed in the trace amount of N^{14} in the cloth to create new C^{14} on the Shroud primarily by the $[N^{14} + \text{neutron} \rightarrow C^{14} + \text{proton}]$ reaction, thus explaining the 1988 carbon dating of the Shroud to 1260-1390 AD. The C^{14} concentration at the 1988 sample location would have to be increased by only 16% to cause the carbon date to be changed from about 33 AD to 1260 AD. This 16% increase would result if only one neutron were emitted from the body for every ten billion that were in the body. This neutron absorption hypothesis is the only hypothesis that is consistent with the four things that we know about carbon dating as it relates to the Shroud of Turin – the date, the slope, and the range of the measurement data obtained in the 1988 carbon dating of the Shroud and the 700 AD carbon date for the Sudarium. The only person in all our historical records that was crucified exactly like Jesus and could have emitted a burst of radiation from his dead body that was sufficiently intense to create an image of his body on fabric is the historic Jesus of Nazareth. Thus, the evidence from the Shroud indicates that it is most reasonable to believe that it is the authentic burial cloth of Jesus.

Philosophy of Shroud Research

by Robert A. Rucker, February 8, 2019

The methodology that should be used in scientific research on the Shroud is an important philosophical question. Many argue that naturalism must be assumed. In practice, what this means is that the only explanations allowed are those consistent with our current understanding of the laws of physics and science. But there are significant problems with such an assumption of naturalism in Shroud research.

- Science can be defined as the pursuit of the truth by careful observation of repeated experiments varying all known variables that affect the results. When possible, the results are expressed in mathematical equations so that a hypothesis can be developed to explain the phenomena. This is done so predictions can be made which are testable, so that the hypothesis is falsifiable. It should be noticed that naturalism is not mentioned in this definition of science, so naturalism is not an essential part of science.
- The philosophy of naturalism assumes our science is so precise and complete that all phenomena must be consistent with it. For hundreds of years, experiments in classical physics attempted to account for all variables in our four-dimensional view of physical reality consisting of three dimensions in space and one dimension in time. But string theorists now believe that to explain experiments in modern physics, reality must consist of from 10 to 26 dimensions, with our four dimensions being only a small subset of the total. If this is true, it means that events in our four dimensions could be affected by variables in the larger dimensionality, so the variables in our four dimensions are not all the variables. Thus, we are not necessarily justified to assume that all explanations must be consistent with our current understanding of the laws of science, i.e. naturalism.
- New phenomena and laws are the very essence of the historical development of science. The greatest leaps forward in our understanding of reality are always outside or beyond our then current understanding of science. Science should always be open to new discoveries, new laws, or modification of existing laws, as new variables and phenomena are discovered and considered.
- The uniqueness of the image on the Shroud implies the cause may be outside or beyond our current understanding of the laws of science. Repeated experiments have never been done in which a human body produced an image of itself on a piece of fabric. This is because there is no known mechanism for a human body to cause such an image. Yet based on the evidence, the Shroud shows an image of the body that was wrapped within the cloth. Thus, there is currently no known way it could have happened, yet it has happened.
- In the last 120 years of research, the assumption of naturalism has not led to solutions to the mysteries of the Shroud. Thus, to find a solution to the mysteries, we ought to be open to thinking “outside the box” created by the restrictions of naturalism.
- In rejecting the necessity of assuming naturalism, we are not then confined to thinking in terms of miracles, the supernatural, or Jesus’ resurrection. Rather, we only need to recognize that something may have occurred that was outside or beyond our current understanding of the laws of science. In this way, the researcher can maintain a proper scientific methodology and approach the investigation with a neutral mindset that the Shroud may or may not be Jesus’ burial cloth and the image may or may not have been caused by a unique event that is outside or beyond our current understanding of the laws of physics and science.

History of the Shroud of Turin

by Robert A. Rucker, February 8, 2019

According to research on documents, traditions, coins, artistic works, pollen, and DNA the following is the most likely history for Jesus' burial cloth [1, 2, 3]. Jesus' linen burial shroud was found by Peter and John in the tomb after Jesus' crucifixion in Jerusalem (John 20:3-9). Because it was one of the few things left behind by Jesus and because it had Jesus' blood on it, it is very unlikely to have been ignored, reused, burnt or thrown out. Due to its importance, it probably would have been protected from moisture, insects, and intentional destruction. Under these conditions, the linen shroud would only decay by oxidation and dehydration which are very slow processes, so it could easily survive for thousands of years. There are many examples of linen lasting much longer than 2000 years.

Galatians 3:1 (~ 47 to 56 AD) indicates the believers in Galatia had been shown something that "clearly" or "publicly portrayed" "Jesus Christ ... as crucified" (NIV & NASB). The Greek word translated "portrayed" in this verse, "prographa", is one of the sources of our English word "graphic" and can be translated as "signboard" (NLT) or "placard" (Wuest). Based on the meaning of this Greek word and the context in the sentence, this was a physical object with an image which communicated that Jesus had been crucified. They had seen it with their "very eyes" (NIV). The most obvious explanation is that they saw Jesus' burial shroud containing his blood and possibly his image.

Many of the early believers, when they fled Jerusalem to avoid persecution, went to Antioch (Acts 11:19) so it became the center for Christian outreach (Acts 11:26, 13:1). A tradition preserved in the writings of Athanasius (298–373 A.D.) indicates that prior to the destruction of Jerusalem in 70 AD, Christian relics, including the icon of our Lord, were brought from Jerusalem through Pella to Syria, perhaps Antioch. Ancient texts and an inscription indicate Jesus' shroud may have been involved in the conversion of King Abgar the Great of Edessa in Mesopotamia probably in the second century.

The image that is now on the Shroud of Turin was frequently copied in Byzantine art. The earliest surviving example is the Christ Pantocrator painting from St. Catherine's Monastery at Sinai, which probably dates to about 550 AD. The Shroud was most likely brought to Constantinople, the capital of the Byzantine Empire, in 574 as the Image of God Incarnate. An alternate theory is that it was brought to Constantinople in 944 as the Mandylion or Image of Edessa. Its presence in Constantinople long before the C¹⁴ date of 1260 to 1390 is confirmed by Byzantine coins starting in 692, the Hungarian Pray Manuscript (1192-1195), and the report (1203-1204) of French crusader Robert de Clari that Jesus' burial cloth was exhibited weekly at the Church of St. Mary in the Blachernae district of Constantinople. It may have been sold by Byzantine emperor Baldwin II to his cousin, King Louis IX of France, between 1237 and 1261. Others believe it may have been stolen from Constantinople in the sack of the city in 1204. In about 1355 it was exhibited in Lirey, France, as the true burial cloth of Jesus by the French knight Geoffrey de Charny, the grandson of Jean de Joinville, a principle adviser to King Louis IX. In 1453, it was sold by Geoffrey de Charny's granddaughter to Louis, the Duke of Savoy. It was then gradually transported across France till it came into Turin, Italy, in 1578. This historical evidence, when combined with the results of the scientific investigation of the Shroud, is sufficient to convince most researchers that the Shroud of Turin is very likely the authentic burial cloth of Jesus. No other alternative satisfies all the historical and scientific evidence.

1. Jack Markwardt, multiple papers on the Conference-2017 page of www.shroudresearch.net .
2. John Jackson, "The Shroud of Turin, A Critical Summary of Observations, Data, and Hypotheses".
3. Ian Wilson, "The Blood and the Shroud", 1998, The Free Press, ISBN 0-684-85359-0.

Image Formation on the Shroud of Turin

by Robert A. Rucker, February 8, 2019

How were the front and back images of a crucified man encoded onto the Shroud? The main objective of the Shroud of Turin Research Project (STURP) was to study this question. In 1978, they sent about 26 researchers from the US to Turin, Italy, to perform hands-on non-destructive testing of the Shroud for five days, 24 hours a day. Their experiments determined that the image contains no pigment, no carrier, no brush strokes, no clumping of anything between the fibers or threads, no capillarity (soaking up of a liquid), no cracking of the image along the fold lines, and no stiffening of the cloth. Many or all these would be present if the image were due to paint, dye, or stain, yet none of them are present. Their experiments also proved the image is not due to a liquid, a scorch, a photographic process, or any other process that they could conceive of (Heller 1983, Antonacci 2000, Jackson 2017).

Subsequent analysis by STURP proved the straw-yellow discoloration that forms the image is only on the top one or two fiber layers in a thread. The discoloration on a fiber is about 0.2 microns thick around the outer circumference of the 15 to 20-micron diameter of a fiber. The discoloration is caused by a rearrangement of the electron bonds of the carbon atoms that were already in the cellulose molecules in the flax fibers in the linen threads, from single electron bonds to double electron bonds. Thus, the discoloration is due to energy added to the cloth but without substance, i.e. atoms, being added to the cloth. The energy was evidently added to the cloth in one or more very short powerful bursts of radiation so that the electron bonding could be altered before the energy penetrated beyond the top one or two layers of fibers in a thread.

Based on these unique characteristics, most researchers conclude that the image on the cloth could not have been made by any artist or forger in any previous era. The only other option is that the Shroud wrapped a real body of a man who died by crucifixion, and that this body in some unknown way created the image. The mechanism that discolored the Shroud fibers must have required energy to drive it and information to control it. Without information, no image could be formed. The required information is that which defines the appearance of a crucified man, which could only have come from the body that was wrapped in the Shroud [1]. Of the six processes that can transfer information from one location to another (radiation, waves in a medium such as sound waves, a flow of particles in physical connections such as wires, direct contact, diffusion of molecules, and pulses in a gravitational or electrostatic field) only radiation could have transferred the focused information from the body to the cloth [2]. This focused information is required to form the good-resolution images on the Shroud. We can see the image because this information has been encoded into the pattern of discolored fibers that make the image. Experiments have shown that ultraviolet light and protons can discolor linen fibers.

If we follow the evidence where it leads, without assuming we are limited to our current understanding of the laws of physics, we conclude that the image was formed by radiation damage to the molecules in the linen. This radiation, by its intensity and direction, carried the information from the body to the cloth which was necessary to form the image. Thus, this radiation was emitted from within the body as it was wrapped within the Shroud, since bones (teeth, bones in the hands, etc.) can be seen in the image, like an X-ray. The presence of the front and back images without side images indicates the radiation was probably vertically collimated both up and down [3].

Robert A. Rucker: [1] "Information Content on the Shroud of Turin", [2] "The Role of Radiation in Image Formation on the Shroud of Turin", [3] "Summary of Scientific Research on the Shroud of Turin", and [4] "Explaining the Mysteries of the Shroud", on shroudresearch.net/research.html .

Carbon Dating of the Shroud of Turin

by Robert A. Rucker, February 8, 2019

Results of the Shroud of Turin Research Project (STURP) in 1978 supported the authenticity of the Shroud, but this was brought into question by carbon dating. In 1988, samples were cut from the lower corner of the cloth and sent for C^{14} dating at three laboratories in Tucson, Zurich, and Oxford. The average date from the three laboratories [1] was 1260 ± 31 AD, which produced a range of 1260 to 1390 AD when corrected for the variable amount of C^{14} in the atmosphere. Subsequent statistical analysis [3] of the data published in [1] found strong evidence the variation in the laboratory's measurements was not only due to random effects but probably also due to something that could have altered the measured dates from the first century to the Middle Ages. In statistical analysis terminology, this "something" is called a systematic bias. Since this bias was not recognized or corrected for, the conclusion in [1] that the Shroud dates to 1260 to 1390 should be rejected. The evidence [2,3] can be summarized as follows:

- Due to its unique characteristics, the image could not have been made between 1260 and 1390 AD because the technology did not exist. The technology to form this image still does not exist.
- 13 other date indicators are consistent with a first century date for the Shroud and inconsistent with the C^{14} date of 1260 to 1390 AD including the Hungarian Pray Manuscript, the image of the face on paintings as early as about 550 AD and on coins as early as 675 AD, use of a first-century stitch on the Shroud, measurements of reflectance and tensile strength of the linen, etc.
- The average dates from the laboratories in Tucson (1303.5 ± 17.2) and Oxford (1200.8 ± 30.7) are statistically different (difference = 102.7 ± 35.2) from each other at the $102.7 / 35.2 = 2.9$ sigma level, which is above the normal 2.0 sigma acceptance level.
- Plotting the average values from the three laboratories indicates there is a gradient or slope to the C^{14} date of about 36 years per cm of distance from the bottom of the Shroud. This indicates the presence of something that altered the date measurements depending on the sample location. Nuclear analysis computer calculations indicate that the slope in the C^{14} date of 36 years per cm can be explained by the distribution of neutrons in the tomb when emitted from within the body.
- When a Chi-squared statistical analysis is performed on all the measurements and uncertainties, the C^{14} date measurements have only a 1.4% probability of being consistent with the uncertainties. This indicates a 98% probability that something had altered the measurements. This something, or bias, changed the measurements by about 36 years per cm as stated above.
- The date in [1], i.e. (1260-1390 AD), was based on ignoring half the data, i.e. all measurement uncertainties. It is not legitimate to simply ignore all the measurement uncertainties: 1) they were obtained using the same equipment and procedures as the measurements, 2) they were reasonably consistent for all laboratories, and 3) they were reasonably consistent with the uncertainties for the three standards that were run at the same time.

What altered the measured dates? Evidence indicates that the image was formed by a burst of radiation emitted from within the body (Ref. 2). If neutrons were included in this burst of radiation, a small fraction of them would have been absorbed in N^{14} in the Shroud to create new C^{14} . To shift the C^{14} date from 30 AD to 1260 AD requires only a 16% increase in the C^{14} on the Shroud at the sample location.

[1] P. E. Damon, et al, "Radiocarbon Dating of the Shroud of Turin", Nature, February 16, 1989.
Robert A. Rucker: [2] "The Carbon Dating Problem for the Shroud of Turin, Part 1: Background", [3] "Part 2: Statistical Analysis", and [4] "Part 3: The Neutron Absorption Hypothesis".

Is it the Image of Jesus?

by Robert A. Rucker, February 8, 2019

Experiments conducted by the Shroud of Turin Research Project (STURP) in 1978 indicate the characteristics of the image are so unique it could not have been made by an artist or a forger. The only other option is the image was made in some unknown way by the body wrapped within the Shroud. But who's image is it? Could it be the image of Jesus? In a court of law, there are two general ways to prove the identity of a person – by eye-witness testimony based on how the person looks, and by circumstantial or physical evidence such as DNA, fingerprints, shoe prints, pollen, fibers, etc. Consider application of these identification methods to the image on the Shroud.

When you look at the cloth (Figure 1), you see good-resolution front and back images of a crucified man: a severe flogging, a nail wound in the wrist, blood running down the arms, and nail wounds in the feet. Additional aspects relate to how Jesus was specifically crucified: a crown of thorns, a wound in the side with blood running down, and legs not broken. The image also indicates he was dead: the curvature of the feet due to rigor mortis, and blood from the side wound indicating the wound was post mortem, i.e. after death. Closer examination indicates swollen cheeks from a beating to the head, damaged nose from this beating or a fall, abrasions on both shoulders from carrying a rough heavy object, a section of his beard missing, and no body-decay products present. Microscopic examination is also consistent with the image being Jesus: dirt was found in abrasions on the tip of his nose and on one knee consistent with a fall, there was pollen from Jerusalem on the Shroud and pollen around his head from a plant with long thorns, and there were small chips of limestone near the feet containing impurities that match limestone in Jerusalem. Chemical analysis indicates what appears to be blood is real human blood and that it contains bilirubin, which would be present due to torture such as a severe flogging. The face on the Shroud also agrees with our concept of how Jesus looked. This is because our concept is based on the earliest paintings of Jesus (~ 550 AD) which were evidently based on the Shroud. All evidence is consistent with the image being Jesus.

No human body, alive or dead, has ever produced an image of itself on fabric. The only exception is the Shroud with its image of a crucified man. Two criteria indicate the identity of this man.

- Based on the nature of the blood on the Shroud, the blood must have come from a real human body that was wrapped within the Shroud. Based on the image on the Shroud, the body wrapped within the Shroud was the dead body of a man that had been crucified.
- Based on the STURP analysis, the image on the Shroud is not due to paint, dye, stain, liquid, scorch, or a photographic process. Evidence [1, 2] indicates the image is due to radiation damage to the linen caused by a burst of radiation emitted from within the body that was wrapped within the cloth. We have no other example of this happening. It was evidently unique.

Thus, the question is, what man who died by crucifixion could have gone through a unique event in which his dead body emitted such a powerful burst of radiation that it burned an image of itself onto the linen cloth in which it was wrapped? If one looks through all mankind's historical records, only Jesus and his reported disappearance from within his burial shroud satisfy these two criteria. There is no other reasonable option. Thus, it should be concluded that the image on the Shroud of Turin is Jesus. When this is recognized, a holistic explanation for the mysteries of the Shroud can then be developed [3].

Robert A. Rucker: [1] "Information Content on the Shroud of Turin", [2] "The Role of Radiation in Image Formation on the Shroud of Turin", [3] "Explaining the Mysteries of the Shroud"

Our Research on the Shroud of Turin

Books by Mark Antonacci: 2. “Test the Shroud”, 2015, 502 pages, available at www.testtheshroud.org
1. “The Resurrection of the Shroud”, 2000, 328 pages

Papers by Mark Antonacci available on the ARTICLES page of www.testtheshroud.org

“An Unrealistic Approach and Analysis of the Blood Flows on the Shroud of Turin”
“Production of Radiocarbon by Neutron Radiation on Linen” by A. Lind, Mark Antonacci, et al
“Nuclear Science and the Shroud of Turin”
“Particle Radiation from the Body Could Explain the Shroud’s Images and its Carbon Dating”
“Scientists and Secmantics”

Papers by Robert A. Rucker available on the RESEARCH page of www.shroudresearch.net

Summary Papers

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Image Formation on the Shroud

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Other Aspects of Shroud Science

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Evaluation of Items Written by Others

Paper 17 “Evaluation of ‘A BPA Approach to the Shroud of Turin’”
Paper 4 “Review of ‘Test the Shroud’ by Mark Antonacci”
Paper 3 “Review of ‘The Shroud of Turin: Radiation Effects, Aging, and Image Formation’ by Ray Rogers” by Robert A. Rucker, G. Fanti, M. Antonacci, T. Fleming, and K. Propp

Miscellaneous

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Paper 2 “The Disappearance of Jesus’ Body, Part 2: Physical Considerations”
Paper 1 “The Disappearance of Jesus’ Body, Part 1: Biblical and Theological Considerations”