



# The Shroud of Turin an Enduring Mystery

## Part 4: Skeptics & Image Formation



Dr. Ray Schneider, P.E., Ph.D.  
Associate Professor Emeritus  
Bridgewater College, Virginia



# The Deeper Mystery

- We've Looked At The Shroud From Three Perspectives
  - **RELIGIOUS:** We've seen that its markings blood and image faithfully depict the passion of Christ
  - **SCIENCE:** We've seen that the science demonstrates that it is not a painting or apparently a product of human artifice
  - **HISTORY:** While there are certainly holes, a plausible historical reconstruction is possible especially with the **corroborative witness** of the Sudarium of Oviedo



# The Skeptics

- The Skeptics Insist That The Shroud Is Too Good To Be True. **It Must Be A Forgery.**
  - they point to the C14 Date
- Given The Work Done To Date It's Reasonable To Say: "**Show Me!**"
  - Show me how to make one?
  - Show me what makes it inauthentic?
  - How do I know how to make that distinction between a forger or an authentic relic of the tomb?



# Characteristics of the Image

- Any demonstration that the shroud is a forgery requires that we identify at least some way that a forger could duplicate **all** the characteristics of the shroud
  - Image Characteristics
  - Blood Flows
  - Forensic Fidelity
  - elements a forger would or could not know about
    - pollen, fluorescent serum rings, dirt from Jerusalem, details of crucifixion that differed from art tradition

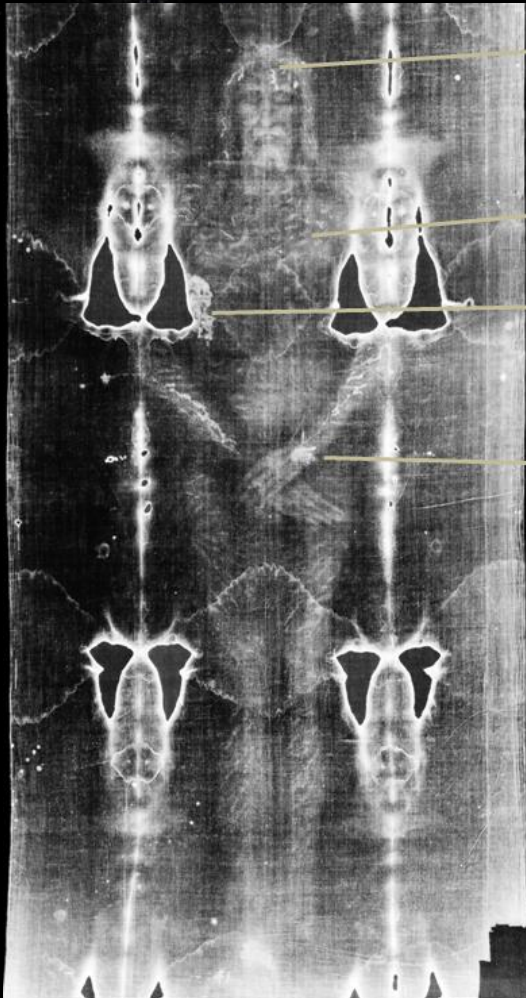


# Some Image Properties

- Negative
- STAR Features
  - Superficial
  - Three Dimensional
  - Areal Density
  - Resolution
- Blood Before Image
- Forensic Accuracy
- Historical Crucifixion Accuracy

# A Negative Image

- A Negative That Is Not A Negative



# STAR Properties

## Four Most Challenging Image Properties

**Superficial Image** only on top-most fibrils and only on the surface, nominally  $< 600\text{nm}$  thick.



**Three Dimensional Image** which encodes cloth to body distance.



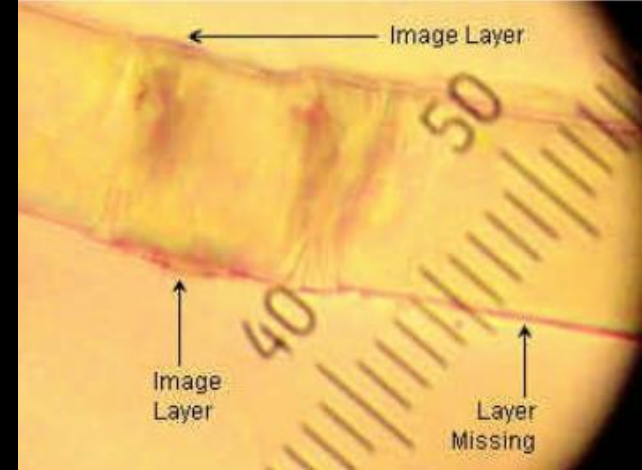
**Areal Density**, all image fibers the same color to  $\approx 2\%$  and density due to more colored fibrils where color is darker not darker color.



**Resolution**  $D/d < 1/3$  requires vertical anisotropy



# Superficial

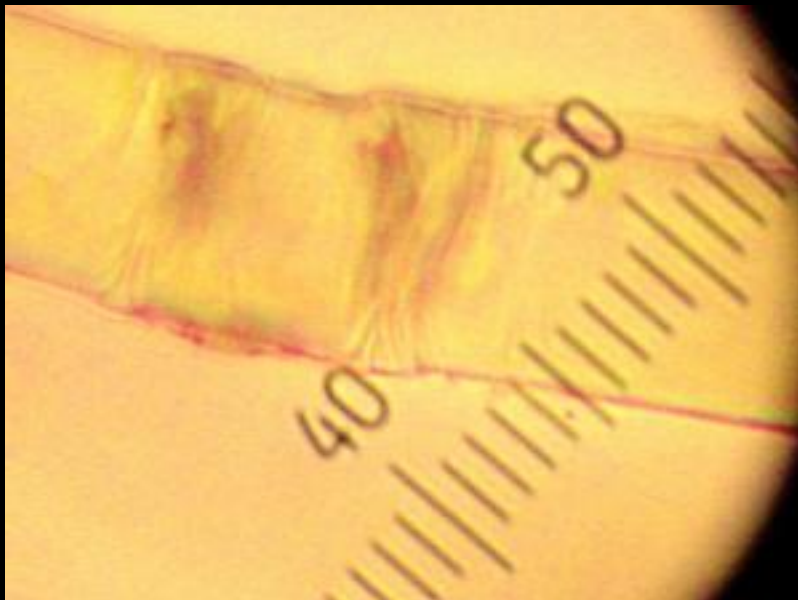


- The Image Is On The Uppermost Fibers That Make Up The Threads
- It Is Only One Fiber Deep
- The Image Chromophore Is A Thin Layer On The Outside Of The Fiber **200-600 nm** Thick
  - possible impurity layer or primary cell wall
- The Image Is Uniform In Color
- Adler & Heller Say It Is Oxidized Cellulose



# Image Fibers

- The superficial nature of the image
  - does not penetrate the surface fibers of the thread
  - exists only on the surface of the fibers themselves extending only a few hundred nanometers into the fibers
  - image color exhibits sudden termination yet follows fibers



Phase contrast microscopic view of image-bearing fiber from the Shroud of Turin. The carbohydrate layer is visible along top edge. The lower-right edge shows that coating is missing. The coating can be scraped off or removed with adhesive or reduced with diimide

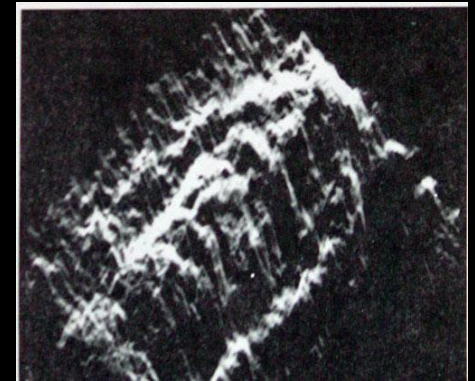
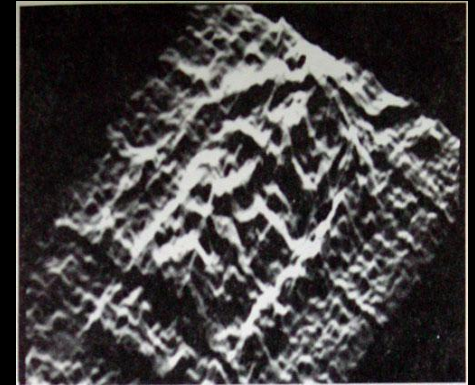
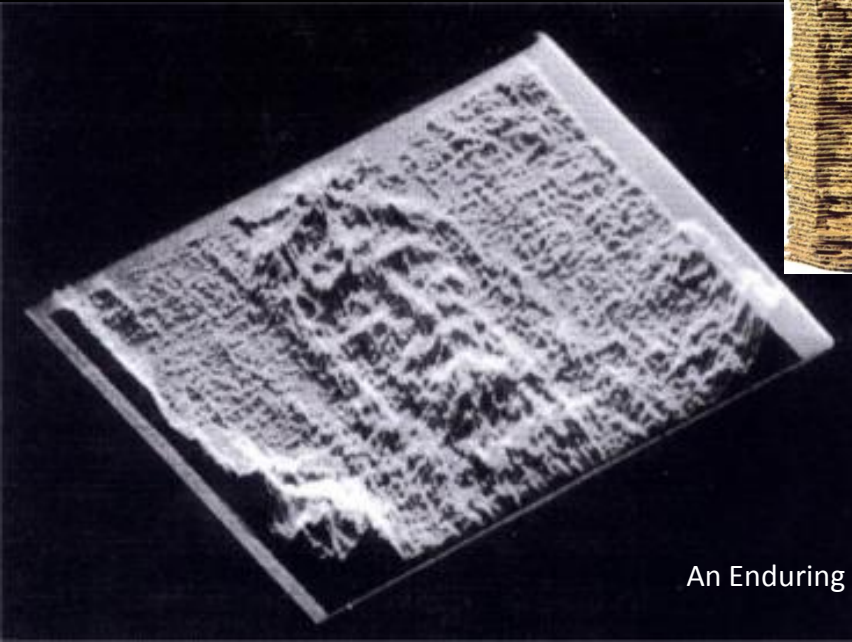
[http://en.wikipedia.org/wiki/Shroud\\_of\\_Turin](http://en.wikipedia.org/wiki/Shroud_of_Turin)

An Enduring Mystery © 2015 R. Schneider

<https://shroudofturin.files.wordpress.com/2013/11/mark-evans.pdf>

# Three Dimensional

- Encodes Cloth To Body Distance
- Exponential Decay In Intensity
- Extinction at 4-5 cm





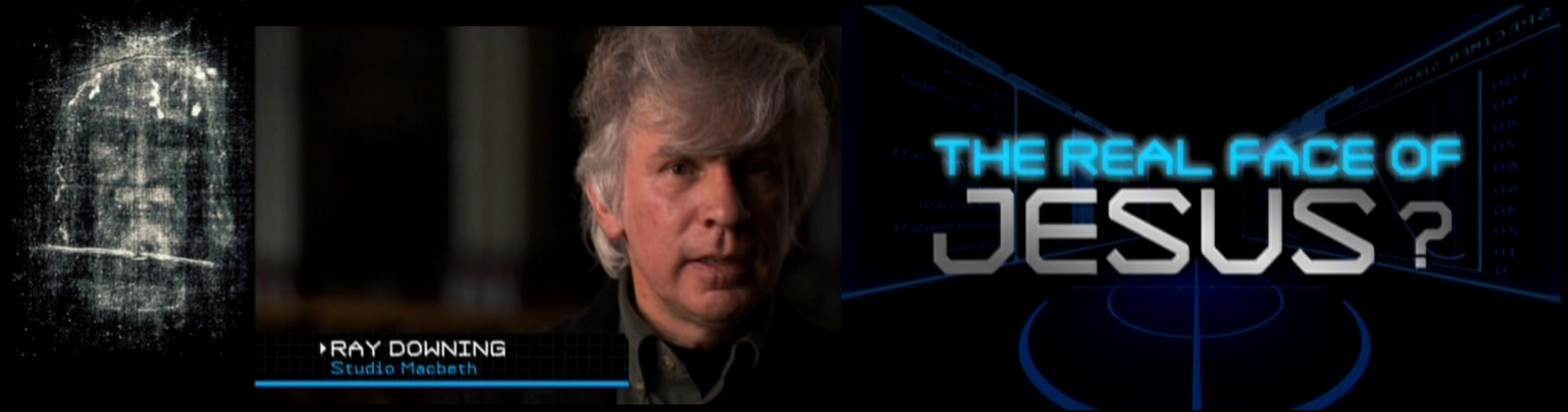
# Exploring The 3D Information

- Cleaning Up The 3D Information To Make A Clearer Image



Petrus Soons





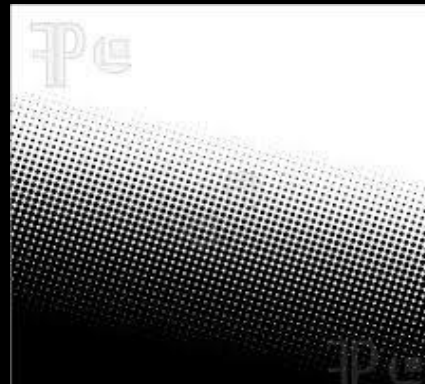
- A Fascinating Development of the 3D information on the shroud using computer technology



<http://www.history.com/shows/the-real-face-of-jesus/articles/the-shroud-of-turin>

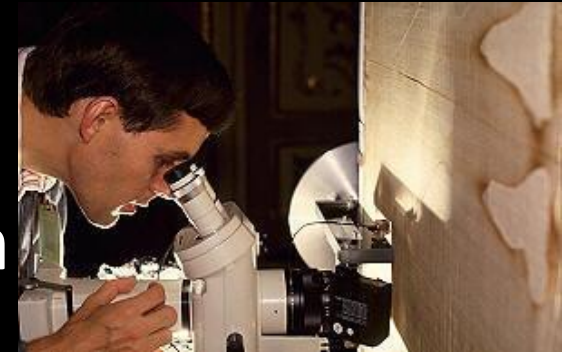
# Areal Density

- The elements that make up the shroud image are all the same color. Like a halftone image all the "dots" are the same color, more where its darker and less where its lighter
- In the case of the shroud the fibers are a uniform yellow of oxidized cellulose



# Resolution

- John Jackson pointed out the problem of the resolution of the shroud features that any image process must achieve. Using the example of the lips he estimated the required resolution at  $D/d$  where  $D_{\text{lips}} \approx 0.4 \text{ cm}$  and  $d_{\text{cloth}} \approx 1.1 \text{ cm}$  so  $D/d \approx 1/3$
- Any suitable image process must achieve this level of resolution





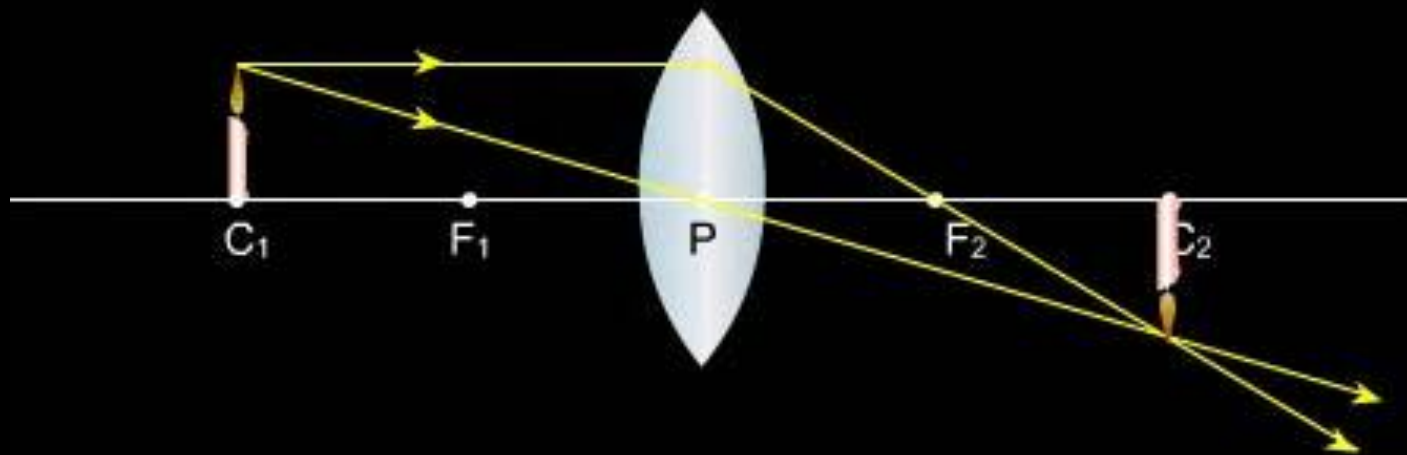
# Negative & STAR

## How Do You Do All Of That?

How are these  
characteristics compatible  
with one another?

# Resolution Requires Collimation and Focus

- Normally To Get A Focused Image Requires A Lens Or Some Kind Of Focusing Process
- How Can It Be That We Have A Focused Image On The Shroud?







# Mechanism?

## Collimation In The Tomb

- Gravity ?
- Laminar Air Flow ?
- Earth's Static Electric Field ?
- Some Combination ?

**We Just Don't Know**



# BUT

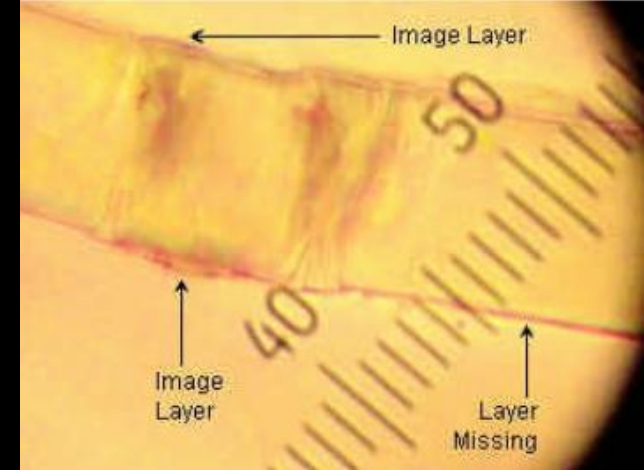
## Collimation Is Not Enough



- The image mechanism encodes cloth to body distance so something about the process "**knows**" how far the cloth is from the body
- **How Does That Happen?**
- The 'agency' degrades with distance extinguishing after about 4-5 cm.
- What happens between body and cloth?



# Chromophore



A **chromophore** is the part of a molecule responsible for its color. The color arises when a molecule absorbs certain wavelengths of visible light and transmits or reflects others.

- The Chromophore of the shroud appears to be oxidized cellulose which can be reduced with diimide.
- A “catalytic compound” (stimulus) promoted the oxidation of the cellulose of the linen/impurity layer to produce a thin (200-600 nm) image



# Extinction

- No Image Beyond 4 or 5 cm ... WHY?
- What's Magic About That Distance?
- Some Thoughts
  - Time frame of extinction distance set by speed of propagation of the image producing agent
    - speed of light 5 cm in 0.167 nanoseconds
    - gravity fall 5 cm in 0.96 seconds
    - electric field charge particle flux ? variable
    - gas or aerosol draft ? variable
  - Process may involve a chemically active entity that is consumed as it goes through the intervening distance

# Jackson Tinted Fluid Experiment

- By using a bust coated with phosphorescent paint that could be charged to glow
- then immersed in water with dye to attenuate the glow from the bust as a function of depth
- Jackson was able to duplicate the 3D characteristics of the shroud and explain some distortions

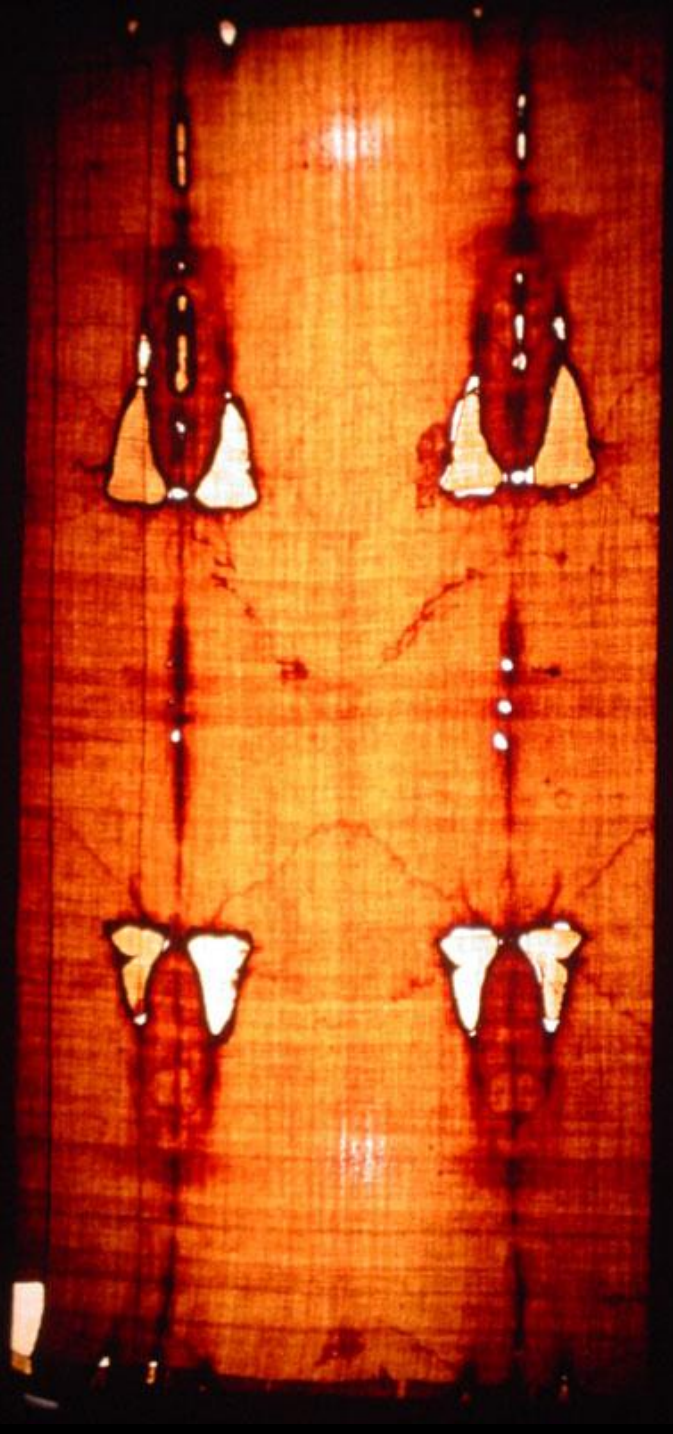
They took the bust, still with the phosphorescent coating, and submerged it, nose up, in a large container of dilute black ink. The nose, which was closest to the top of the inky solution, was brighter; the eye sockets and the hairline, darker. A photograph of the surface of that liquid, when placed in the VP-8, produced an *authentic* 3-D image of the head.

[http://theshroudofturin.blogspot.com/2007\\_12\\_01\\_archive.html](http://theshroudofturin.blogspot.com/2007_12_01_archive.html)



# Don't Forget

- The Blood Had To Go On Before The Image
- And The Whole Thing Had To Retain Forensic Accuracy And Map To A Cloth Wrapped Body

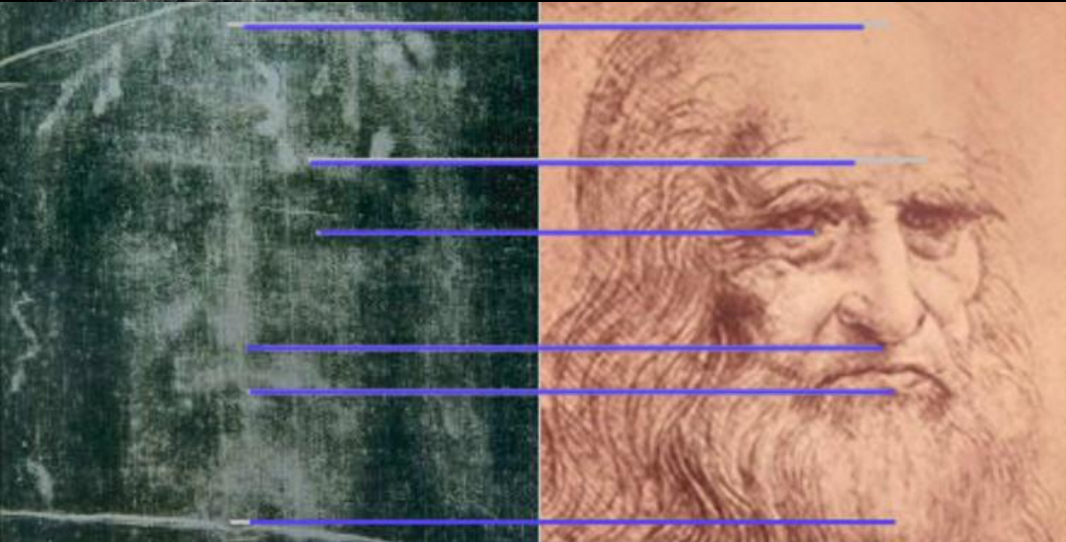




# What Plays The Role Of The Ink?

- Any Image Mechanism Has To Duplicate The 3D Characteristic, The Resolution, And All The Other Characteristics ...
- **TALL ORDER**
- Ray Downing's History Channel Documentary Did A Nice Job Of Summarizing The Issue.  
Without The *INK (metaphorically)* No Image
  - Collimated: A Silhouette
  - Omnidirectional: A Blur
  - No Solution Was Offered

# Studio or Tomb



- Artist or Natural Phenomenon
- What Are Our Options?
  - A Forger
    - But How?
  - Natural
    - But How?
  - Supernatural
    - How Do You Know?





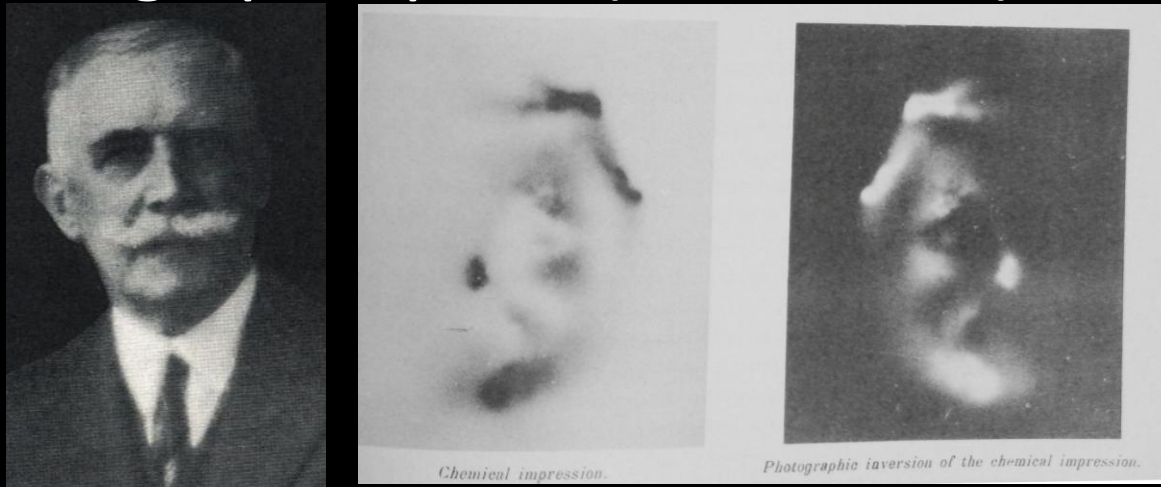


# Some Theories People Have Suggested

Keep in mind that whatever is true  
must explain all the details ...

# Vaporograph

- Paul Vignon's Vaporograph Theory Kicks Of The Question of **HOW WAS THE IMAGE FORMED?**
- Plaster bust impregnated with zinc powder produces an image at a distance on a photographic plate (Simulation)



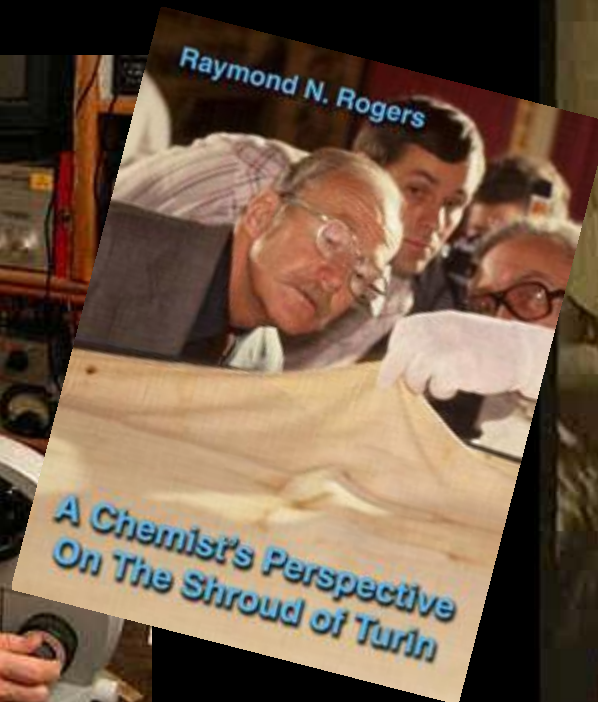
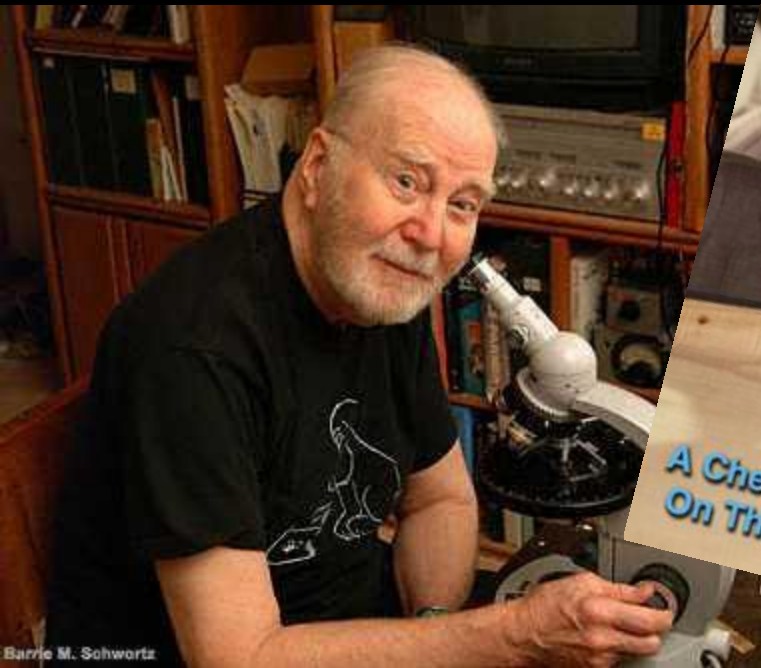
# Raymond Rogers

- UCLA / Los Alamos Science Fellow
- Member of the 1978 STURP team
- Cofounder of the Coalition for Excellence in Science Education.
- Member of the Department of the Air Force Scientific Advisory Board
- Published over 50 peer-reviewed papers in scientific journals.

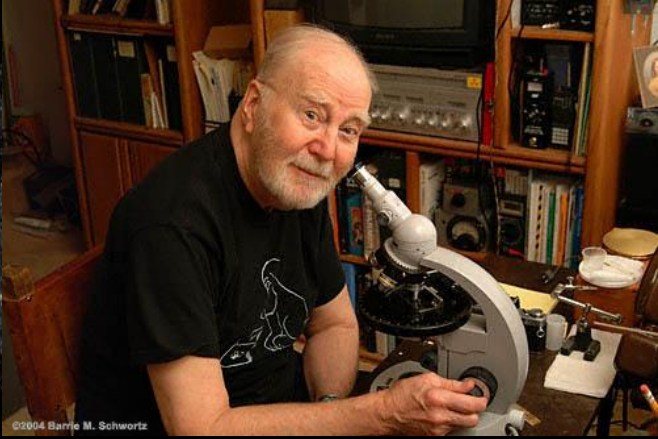


# Ray Rogers: Maillard Reactions

- Ray Rogers (1927-2005), Los Alamos Chemist, member of the STURP team and author of important ideas about the image formation process <http://www.shroud.com/pdfs/rogers10.pdf>



# Ray Rogers' Image Hypothesis



- Maillard Reactions
- **in a thin layer of starch impurities**

The cloth was produced by technology in use before the advent of large-scale bleaching. Each hank of yarn used in weaving was bleached individually. The warp yarns were protected and lubricated during weaving with an unpurified starch paste. The finished cloth was washed in *Saponaria officinalis* and laid out to dry. Starch fractions, linen impurities, and *Saponaria* residues concentrated at the evaporating surface. The cloth was used to wrap a dead body. Ammonia and other volatile early amine decomposition products reacted rapidly with reducing saccharides on the cloth in Maillard reactions. The cloth was removed from the body before liquid decomposition products appeared. The color developed slowly as Maillard compounds decomposed into final colored compounds.

— quoted from *Scientific Method Applied to the Shroud of Turin*  
by Raymond N. Rogers © 2002

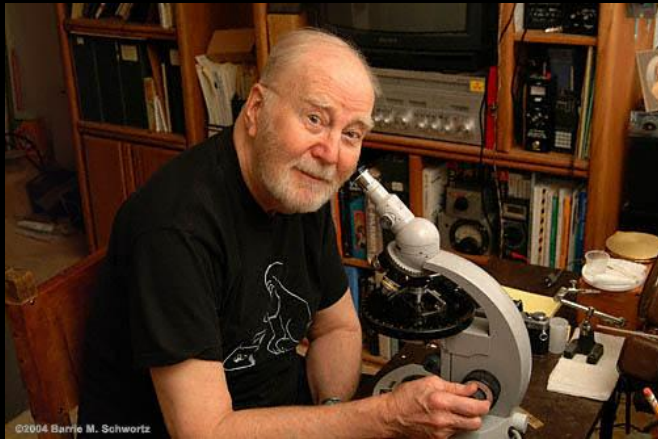
# The Rogers' Theory

- PROS

- Explains Superficiality
- Explains Banding
- Explains uniform color
- Explains ghosts

- CONS

- Doesn't explain resolution
- Doesn't explain general uniformity of the image
- Striation of image fibers?





# Can We Make One?

Let's Look At Some Efforts By Those  
Who Have Tried Mostly Skeptics



# Duplicating The Shroud

- The C14 Date Was Welcomed By The Skeptics
- It Was A Vindication Of Their Position
- Nevertheless To Make A Shroud?
- **AN OVERWHELMING CHALLENGE**
- The Skeptics
  - Paintings, Rubbings, Powderings, Photographs And More
  - TRYING TO FIGURE IT OUT





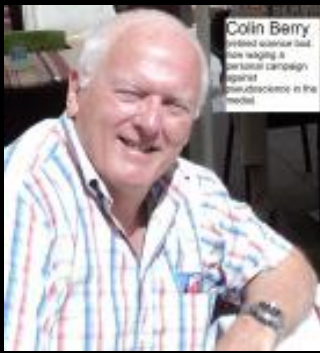
# Intermission

Let's take 10 minutes to stretch



# Before Going On Any Questions or Discussion?

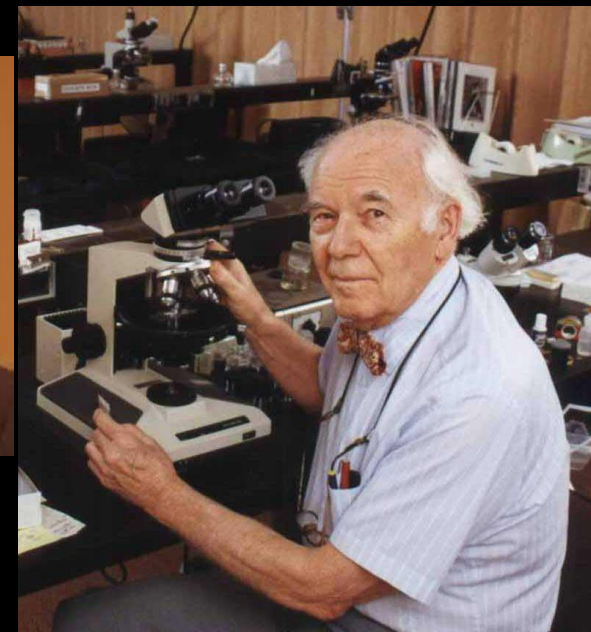
Does Anything Need To Be Addressed  
Before We Explore The World Of The  
Skeptics?



Colin Berry



Joe Nickell



Walter McCrone



Luigi Garlaschelli



N.D. Wilson



Clive Prince & Lynn Picknett



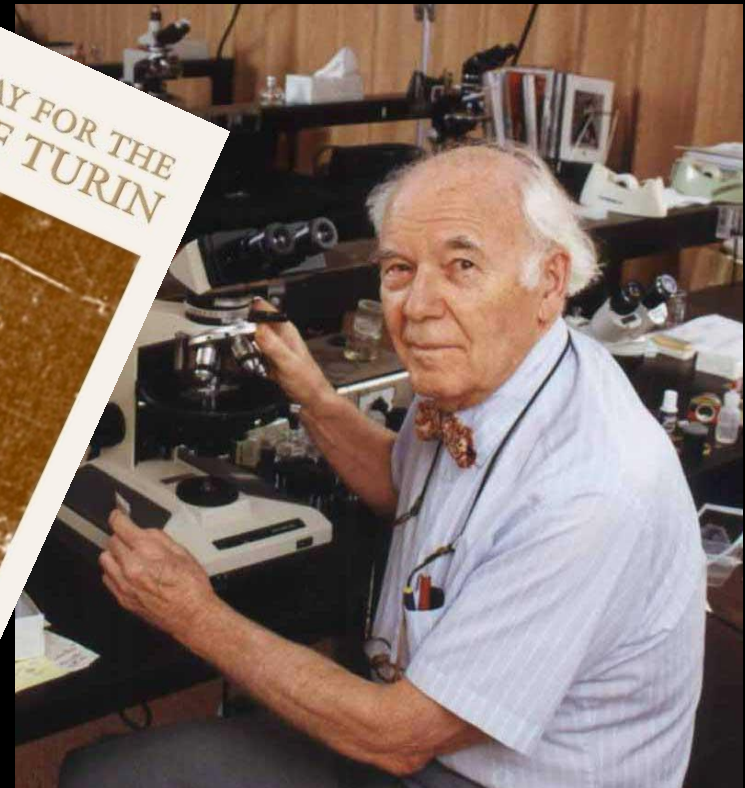
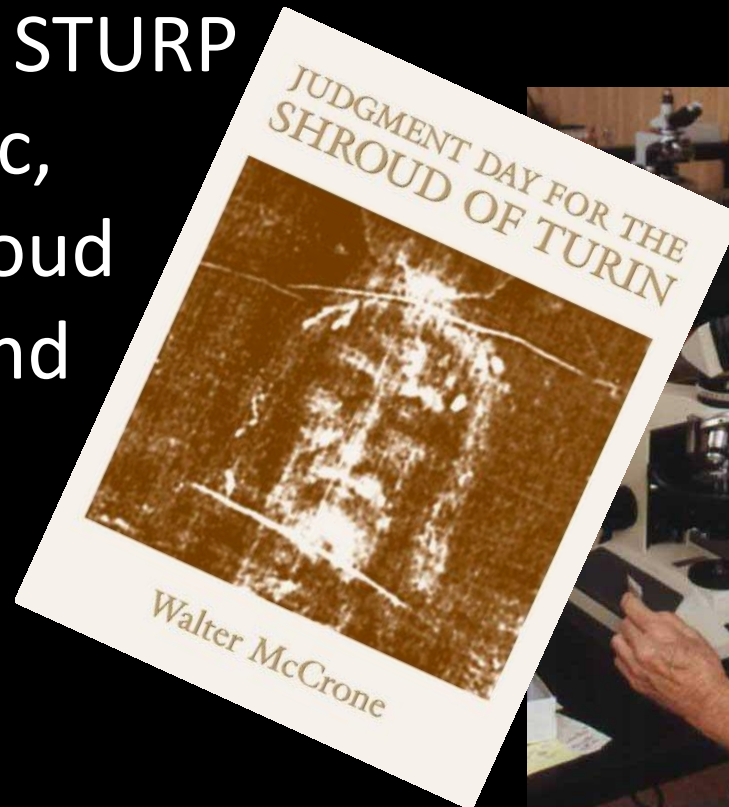
Randall R. Bresee

# The Skeptics

## By No Means A Complete List

# Walter McCrone: Microscopist

- Walter McCrone (1916-2002) microscopist worked with STURP tapes, skeptic, believed shroud was some kind of painting



<http://www.holyshroudguild.org/drmccrone5.html>



# Walter McCrone

## On The Basis Of Microscopy On STURP Tape Samples

- I identified **the substance of the body-and-blood images as the paint pigment red ochre**, in a collagen tempera medium. The **blood image** areas consist of another pigment, **vermilion**, in addition to red ochre and tempera. These paints were in common use during the Middle Ages.
- The paint on the shroud was dilute (0.01 percent in a 0.01 percent gelatin solution). ... Known as **grisaille**, the style of the painting, with its very faint, monochromatic image, was also common in the 14th century.

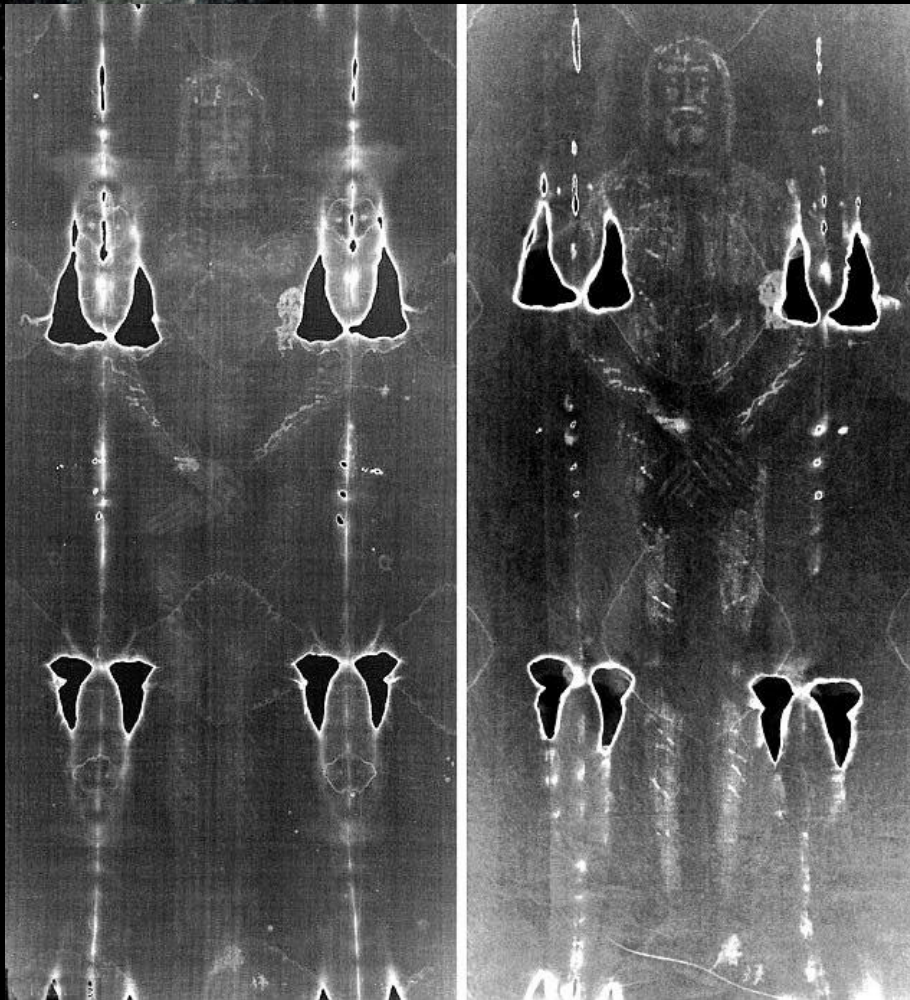
<http://www.shroud.com/bar.htm#sidebar>



# Data Trumps Just Looking

- McCrone looked at the sticky tape samples through a microscope and didn't really understand the chemistry
- Adler & Heller did numerous direct chemical tests with reagents on the samples
  - established the blood was blood
  - iron oxide only in water stain areas and blood scorch areas
    - Burned blood produces iron oxide
  - retted linen explains presence of iron inside fibers
  - specks of paint from "sanctifying paintings)
  - x-ray data invalidates McCrone claims
    - iron oxide not present in sufficient quantities to be the chromophore
    - cinnabar in quantities McCrone claimed would have shown up in x-ray data and it didn't
    - no protein in image areas

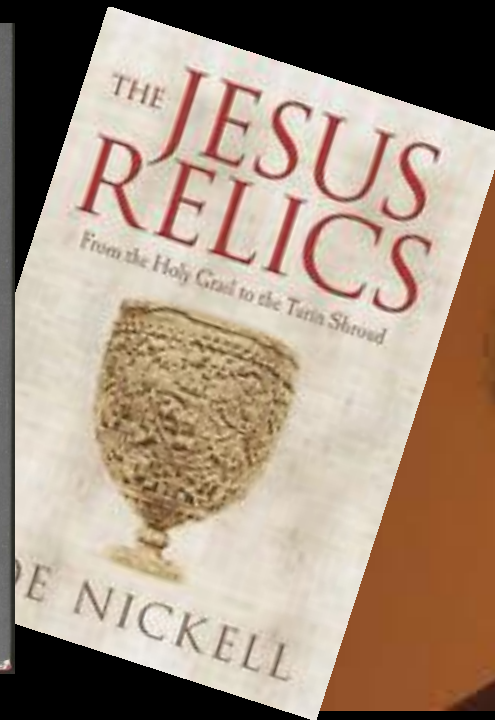
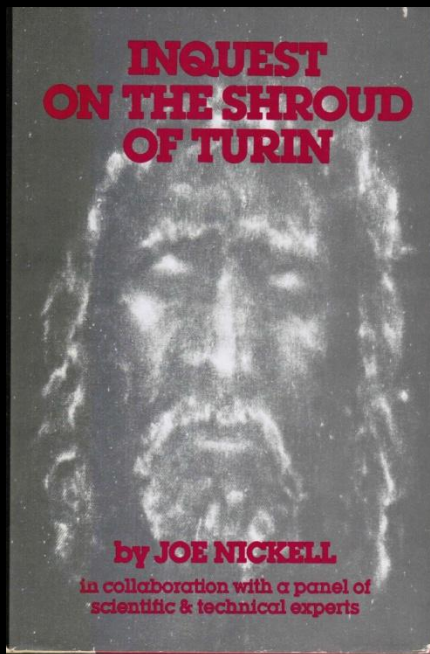
# Rubbing With Acid



- Luigi Garlaschelli, Researcher in Organic Chemistry, University of Pavia
- Made by rubbing a pigment containing dilute acid
- The blood was painted on after the image

# Joe Nickell: Stage Magician and Professional Skeptic

- Joe Nickell (1944 - ) prominent shroud skeptic. Has tried to duplicate shroud using bas-reliefs and rubbings with mixed success



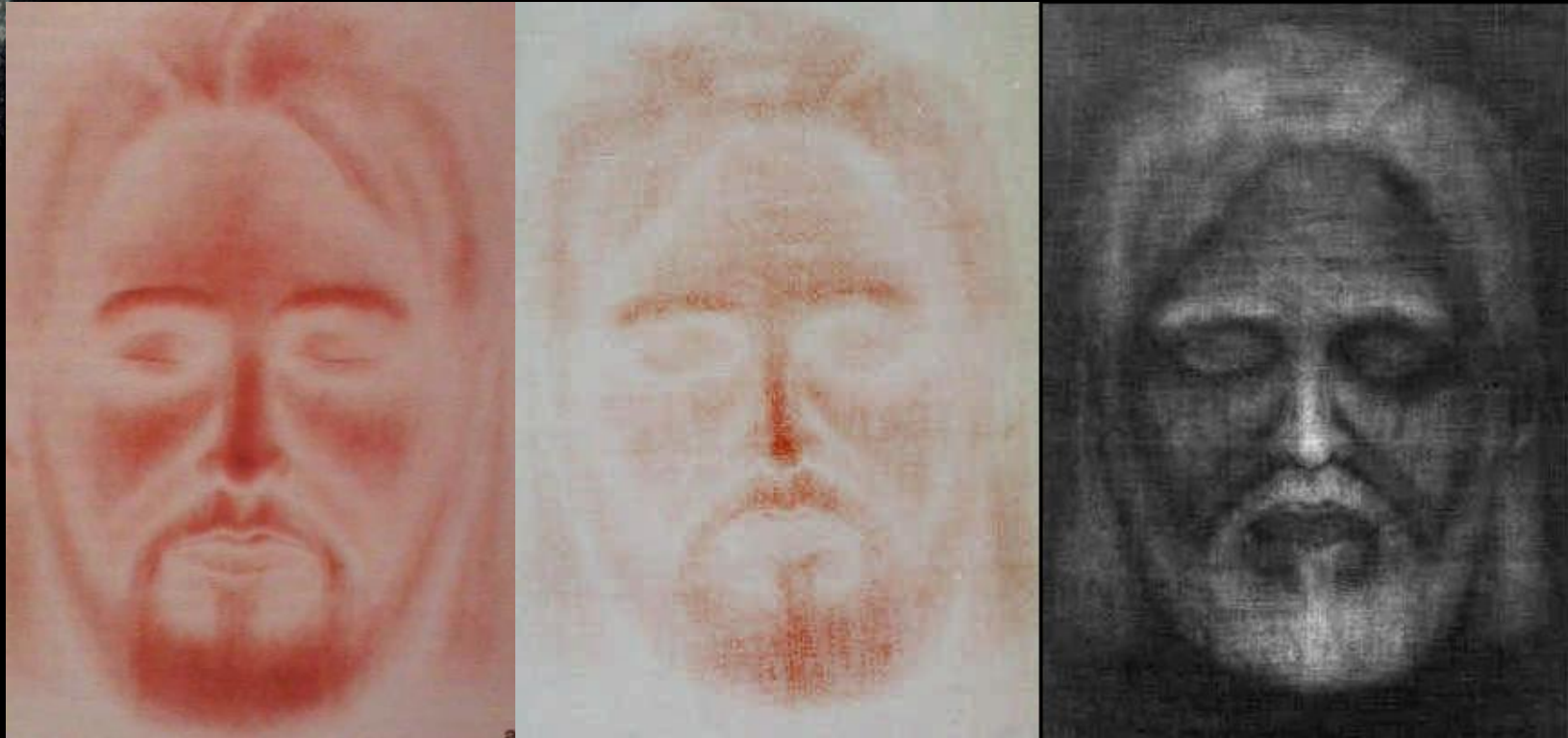


# Rubbings

- Joe Nickell has a Ph.D. in English
- He's a noted shroud skeptic and debunker of all sorts of paranormal things



# Painting With Powder



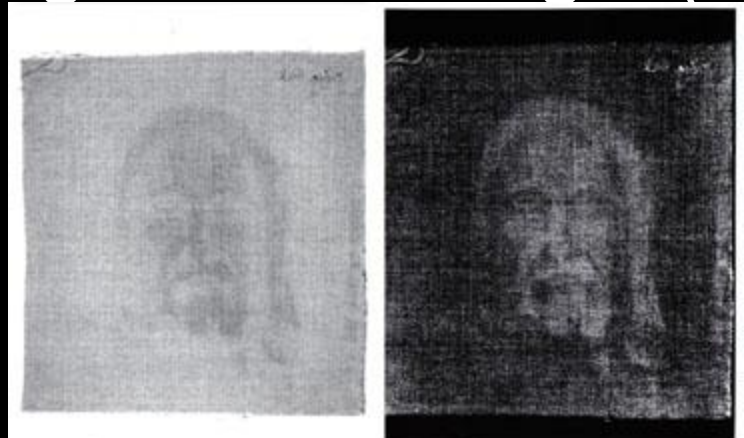
- Emily A. Craig, Ph.D., and Randall R. Bresee, Ph.D. produced a facial image using red ochre powder dust transfer technique.

<https://www.shroud.com/pdfs/craig.pdf>

# Shadow Shroud

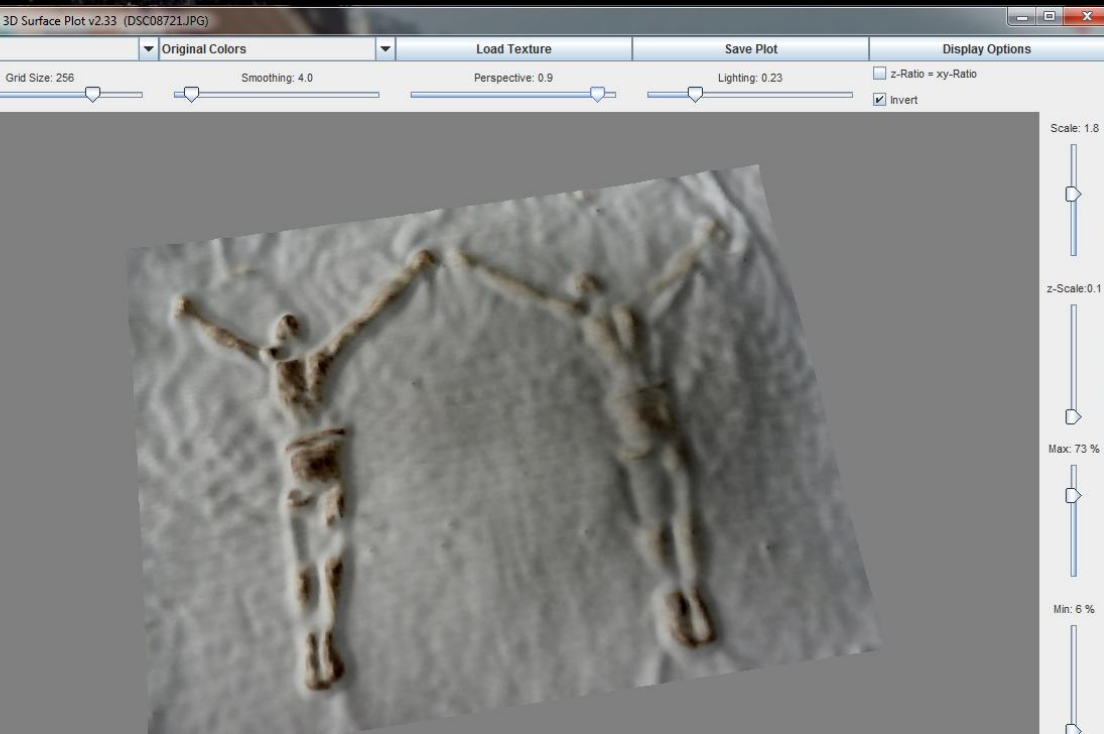


- N. D. Wilson produced interesting images using painted glass and sunlight (2005)



<http://shroudstory.com/2014/12/12/only-the-shadow-knows/>  
<http://www.shadowshroud.com/index.htm>

# Scorch Experiment



- Done by skeptic Colin Berry with a small brass crucifix
- Not clear how well it would scale
- Provides some apparent 3D
- Problem: Scorches fluoresce and image does not fluoresce

<https://shroudofturinwithoutallthehype.wordpress.com/2013/11/14/a-challenging-scorch-assignment-that-i-had-been-putting-off-and-off-and-off/>

# Leonardo da Vinci Painted It (15 April 1452 – 2 May 1519)

- Clive Prince & Lynn Picknett think Leonardo faked the shroud and use his Savior of the World painting to try to prove it. <https://www.youtube.com/watch?v=N382dggI4C0>



# One Small Problem



- Leonardo was not born until almost 100 years after the shroud was being shown in Lirey
- A more obvious explanation for the Salvator Mundi of Leonardo is that he modeled it on the shroud

# Medieval Photograph

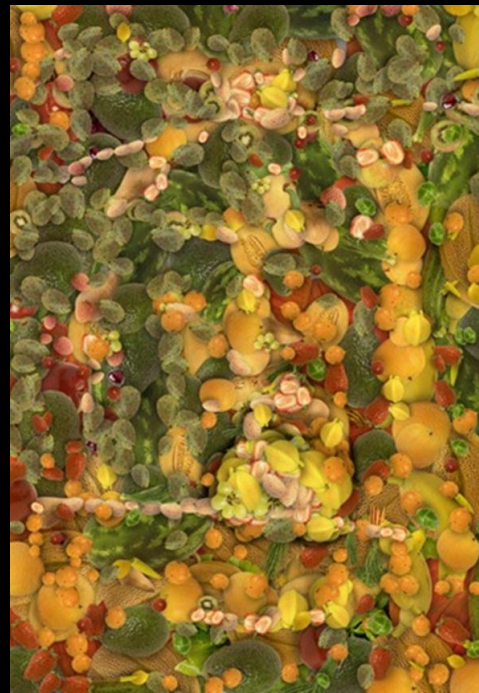
- Prof. Nicholas Allen Postulates minimum of two and possibly three exposures over a period of weeks to obtain the images
  - doesn't address the blood
  - images not 3D
  - uses materials not found on shroud

Critique by Barrie Schwartz:

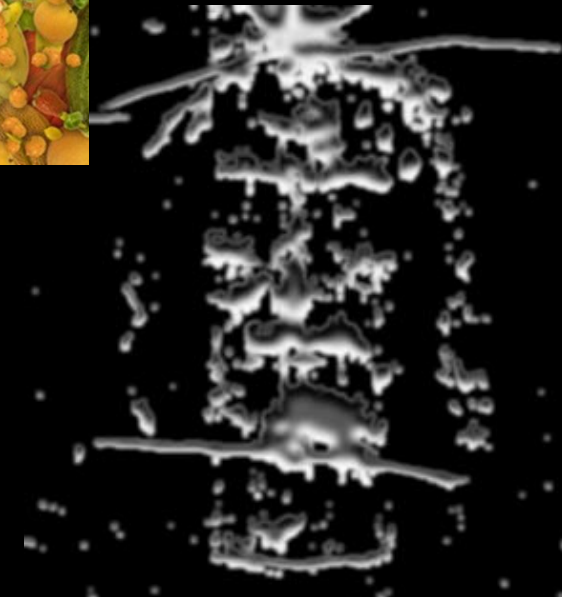
<http://www.reviewofreligions.org/385/is-the-shroud-of-turin-a-medieval-photograph-a-critical-examination-of-the-theory/>



# Dan Porter Checks In



- Dan runs [shroudstory.com](http://shroudstory.com)
- Rather a humorous example of poking fun at those who come up with theories of shroud fakery.
- This was titled: **Inspired by Colin Berry's Experiments with Lemons . . .**



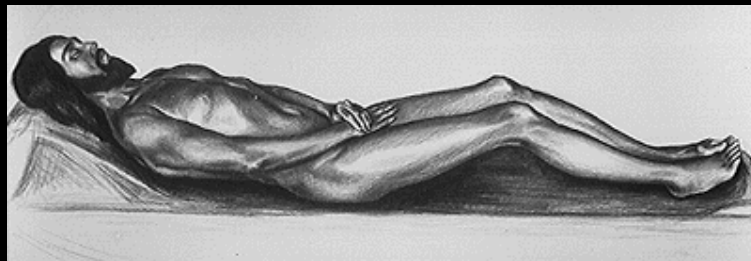
So I Couldn't Resist  
Photoshopping One Too

An Enduring Mystery © 2015 R. Schneider



# The Shroud Inspires Artists

- The Mysterious And Moving Character Of The Shroud Has Inspired Artists To Produce Shroud Representations
- This May Account As We Have Seen For The 6<sup>th</sup> Century Art Explosion Noted By Vignon



2<sup>nd</sup> Life

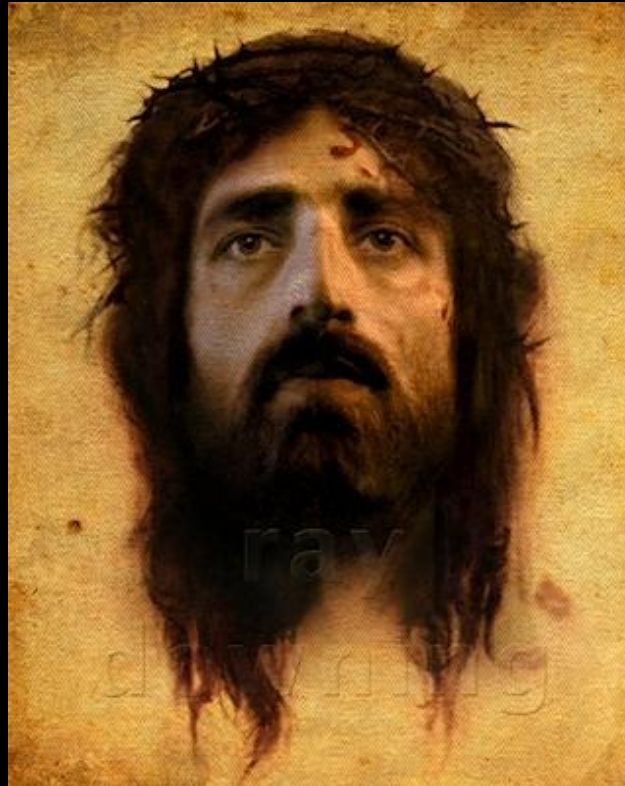
Sunti Pichetchaiyakul Sculpture

# Ray Downing's Images

- Using Digital Technology and Artistry Downing Recovers "The Real Face of Jesus" From The Shroud of Turin



Ray Downing



# Sculptor Luigi Mattei

- Shroud sculpture inspired by the Shroud of Turin



<http://pegponderingagain.com/2013/01/20/shroud-of-turin/>

[http://www.stthomasmore.net/STMS\\_Blog/1519569](http://www.stthomasmore.net/STMS_Blog/1519569)



# No Satisfactory Mechanism for Image Formation

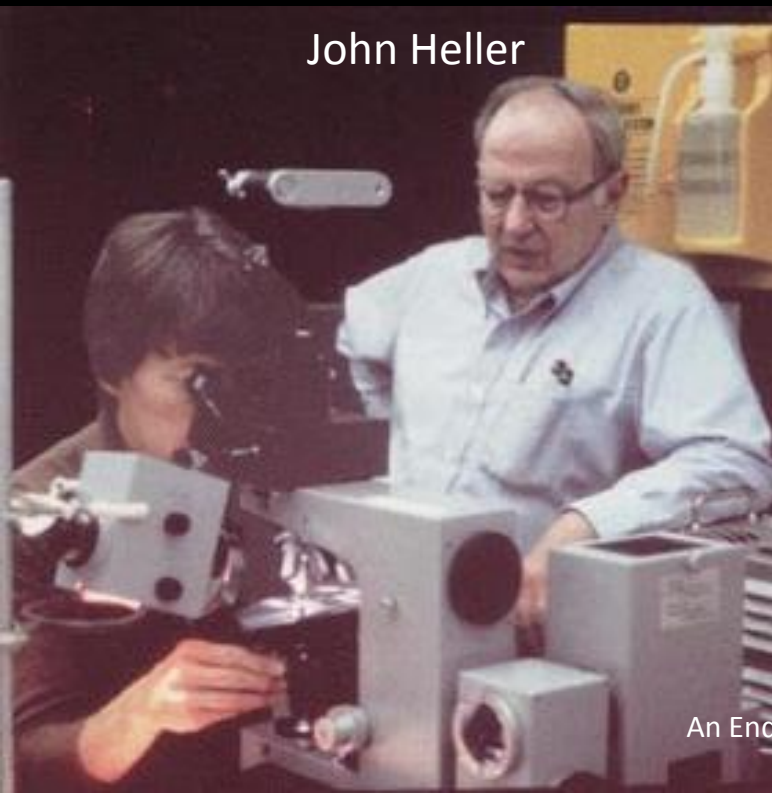
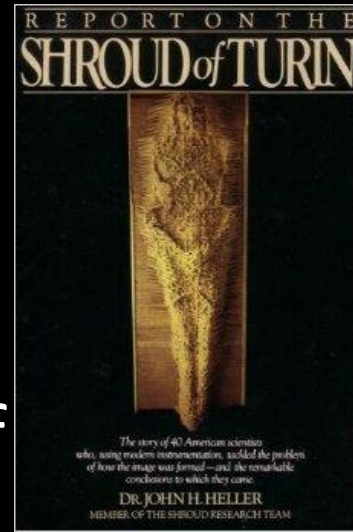
- Surface Chemical Reaction **STAR**
  - gas diffusion (Vignon, Rogers)
- Coronal Discharge **STAR**
- Energy Release at Resurrection **STAR\***
- Scorch from heated bas-relief **STAR\*\***
- Rubbing with pigments or acids **STAR**
- Painting **STAR**
  - (art of 1350's incapable of creating a shroud-like image)
- Early Photograph of Middle Ages **STAR**
  - highly implausible

Legend:  
**gold** = NA  
**bold** = Applicable

\* the miracle hypothesis is not confirmable or disconfirmable because it is wholly *ad hoc*  
\*\* scorches fluoresce, but shroud body image does not

# Dr. John Heller ( 1921-1995) Dr. Alan Adler (1932-2000)

- John Wrote The Best book on the work of the STURP team



John Heller

- Together Demonstrate That The Blood Was Really Blood
- Identified The Chromophore As Oxidized Linen
- **Blood Before Image**



Al Adler

# The Unscientific Hypothesis

- Miracles, if they occur, lie outside the realm of science ... Well almost? What of side effects?



"I think you should be more explicit here in step two."



# Lots Of Miracle Hypotheses

- Body Emits Radiation
  - Neutrons, Protons, UV photons, etc.
- Body Dematerializes in a shell of energy
  - cloth falls through the shell leaving an image
- The Flash of the Resurrection
- Some sort of Quantum Mechanical Event
- **PURELY SPECULATIVE HYPOTHESES  
ALTHOUGH SOME CAN BE SIMULATED**



# Two Kinds Of Miracles

- Miracles of the First Kind
  - Supernatural intervention transcending nature
  - Genesis 1:3 <sup>3</sup> Then God said, “Let there be light”; and there was light.
- Miracles of the Second Kind
  - A "miraculous result" occurs due to a combination of a large number of individually improbable events which produce an unlikely but spiritually meaningful result



# The Flash of Resurrection?

- Kevin Moran and Giulio Fanti Explore A VP-8 Analyzer At The 2008 Columbus Conference
- Moran Favors Some Kind Of Resurrection Flash
- Fanti Supports Coronal Discharge



# Radiation



- Dr. August Accetta \* had this image taken after being injected with a radioactive material (Tc-99m) used in medical imaging
- Technesium-99 metastable methylene diphosphate decays with a 6 hour half-life yielding a single 140 Kev gamma ray
- Problem: Collimation

\* Work done with Kenneth Lyons M.D. and John Jackson, Ph.D.

<https://www.shroud.com/pdfs/accett2.pdf>

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# Coronal Discharge

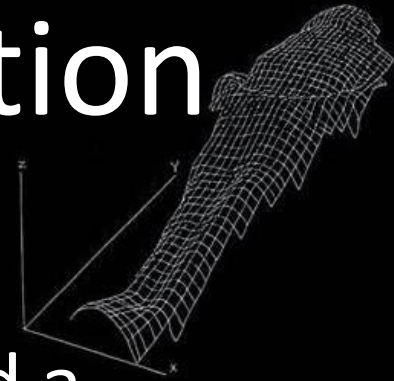


- Professor Giulio Fanti believes that coronal discharge could explain the shroud image
- Giulio has done a lot of good science
- Coronal Discharge requires very high voltages



# Bodily Dematerialization

- In a 1990 paper in Shroud Spectrum International #34 John Jackson proposed a controversial theory
  - In the process of Resurrection the body became a shell of energy and dematerialized (became mechanically transparent)
  - The cloth falling through the space volume caused the energy (UV or soft x-ray) absorbed by surface fibers imprint image



<http://www.shroud.com/pdfs/ssi34part3.pdf>

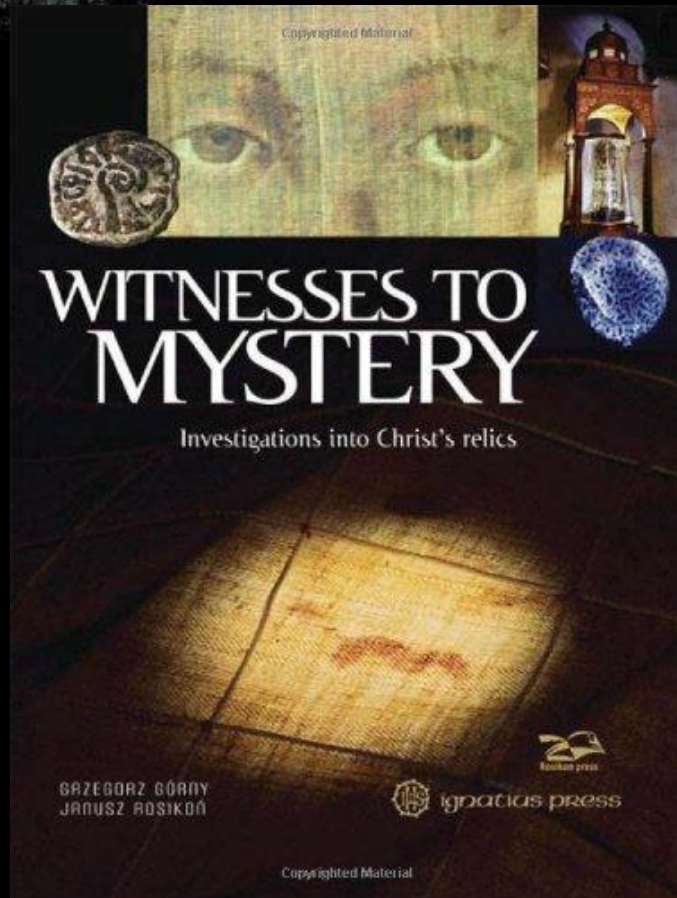
[https://www.academia.edu/9063899/The Turin Shroud Was Not Flattened Before the Images Formed and no Major Image Distortions Necessarily Occur from a Real Body](https://www.academia.edu/9063899/The_Turin_Shroud_Was_Not_Flattened_Before_the_Images_Formed_and_no_Major_Image_Distortions_Necessarily_Occur_from_a_Real_Body)



# Is There A Way To Go Forward?

Can We Identify The Man of the  
Shroud?

# The Christ Relics



- Is This All The Evidence There Is?
- If the Sudarium of Oviedo corroborates the shroud, what of other relics?
- **Perhaps a question for the future**



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# Next Time

- We've Seen A Lot About The Shroud of Turin
- We've Looked At Correspondences With The Passion Accounts In Scripture
- We've Looked At Much Of The Science
- We Explored The History
- We've Looked At Image Characteristics And The Attempts Made To Duplicate The Shroud
- **NEXT TIME WE'LL WEIGH THE EVIDENCE AND LOOK TOWARDS THE FUTURE**