Speculations on the 14th Century Origins of the Turin Shroud

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Preliminaries

- Assumption that the circa 14\textsuperscript{th} century radiocarbon date is valid
- How far does this assumption take us in terms of extant 14\textsuperscript{th} century technology
- Maybe things you haven’t heard before
The Question of Authenticity

- Cannot be rigorously proven by extant methods
- Even if 2000 years old, further rigorous proof as “The Shroud” is required
- Difficult to impossible to account for image with known circa 30 AD technology
- Requires unbroken chain of yet undiscovered authenticated documents or DNA evidence or technology yet to be developed(?)
History

- First historical record 1356 in family of DeCharney in Lirey, France
- Bishop of Troyes letter to Pope declaring it a forgery and an alleged confession
- Fire in 1537 and application of cotton patches
- Moved to Turin in 1650
- Mention of linen burial cloth but no “image” in the Gospels
- Highly detailed frontal and dorsal images of the Crucified Christ
- Marks resembling Roman flagrum, crown of thorns, spear and other wounds consistent with gospel and other written accounts
- Wounds in the wrists—not the hands
- Evidence of trauma
- Faint reversed image
- Representations of blood stains
- Cotton patches covering burns from 1537 fire
- Linen appears in good condition
Pollen from the mid-east found on cloth
Blood stains contain hematite
Image lies on surface of the fibers
Optical resolution $\sim 0.5$ cm
No evidence of pigments in image proper
No evidence of brush strokes
1978 Detailed Scientific Investigations

- No heavy metals characteristic of pigment present
- Pervasive background of Iron
- IR image in MWIR/ LWIR consistent with visible image
- Nothing remarkable revealed in X-Ray
- No reverse side image
Speculative Theory

- The Shroud mage is likely the remnants of a 14th century blockprint (woodcut etc.) printed with iron gall ink. WHY?
- The following are attributes of block-prints:
  - High and reasonably consistent resolution
  - 3-d like property in frontal perspective
  - Existing examples in size and quality from that era (14th – 15th Century)
  - Negative image
  - No brush strokes or conventional pigments
  - Linen difficult to dye
  - Iron gall ink was in wide spread use at the time and is corrosive
Further.....

- Circumstantial Issues
  - End of black death enriched survivors who became wealthy and desired luxurious goods
  - Champagne Region, France big trading center
  - Flanders, nearby to the north, was a center for textile manufacture using block printing technique
  - Wounds in wrist are rare but found elsewhere
  - Pronounced a forgery by confessor
  - Apparently tourist attraction
  - Optical characteristics not supported by radiative theories
5th Century Roman Engraving

Engraving art form well developed

Palace of the Doges Museum, Venice
Linen is Difficult to Dye

- Reason why cotton patches were used
- Reason why original ink flaked off and residuals show up as iron background
- Image must have been much more prominent in earlier time or would not have been a particularly great tourist attraction.
A comment on dyeing linen

Due to the structural binding of the cellulose fibers in linen, the pigments will only adhere to the surface of the fibers. While linen will dye just as vibrant and deeply as other fibers, it will not retain its color as long. Exposure to air, light and chemicals speed the deterioration process.
15th Century Blockprints
Large high resolution print
~ 7'}
Sectional Blocks for Large Images
Wrist Wounds
Church in Regensberg
Iron Gall Ink is Corrosive

- FTIR techniques applied to iron gall inked damaged paper

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INTRODUCTION

Iron gall ink corrosion of paper is one of the largest threat for our graphic patrimony. A great work has been done in this field to explain the possible mechanism of paper degradation and to propose curative methods [1,2,3,4]. The main degradation mechanism proposed in the literature is the following : iron gall ink prepared with different ingredients including tannins and vitriol causes both acidic hydrolysis and Fe²⁺ catalysed oxidation of cellulose. Paper turns brown and loses its mechanical properties. Yet the great variety of iron gall ink recipes [5,6], and the great variety of visual aspects of manuscripts suggest that many side effects could occur and contribute to the different aspects of paper degradation (colour changes, halos, mechanical properties).
Optical characteristics do not support any radiative theory
3-d Characteristics
“We could reasonably expect that the relief transfers coloring matter in proportional to its local curvature and pressure”

Points of high pressure and high ink density

Points of low pressure and low ink density
Woodcuts are a technique of printing designs from planks of wood. It is one of the oldest methods of making prints from a relief surface, having been used in China to decorate textiles since the 5th century AD.

In Europe, printing from wood blocks on textiles was known from the early 14th century, but it had little development until paper began to be manufactured in France and Germany at the end of the 14th century.

Textile printing was known in Europe, via the Islamic world, from about the 12th century, and widely used.

Thriving linen industry in Flanders from the 11th century on.
Flanders
Center for Printmaking
Conclusion

.........*Confluence of historical and social circumstances with scientific data and observations make a plausible case for a 14th century Shroud using extant techniques.*