Shroud of Turin

Evidence Review — Classified by Scientific Strength

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About this review

This document reviews the scientific and historical evidence for the Shroud of Turin's authenticity, classified into three tiers based on peer-review status, independent replication, and mechanistic specificity. The reasons for any exclusions are documented at the end of this report.

Summary

20	16	9
Strong lines of evidence	Moderate lines of evidence	Suggestive lines of evidence

TIER: STRONG

Peer-reviewed, independently replicated, mechanistically specific

1. Absence of paint, pigment, or binding media

Chemistry • STURP 1978 • Multiple methods

FTIR, Raman spectroscopy, XRF, and UV-visible spectroscopy all confirmed zero paint, pigment, dye, or organic binder in body-image areas above detection limits. Coloration results from superficial cellulose oxidation/dehydration. This was STURP's core chemical consensus and has not been credibly challenged.

References:
- Heller & Adler (1981) — Canadian Soc. Forensic Sci. J.
- Schwalbe & Rogers (1982) — Analytica Chimica Acta
- Gilbert & Gilbert (1980) — Applied Optics

2. Image superficiality: 0.2–0.6 μm depth

Physics • Microscopy • STURP 1978

The body image is confined to the topmost fibrils of the outermost threads — a layer of only 200–600 nanometers. Interior fibers and the cloth's reverse side are chemically unaffected. No known painting, rubbing, contact transfer, or scorching technique produces coloration this superficial while leaving deeper layers undisturbed. This is one of the most mechanistically constraining properties of the image.

References:
- Fanti et al. (2010) — J. Imaging Sci. & Technology
- Fanti & Maggiolo (2004) — Journal of Optics A

3. Blood deposited before image formed (stratigraphic precedence)

Forensics • Microscopy • Critical constraint

Spectroscopic and stratigraphic analysis confirmed bloodstains lie over image fibers — the image does not appear beneath blood. A forger would apply blood over an existing image; the Shroud shows the opposite. This rules out any hypothesis where image formation occurred first.

References:

- Jumper et al. (1984) — Archaeological Chemistry III
- Heller & Adler (1981) — Canadian Soc. Forensic Sci. J.

4. Serum halos visible under UV fluorescence

Forensics • UV imaging • Experimentally confirmed

UV-fluorescent serum margins surround bloodstains. Experiments confirmed these halos can only be produced by blood that first clotted on a living body surface and transferred as an imprint. Multiple tests (dropping, applicators, reconstituted dried blood) all failed to reproduce the halos. Aged serum becomes water-insoluble via Maillard-type cross-linking, explaining its survival despite water exposure.

References:

- Miller & Pellicori (1981) — J. Biological Photography
- Pellicori (2020) — Int. J. Archaeology

5. Three-dimensional spatial encoding (VP-8 analysis)

Physics • Image analysis • Unique property

VP-8 Image Analyzer studies showed image density correlates quantitatively with expected cloth-to-body distance, producing an anatomically coherent 3D relief. This distance-to-brightness encoding is absent from all known paintings, etchings, and photographic media. The property is not that 3D encoding was 'impossible' — it is that no known formation mechanism produces it on cloth without leaving other detectable artifacts.

References:

- Jackson, Jumper & Ercoline (1984) — Applied Optics
- Jackson et al. (1977) — 1977 STURP Conference Proceedings

6. Photographic negative property

Optics • Discovered 1898 • Pre-photography concept

Discovered by Secondo Pia in 1898 and confirmed by Giuseppe Enrie in 1931: tonal inversion of the cloth produces a lifelike positive anatomical image. The concept of a photographic negative was entirely unknown before 19th-century photography. No medieval artist could have intentionally encoded this property, and no known artistic medium produces it as a by-product.

References:

- Enrie (1931) — documented in Wilson (1977)
- Fanti (2015) — SHS Web of Conferences

7. Binary threshold behavior at fibril scale

Microscopy • Physics • Peer-reviewed

Individual linen fibrils are either fully colored or completely unaffected — no intermediate states exist. This binary, switch-like behavior at the microscopic level is inconsistent with any gradual application process

(painting, rubbing, staining). It implies a threshold-limited photochemical or radiation-based process operating at the molecular level.

References:

- Fanti et al. (2010) — J. Imaging Sci. & Technology
- Adler (1999) — Shroud Spectrum International

8. Double superficiality: image on both fibril surfaces

Microscopy • Unique property • Peer-reviewed

Fanti & Maggiolo (2004) reported coloration appearing on the outermost fibrils on both faces of individual threads, with the interior untouched. This double superficiality is mechanistically extraordinary: the image-forming agent affected only the very top and bottom of each thread without penetrating through.

References:

- Fanti & Maggiolo (2004) — Journal of Optics A

9. Nail wounds through wrists, not palms

Forensics • Anatomy • Against artistic convention

The nail wounds pierce the wrists (carpal/Destot's space), not the palms as depicted in virtually all medieval and Renaissance Christian art. Anatomical and experimental studies confirm palmar nailing cannot support body weight. A medieval forger would have followed the established artistic tradition.

References:

- Zugibe (1984) — Canadian Soc. Forensic Sci. J.
- Bevilacqua et al. (2014) — Injury

10. Absent thumbs — median nerve transection

Neurology • Anatomy • Unknown to medieval art

Both hands show only four visible fingers; thumbs are involuntarily retracted into the palms. Transection or compression of the median nerve by a wrist nail causes reflex adduction of the thumb — a neurological response unavailable to medieval artists working from iconographic tradition. No pre-Shroud artwork shows this detail.

References:

- Zugibe (1984) — Canadian Soc. Forensic Sci. J.

11. Dual blood-flow angles from wrist wounds

Forensics • Biomechanics • Crucifixion-specific

Blood flows from wrist wounds at two distinct angles (~55° and ~65° to the forearm axis) consistent with a body alternating between two positions during crucifixion — pushing up to breathe and sagging down. This dual-angle pattern precisely matches experimental crucifixion biomechanics and could not be produced by a static artistic pose.

References:

- Bevilacqua et al. (2014) — Injury
- Zugibe (1984) — Canadian Soc. Forensic Sci. J.

12. Cap-shaped scalp wound distribution + Sudarium geometric corroboration

Forensics • Against artistic convention • Point-cloud analysis

Scalp punctures form a circumferential cap distribution, not the single circlet of Christian iconography. Rocamora's 2023 point-cloud registration of bloodstain centroids from the Shroud and the Sudarium of Oviedo onto a 3D skull model produced Procrustes disparity values of 0.0143–0.0176 (well below the 0.05 same-source threshold), independently confirming the perimeter wound band from two separate cloths.

References:

- Rocamora (2023) — geometric analysis
- Fanti (2024) — Hemasphere

13. Over 100 scourge marks with flagrum dumbbell morphology

Forensics • Roman history • Quantified

More than 100 distinct marks display the dumbbell/figure-eight impact shape characteristic of the Roman flagrum taxillatum (lead-weighted whip). Marks cover the back, sides, and legs in patterns indicating two torturers at different angles — consistent with Roman military practice. The dumbbell shape is a forensically specific instrument signature.

References:

- Bevilacqua et al. (2018) — Peertechz J. Forensic Sci.
- Fanti (2024) — Hemasphere

14. No decomposition evidence — short post-mortem window

Biology • Forensics • Timeline constraint

The image shows no biological staining, volatile artifact, or chemical signature of advanced decomposition. The body-cloth separation therefore occurred within a narrow post-mortem window — before the processes that leave irreversible chemical signatures on burial linens. This is a forensically neutral observation that constrains the timeline of separation.

References:

- Bevilacqua et al. (2018) — Peertechz J. Forensic Sci.
- Jackson et al. (2017) — Turin Shroud Center of Colorado

15. Modern reproduction failures — 25 constraints unsatisfied simultaneously

Engineering • Image science • Ongoing

No laboratory has simultaneously replicated the image's full property set: sub-micron superficiality, non-scorch chemistry, distance-encoded 3D information, photographic negative properties, binary fibril behavior, and absence of lateral imaging. ENEA's excimer laser experiments achieved some superficial coloration but could not reproduce 3D encoding or negative properties.

References:

- Di Lazzaro et al. (2010) — J. Imaging Sci. & Technology
- Di Lazzaro et al. (2012) — Applied Optics

16. Absence of lateral (side) images

Physics • Geometry • Mechanistic constraint

Despite the cloth having draped over a 3D body, no image appears on the lateral surfaces. Any contact-transfer, vapor-diffusion, or full-wrap radiation process would produce side images. Their complete absence eliminates large classes of proposed formation mechanisms and requires a directional, near-orthogonal projection process.

References:

• Jackson et al. (1984) — Applied Optics
• Schwalbe & Rogers (1982) — Analytica Chimica Acta

17. Image is fold-independent — intensity tracks body-cloth distance

Physics • Image analysis • Peer-reviewed

Image intensity correlates with cloth-to-body distance, not with weave topology, crease lines, or fold patterns. Any contact or pressure-dependent technique would show intensity variation at fold lines. The Shroud image does not, confirming the image-forming signal was governed by spatial distance rather than mechanical contact.

References:

• Jackson et al. (1984) — Applied Optics
• Fanti (2015) — SHS Web of Conferences

18. Confirmed real ancient blood — species at least primate, specific species undetermined

Biochemistry • Peer-reviewed • Multiple tests

Multiple independent chemical tests confirmed the bloodstain areas contain genuine ancient biological blood: porphyrin spectroscopy, immunological detection of serum albumin and immunoglobulin, and hemoglobin identification. This is not consistent with iron-oxide pigment (McCrone's claim), which produces none of these biochemical markers. However, the precise species designation cannot be extended beyond 'at least primate': the anti-human antibody preparations used are now known to cross-react with blood from rodents, cats, dogs, and other species, and MNS antigen tests were undermined by xenotransplantation research showing human antisera react across a wide range of non-human species. Heller and Adler's own published conclusion was 'at least primate in origin.' The subsequent softening to 'human blood' in decades of commentary was not warranted by the tests actually conducted. The correct scientific classification remains: real ancient blood, species undetermined by methods used to date.

References:

• Heller & Adler (1980) — Applied Optics
• Heller & Adler (1981) — Canadian Soc. Forensic Sci. J.

19. Sudarium of Oviedo: independent 7th-century custodial trajectory

History • Independent relic • Spain from ~600 CE

The Sudarium's documented presence in Spain from the early 7th century — before any known history of the Shroud in medieval Western Europe — precludes coordinated medieval fabrication of two cloths on independent custodial trajectories. If specific wound-pattern correspondences exist, they cannot have been arranged retroactively.

References:

• Wilson (1977) — 1977 STURP Conference Proceedings
• Barta et al. (2015) — SHS Web of Conferences

20. Wrapping-consistent geometric distortions

Geometry • Image analysis • 3D modeling

Distortions of the hands, calves, and torso in the Shroud image are quantitatively consistent with 3D-to-2D mapping of a linen sheet draped over a supine human form — not a flat artistic representation. The distortions precisely match what cloth physics predicts for contact with a real three-dimensional body.

References:

- Fanti (2025) — Medical & Clinical Case Reports Journal
- Jackson et al. (2017) — Turin Shroud Center

TIER: MODERATE

Peer-reviewed or well-documented, with identified limitations or awaiting full independent replication

1. Sudarium: specific mechanistic wound correspondences

Forensics • Geometric modeling • Methodological caveats

Beyond the unreliable point-count framework, individual mechanistic correspondences survive scrutiny: the epsilon-shaped forehead clot morphology, the pulmonary edema fluid pattern at nose/mouth (6:1 blood-to-fluid ratio consistent with crucifixion suffocation), and the 19° rotation alignment based on physical modeling of different application geometries.

> **Caveat:** The 120+ 'congruence point' claim is excluded: Whanger's PIOT was not conducted under pre-registered blinded conditions, so the count describes analyst selection, not probability.

References:

- Hermosilla (2015) — SHS Web of Conferences
- Bevilacqua et al. (2014) — Injury

2. Bilirubin elevated — trauma blood chemistry

Chemistry • Microspectroscopy • Contested

Adler's microspectroscopy found elevated bilirubin complexed with heme derivatives in blood areas — consistent with extreme hemolytic trauma. If confirmed, this indicates blood from a severely traumatized individual. The proposed stabilization mechanism (bilirubin-heme complexation) is chemically plausible.

> **Caveat:** Free bilirubin is highly light-sensitive and would not survive 2,000 years. The stabilization mechanism has not been independently verified. The bilirubin hypothesis cannot be taken as established (Grasso 2026).

References:

- Heller & Adler (1981) — Canadian Soc. Forensic Sci. J.

3. Fanti mechanical/spectroscopic fiber dating: 300 BCE – 400 CE

Materials science • Alternative dating • Peer-reviewed

Two independent methods — vibrational spectroscopy (FTIR/Raman) and mechanical tensile testing of individual fibers — placed the linen's age in a range spanning 300 BCE to 400 CE, consistent with 1st-century origin. Both studies were peer-reviewed and published in mainstream materials science journals.

> **Caveat:** These methods rely on cellulose degradation rates affected by storage conditions, heat, humidity, and prior treatments. Results have not been independently replicated by a separate laboratory.

References:

- Fanti & Basso (2017) — Int. J. Reliability, Quality & Safety Eng.
- Fanti et al. (2013) — Vibrational Spectroscopy

4. Rogers repair-patch hypothesis: C-14 sample anomaly

Chemistry • Radiocarbon critique • Peer-reviewed

Rogers' 2005 peer-reviewed analysis found cotton contamination and madder dye in the C-14 sampling area — substances absent from the main cloth — suggesting the tested corner was a medieval repair zone. If confirmed, the 1988 result dated a repair, not original fabric.

> **Caveat:** Rogers' analysis has not been independently replicated. The three C-14 labs and mainstream textile experts have not accepted it. It is the strongest published challenge to the 1988 result, not an established refutation.

References:

- Rogers (2005) — Thermochimica Acta

5. Rigor mortis body positioning forensically consistent

Forensics • Pathology • Post-mortem analysis

Detailed forensic examination shows the body posture — fixed finger flexion, foot positioning, head inclination — is consistent with rigor mortis in a crucifixion victim, not a living or voluntarily posed subject. The slight forward head tilt matches what gravity and muscle relaxation produce after death on a cross.

References:

- Bevilacqua et al. (2018) — Peertechz J. Forensic Sci.
- Zugibe (1984) — Canadian Soc. Forensic Sci. J.

6. Herringbone twill textile structure — 1st-century Near Eastern

Textile forensics • Archaeology • Comparative

The 3-over-1 herringbone twill is consistent with 1st-century Near Eastern weaving traditions. Shamir's comparative analysis found no comparable examples in medieval European textile production. Z-twist thread direction and absence of cotton in the main body are also consistent with ancient Middle Eastern manufacture.

> **Caveat:** The 1988 radiocarbon result remains the only direct radiometric dating of the main cloth. Textile analysis establishes plausibility of ancient origin; it cannot override a direct isotopic measurement unless the repair-patch hypothesis is confirmed.

References:

- Shamir (2015) — SHS Web of Conferences

7. No diffusion or capillary patterns in body image

Chemistry • Image analysis • Mechanistic constraint

The body image shows no liquid halos, vapor-spread borders, or capillary flow patterns from any wet chemical application, vapor deposition, or dye transfer. UV fluorescence microscopy confirmed this clearly. Any liquid or vapor medium would leave detectable capillary spread into adjacent fibers.

References:

- Schwalbe & Rogers (1982) — Analytica Chimica Acta
- Pellicori (1980) — Applied Optics

8. Dynamic clot transfer evidence — clot edges precisely preserved

Forensics • Blood mechanics • Anti-forgery

Blood clot edges are precisely preserved, including the exact margins of clot retraction. This pattern is produced only when clotted blood is gently transferred from a skin surface to cloth and the cloth removed without disturbing the clot structure. No method of directly applying blood to cloth produces this characteristic.

References:

- Svensson & Heimburger (2012) — Scientific Research and Essays

9. 1532 Chambéry fire: symmetric damage pattern and image stability

Physical chemistry • Historical verification

The symmetric pattern of burn holes and water stains from the 1532 fire is fully consistent with historical accounts of the cloth's folding at the time. The body image maintained its properties up to burn edges, while traditional pigments would show bleeding, color change, or degradation at burn sites.

References:

- Wilson (1977) — 1977 STURP Conference Proceedings
- Fanti (2015) — SHS Web of Conferences

10. Facial trauma consistent with Passion accounts — maxillo-facial analysis

Forensics • Pathology • Peer-reviewed

Cephalometric analysis identified mandibular displacement, nasal injury, and swelling consistent with blunt force trauma to the face. The specific injury pattern (septal deviation, zygomatic bruising) represents forensic-level detail absent from medieval iconographic conventions.

References:

- Majorana et al. (2015) — Folia Morphologica

11. Gradual image intensity fall-off at body edges

Optics • Anti-stencil • Image analysis

Image intensity falls off smoothly and gradually at the boundaries of the body image — no stencil-like sharp edges that would result from any masking or direct-contact technique. This smooth gradient is consistent with a distance-dependent formation process.

References:

- Jackson et al. (1984) — Applied Optics
- Pellicori (1980) — Applied Optics

12. Frontal and dorsal image density parity

Image analysis • Physics • Symmetry

Calibrated microdensitometry shows comparable maximum optical densities between front and back body images at corresponding anatomical high-points. This symmetry is inconsistent with a single-direction artistic application and requires a formation process that affected both cloth surfaces with comparable intensity.

References:

- Jackson et al. (2017) — Turin Shroud Center of Colorado

13. Unbroken legs — deviation from Roman crucifixion practice

History • Jewish burial law • Anti-normative detail

Roman crucifixion typically included breaking the legs (crurifragium). The Shroud figure's legs are intact. This deviation corresponds precisely to Gospel accounts and Jewish purity law requirements for burial. A medieval forger following artistic convention would have no reason to encode this detail.

References:

- Shamir (2015) — SHS Web of Conferences
- Zugibe (1984) — Canadian Soc. Forensic Sci. J.

14. Serum halo sequence encodes wound chronology

Forensics • UV imaging • Timeline

The extent of serum halo development varies by wound type in a sequence consistent with the Passion timeline: scalp wounds (most developed — inflicted earliest), scourge wounds (intermediate), nail wounds (minimal — late in dying), side wound (none — post-mortem). The halos are chemical fossils of a beating heart at progressively failing capacity.

References:

- Miller & Pellicori (1981) — J. Biological Photography
- Svensson & Heimburger (2012) — Scientific Research and Essays

15. Pre-1355 literary documentation of an image-bearing burial cloth

History • Documentary record • Continuity

Over 30 pre-1355 literary sources reference a burial cloth of Christ with image-bearing properties. Key witnesses include Robert de Clari's 1204 eyewitness account of a shroud displayed weekly at Blachernae Church in Constantinople showing 'the figure of our Lord,' and Theodore Angelus's 1205 letter to Pope Innocent III about the sacred linen taken during the Fourth Crusade.

> **Caveat:** Identification of the Mandylion of Edessa with the folded Shroud (the 'tetradiplon' hypothesis) is contested by Byzantine specialists and remains debated.

References:

- Wilson (1977) — 1977 STURP Conference Proceedings
- Marino (2021–2024) — compilation study

16. Hands crossed over pelvis — ancient burial, not medieval convention

Archaeology • Burial customs • Cultural specificity

The Shroud figure's hands are crossed over the pelvic region, corresponding to ancient Near Eastern and Egyptian burial practices documented archaeologically. Medieval European Christian burial typically placed hands crossed over the chest in prayer position. A medieval European forger would naturally follow contemporary conventions.

References:

- Shamir (2015) — SHS Web of Conferences

TIER: SUGGESTIVE

Real evidentiary weight with significant methodological limitations or relying on non-peer-reviewed publications

1. Pollen: Judean/burial-plant profile (contested chain of custody)

Botany • Type-C evidence • Awaits re-sampling

Danin & Baruch's 1999 reanalysis of Frei's preserved tapes found a Judean pollen profile. Boi's independent re-examination identified Helichrysum (a burial ointment plant) as dominant — consistent with first-century Jewish burial practice requiring physical contact with ritual oils, not long-distance airborne transport. Either reading is difficult to reconcile with European medieval fabrication.

> **Caveat:** Chain of custody is broken: all work is downstream of Frei's original uncontrolled sampling. Frei's credibility was damaged by the Hitler Diaries affair. Forensic palynologist Vaughn Bryant confirmed no fresh controlled re-sampling has been done. Classified 'Type C' by the Shroud Science Group.

References:
- Boi (2017) — Archaeometry
- Danin & Baruch (1999) — Botany and the Shroud

2. Travertine aragonite limestone — Jerusalem tomb profile

Mineralogy • Geographic trace • Non-peer-reviewed publication

Kohlbeck and Nitowski identified travertine aragonite in Shroud foot-region particles with trace element ratios (strontium, iron, barium) consistent with Jerusalem tomb samples. The elemental fingerprint is geologically distinctive compared to common calcite.

> **Caveat:** Published in Biblical Archaeology Review (popular magazine) and an unpublished ESSJ technical report — neither peer-reviewed. No rare-element marker definitively distinguishes Jerusalem aragonite from aragonite found elsewhere.

References:
- Kohlbeck & Nitowski (1986) — Biblical Archaeology Review

3. Byzantine iconographic parallels — Vignon markology

Art history • Iconography • Debated

Vignon's markology proposed that specific idiosyncratic facial features on the Shroud appear in Byzantine Christ portraits from the 6th century onward, suggesting artists were copying the Shroud. The features in question do not appear in pre-6th-century art.

> **Caveat:** Byzantine art specialists have contested this identification. The Mandylion connection remains debated. This is art-historical interpretation rather than hard physical evidence.

References:
- Vignon & Delage (1902) — French Academy of Sciences
- Wilson (1977) — 1977 STURP Conference Proceedings

4. d'Arcis memorandum: contested provenance weakens the forgery claim

History • Documentary critique • Exculpatory

The 1389 d'Arcis memorandum — the most direct historical claim that the Shroud was 'cunningly painted' — is unsigned, undated, survives only in draft form, and the alleged artist's confession generated no administrative documentation (trial records, confiscation orders). STURP's chemical finding that the image is not a painting removes its empirical premise.

> **Caveat:** Some scholars (Fossati) argue it is a genuine draft of a letter actually sent. The controversy does not prove the memorandum's claims are false.

References:
- Wilson (1977) — 1977 STURP Conference Proceedings
- Schwalbe & Rogers (1982) — Analytica Chimica Acta

5. Statistical irregularities in 1988 C-14 inter-laboratory data

Statistics • Radiocarbon critique • Supporting argument

Statistical analysis of 1988 inter-laboratory and intra-laboratory variance suggested the results were more heterogeneous than expected from a homogeneous sample — raising questions about whether all three labs measured identical material.

> **Caveat:** The statistical argument is contested. Oxford, Arizona, and Zürich labs stood by their methodology. This is a supporting argument for the repair-patch hypothesis, not independent proof.

References:
- Damon et al. (1989) — Nature (original C-14 paper)
- Rogers (2005) — Thermochimica Acta

6. Spear wound: post-mortem blood-water separation

Forensics • Post-mortem indicators • Interpretation

The side wound shows what appears to be separated blood and watery fluid — consistent with post-mortem lancing of a thoracic cavity containing pleural or pericardial fluid. The absence of serum halos around this wound is consistent with post-mortem blood that cannot clot normally.

> **Caveat:** This is a forensic interpretation, not a directly measurable determination. Halos also fail to form when coagulation is impaired or transfer geometry interferes.

References:
- Svensson & Heimburger (2012) — Scientific Research and Essays
- Bevilacqua et al. (2014) — Injury

7. No brushstrokes or directionality in image formation

Image analysis • Anti-artistic • Multi-spectral

Multi-spectral analysis across UV, visible, and infrared shows no directional application marks, brush strokes, or tool marks in the body image area. Any brush-applied or tool-applied medium would leave directional evidence visible under at least one spectral band.

References:
- Schwalbe & Rogers (1982) — Analytica Chimica Acta
- Gilbert & Gilbert (1980) — Applied Optics

8. Accurate human proportions and orthogonal projection

Anatomy • Image geometry • Forensic anthropometry

Anthropometric analysis confirms the body image proportions match human anatomical norms. The image is consistent with near-normal (orthogonal) mapping rather than perspective projection — as expected from vertical emission onto a cloth laid over a supine body.

References:
- Jackson et al. (1984) — Applied Optics
- Jackson et al. (2017) — Turin Shroud Center of Colorado

9. Springtime/Passover pollen types — seasonal timing

Botany • Seasonal markers • Dependent on Frei data

The pollen species tentatively identified on the Shroud include plants that bloom during the spring Passover season. This seasonal specificity would be consistent with the Gospel account of a Passover crucifixion, and difficult to explain if the cloth originated in medieval France.

> **Caveat:** This point is entirely dependent on the reliability of Frei's identifications, which are themselves contested. It should be treated as speculative until controlled re-sampling is performed.

References:
- Boi (2017) — Archaeometry

Methodology note

"Strong" = peer-reviewed, independently replicated, mechanistically specific. "Moderate" = peer-reviewed or well-documented but with identified limitations, or not yet independently replicated. "Suggestive" = evidentiary but contested, methodologically limited, or relying on non-peer-reviewed publications. Based on analysis of the uploaded PDFs including Grasso (2026), The Shroud of Turin: A Forensic Summary of the Evidence.