

3D properties of the Shroud revised

Version 1.0

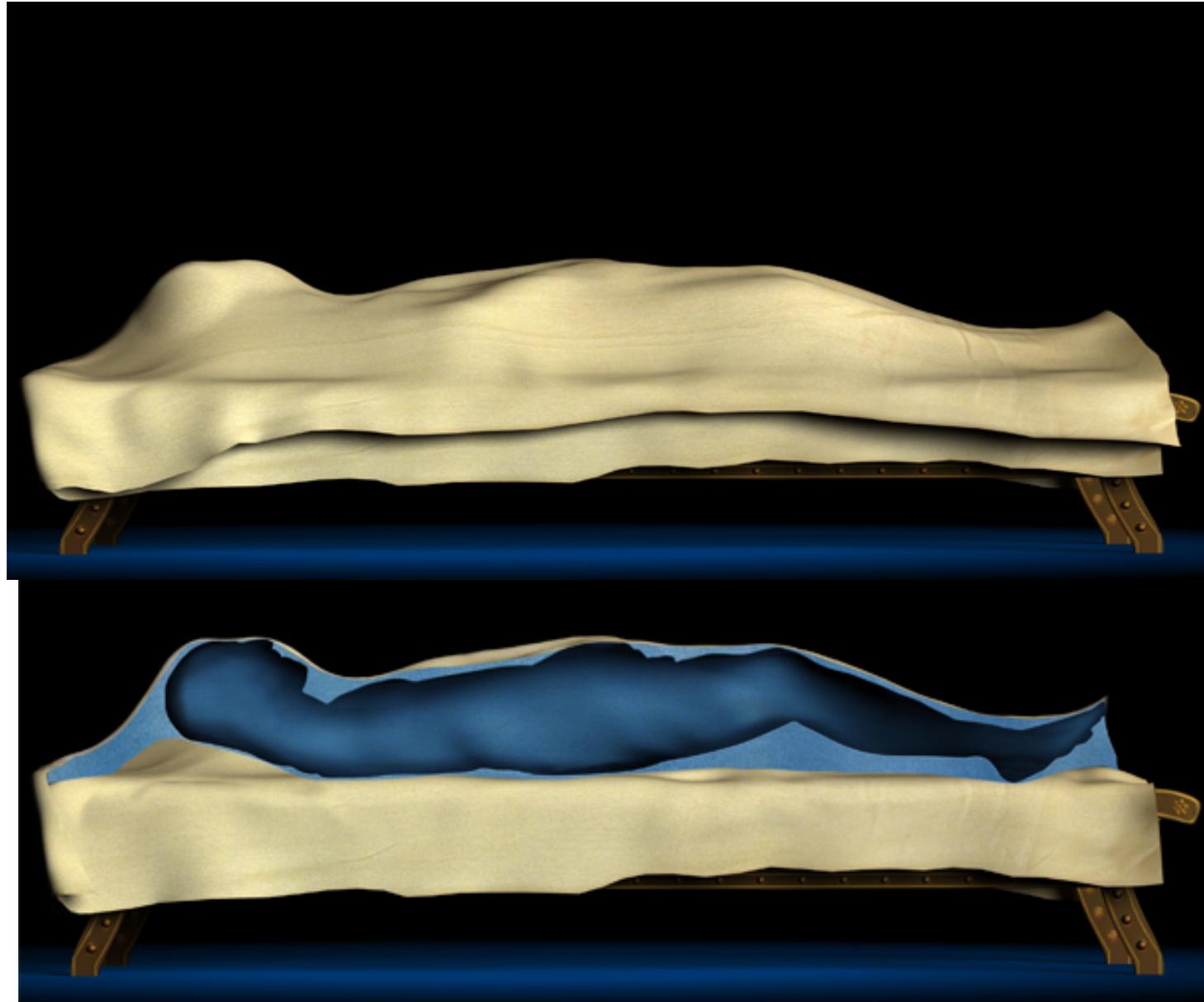
By O.K.

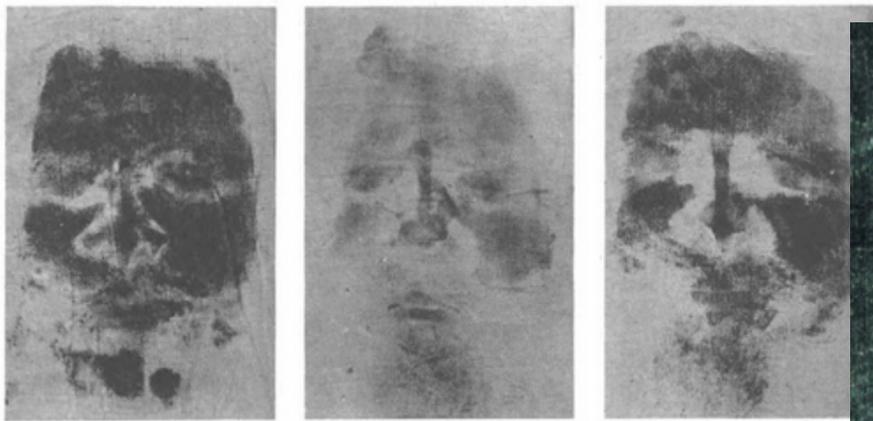
Part 3

What actually is the „body-cloth” distance? 2D and 3D distortions

From 3D and 2D measurements of the Shroud figure we expect that the Shroud was draped around the body in more less this way (there are some inaccuracies on these Ray Downing's pictures, but they are not important now).

→

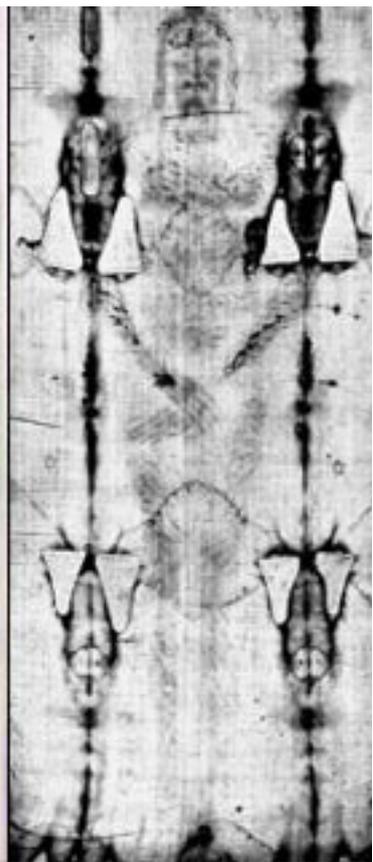




Photographic facsimiles of three impressions.



The same impressions as seen on the negative plates.



IMPRESSIONS TAKEN FROM A LIVING HEAD SMEARED WITH RED CHALK

Yet had the Shroud been draped over the body in such way, we would expect 2D distortions resulting from it. To get an idea what I am talking about , please look at the leftmost image from Vignon's 1902 book. Those are distorted contact face images made with red chalk. Yet the Man of the Shroud looks like we have taken his photo face on (or above his corpse laying oin the ground) -projecting image on the flat reference surface.



Fig.1: A negative image of the face on the Shroud, showing the blood marks on the face and hair.



Fig.2: Tracing and cut-out of the blood marks as they appear on the Shroud image of Figure 1.

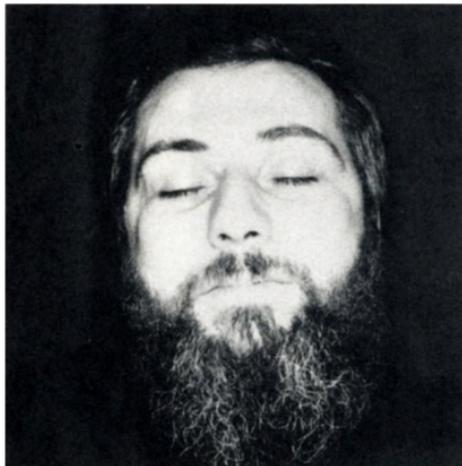


Fig.3: Frontal view of a bearded man.

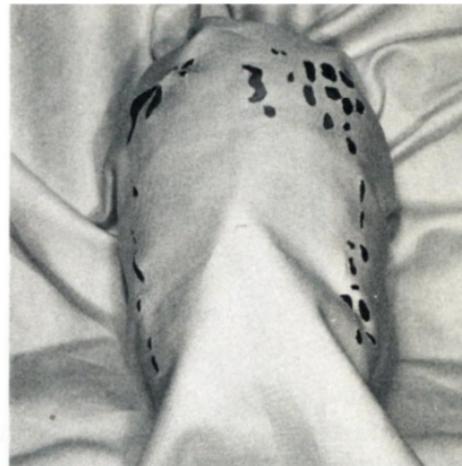


Fig.4: Frontal view of the tracing and cut-out of Figure 2 aligned over the face of the bearded man.

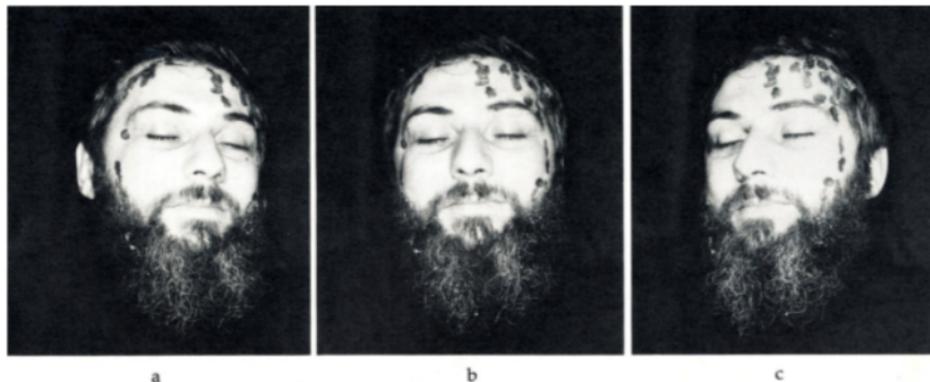


Fig. 5: Face of the bearded man after painting in the cut-outs of the blood marks.

The more confusion came from the **paper** „BLOOD ON THE SHROUD OF TURIN: PART III The Blood on the Face” (Gilbert R. & Bonnie B. Lavoie and Alan D. Adler, SSI No. 20, September 1986, pg. 3-6).

They made a beautiful experiment, they traced bloodmarks visible on face and hair of the Man of the Shroud on the sheet, they covered the face of volunteer and found them on the face (forehead, temples, cheeks and beard), instead of hair where they are apparently. Good observation.

They also concluded: *the blood marks and the image on the Shroud, as discussed above, tell us that the bloodmarks (contact process) and the facial image (non-contact process) were produced by two distinctly different mechanisms, a fact supported by chemical analysis of the Shroud.*

I will show that this conclusion is **unjustified.**

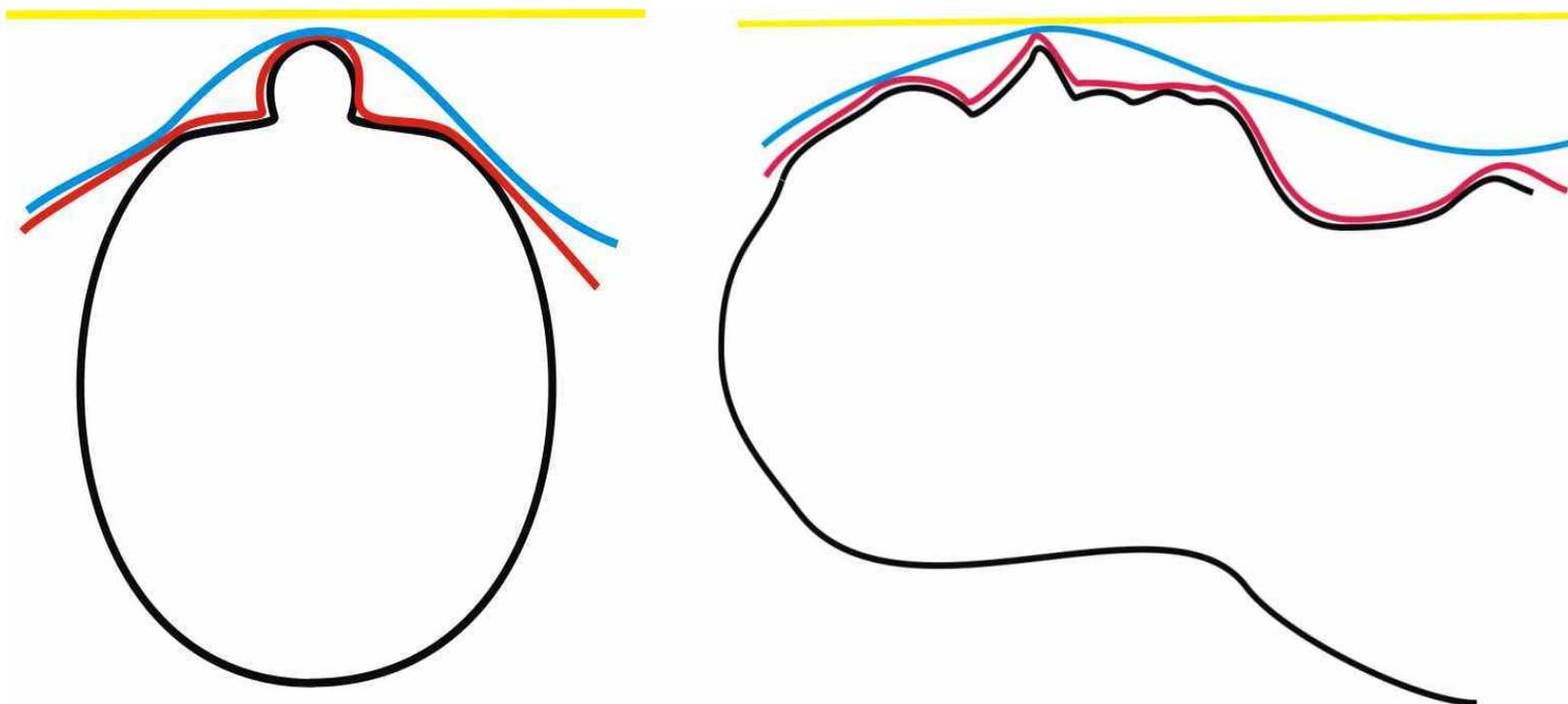
This led some people to suggest a bizarre hypothesis that at least top (or both) half of the Shroud was somehow miraculously flattened and raised during image formation process, to create flat reference surface allowing vertical projection similar to the lensing on photographic plate -with the body hovering in the state of weightlessness between two halves.



Before we critically assess this, we need to analyse possible ways of projections between body and the sheet, and answer two questions:

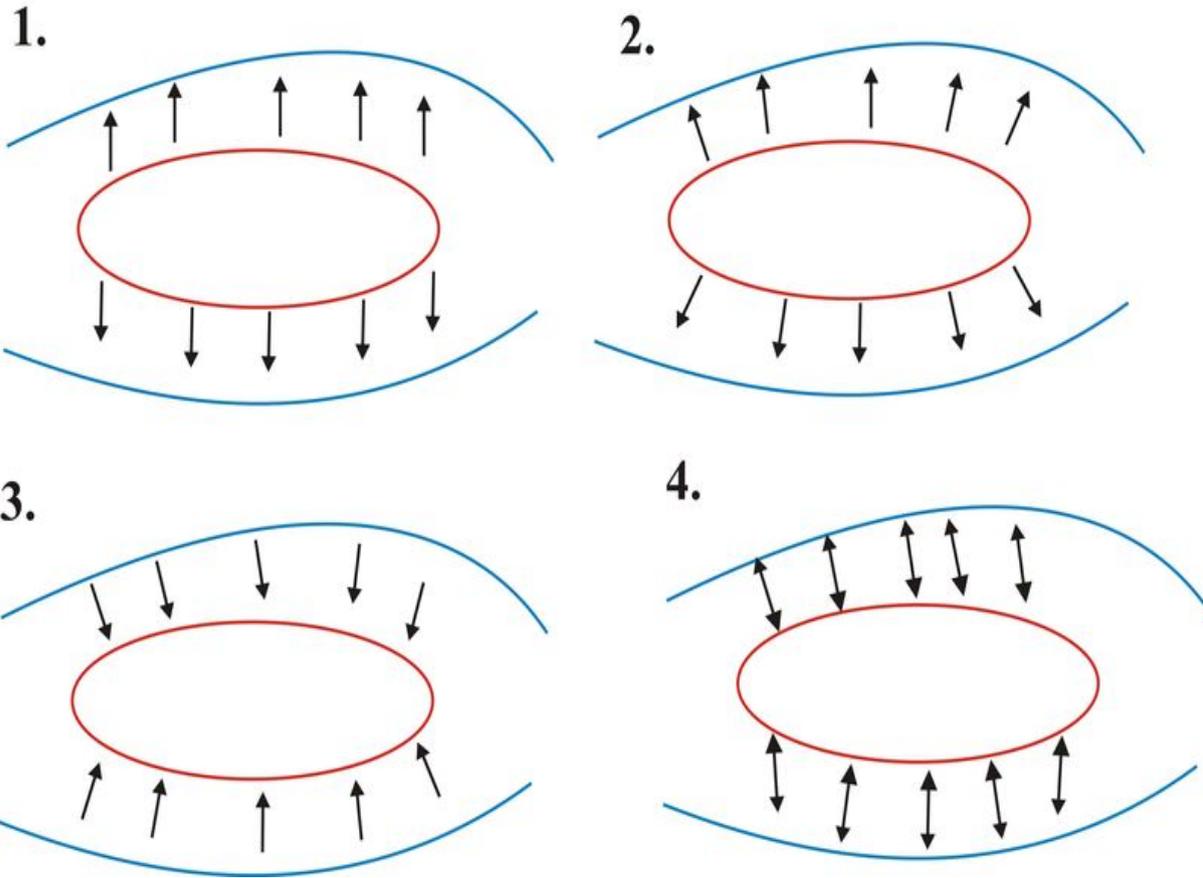
1. Are there any (2D and 3D) distortions of the Shroud image?
2. Should we expect them?

3 ways of how the Shroud was draped along the body



Generally, we can distinguish three ways how the sheet was positioned with reference to the body: 1.) flat reference surface above the body (yellow line) 2.) sheet loosely draped along the body (blue line), 3.) sheet tightly wrapping the body, virtually contact image (red line). From 1.) we expect no 2D distortions from the flat reference surface (still depends on mechanism of projection see next slide), from 2.) we expect minor distortions, from 3.) we expect large distortions, not present in the Shroud image. So we can reject 3.)

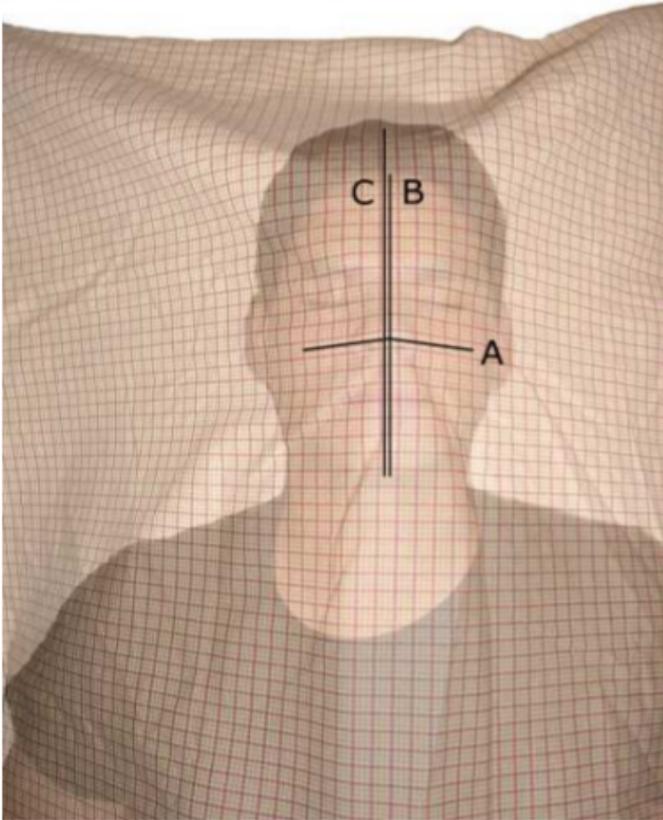
4 main ways of projecting the body image (red ellipse) on the cloth (blue curves)



Actually, they are not the only ones possible, but can be considered main. They are: 1.) vertical projection (assumed by Jackson & Jumper) 2.) projection orthogonal to the body, 3.) orthogonal to the sheet, 4.) projection at the lines of minimal distance between body and the cloth. 3.) and 4.) theoretically may result in multiple images of the same body points.

Generally, as first approximation, all 4 ways give similar results, but there may be subtle differences between them. They may give different kinds of possible distortions from vertical mapping as described by 1.) -the smaller the distance between body and cloth, the smaller deviation.

Are there minor 2D distortions in the Shroud image?

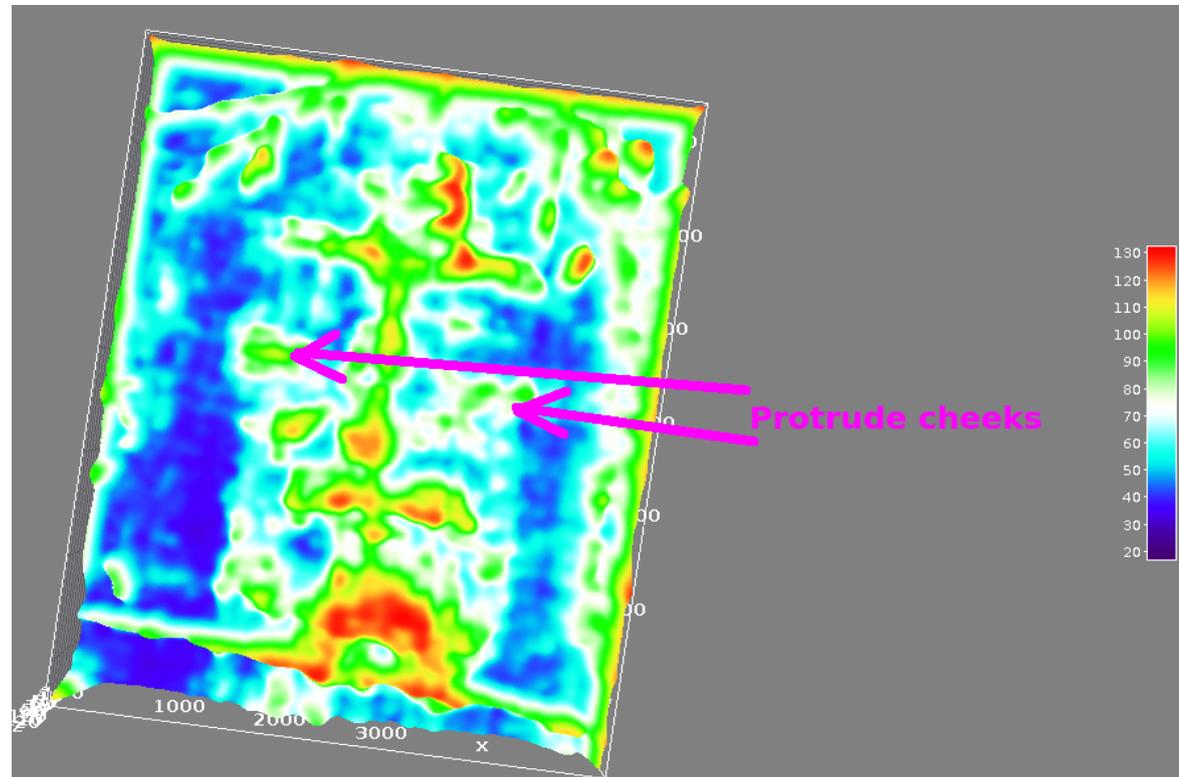
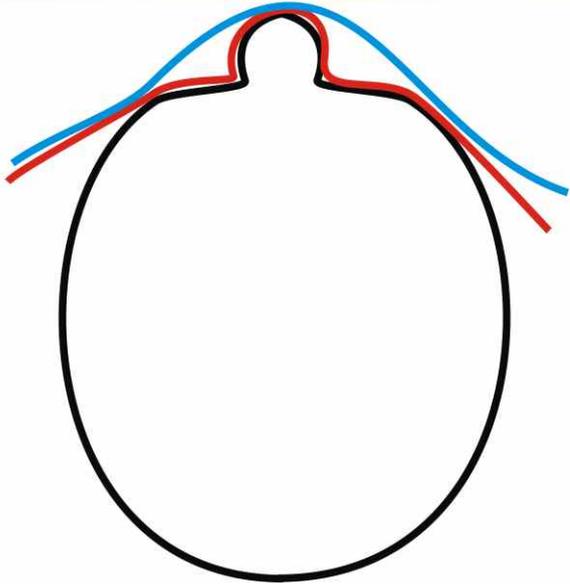


One lengthwise grid division is 1.034 cm, and one widthwise grid division is 1.111 cm. 1 px = 0.225 mm. The Length is the “real expected” length. The Grid Length is the “distorted” length.

Label	Px (x)	Length cm	Grid Length cm	% increase
A	393	8.8	12.2	28%
B	718	16.2	19.4	16%
C	833	18.7	25.8	27%

The answer is **YES**. There are two excellent papers on the subject: Ercoline, W.R., R.C. Downs, Jr. and J.P. Jackson, "Examination of the Turin Shroud for Image Distortions," IEEE 1982 Proceedings of the International Conference on Cybernetics and Society, October 1982, pp. 576-579 and Mario Latendresse „Evidence that the Shroud was not Completely Flat during the Image Formation” from the 2005 3rd International Dallas Conference (link to the [paper](#) and [presentation](#)). They are perfectly consistent with loose sheet scenario.

What about 3D distortions?



To explain what they are, let me use an example. We suppose that there is a relation between image intensity and body-cloth distance. The latter depends on the way of projection, and the way how the Shroud was draped along the body. They imply which parts of the body were closer, and which further from the body. For example, in the loose sheet scenario (blue line) the cheeks should be in direct contact with the sheet -and they are (consistently) more protrude on the 3D plot. We will address other examples later.

To see how the Shroud wrapped the body, watch two part video by David Rolfe with John Jackson and Rageh Omaar

Part 1 →



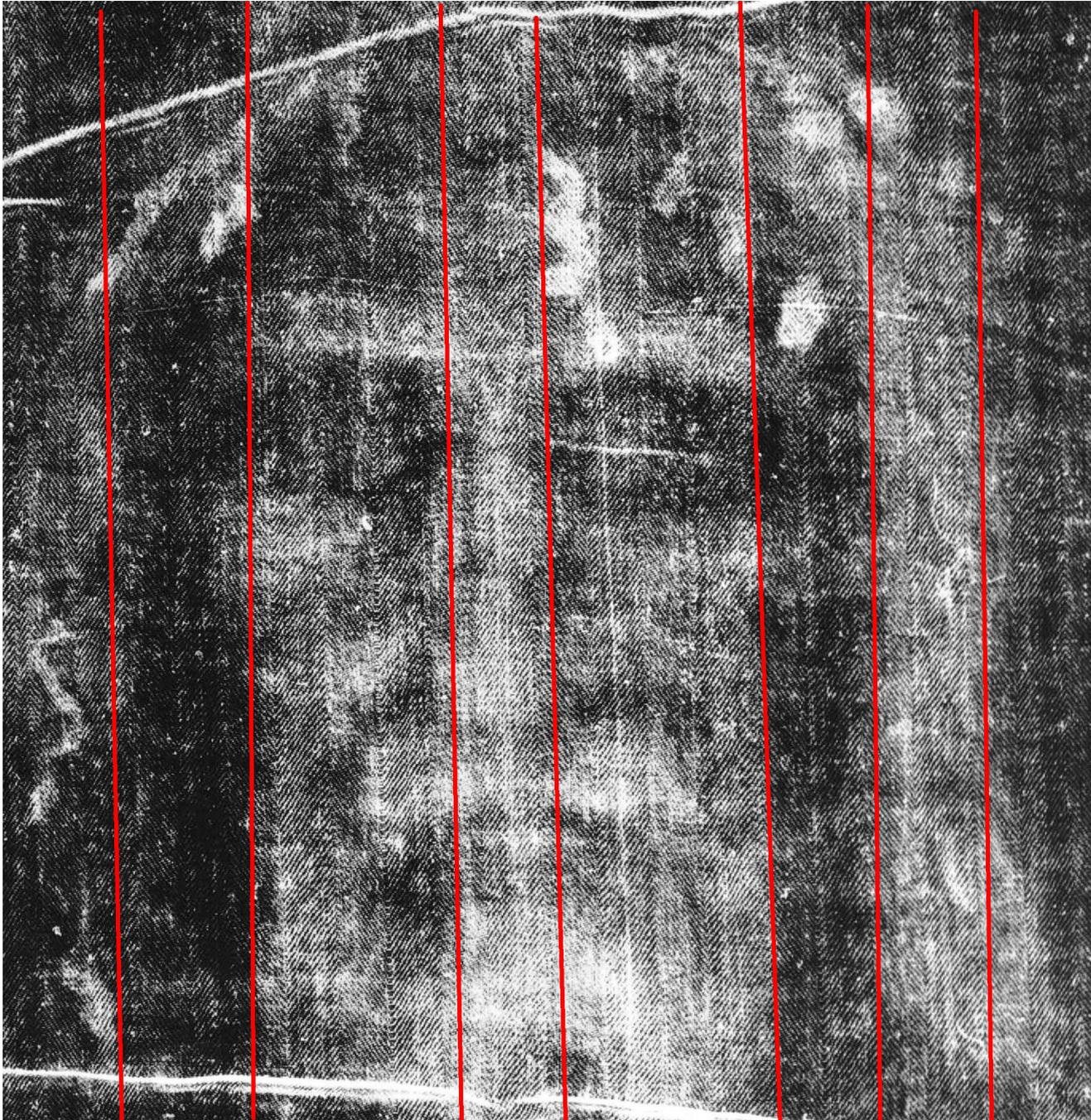
← Part 2

Overview



- The presence of minor 2D distortions of the Shroud image suggest sheet loosely draped over the body scenario. The minor distortions are barely noticeable (but noticeable!) and the first impression for the viewer is like the body of the Man of the Shroud was projected on the flat reference surface hovering above it -just like projecting the image on a photographic plate.
- The bloodmarks position suggest they were created by contact mechanism, in the case of the face on its sides.
- The 3D distortions at first glance seem consistent with loose sheet scenario -but...

The bandings and their importance



The prominent feature of the Shroud image, particularly in the face, is the presence of several vertical and (less dominantly) horizontal bands of lighter and darker areas, which align the face vertically. The lighter bands seems to be superimposed over the nose and the hair from both sides, while darker bands seem to be present between the cheeks and hair. Bandings modulate the intensity of the image.



Hands UV, showing bands of color and their effect on image color density.

See also Hugh Farey's paper [Banding on the Shroud of Turin](#)

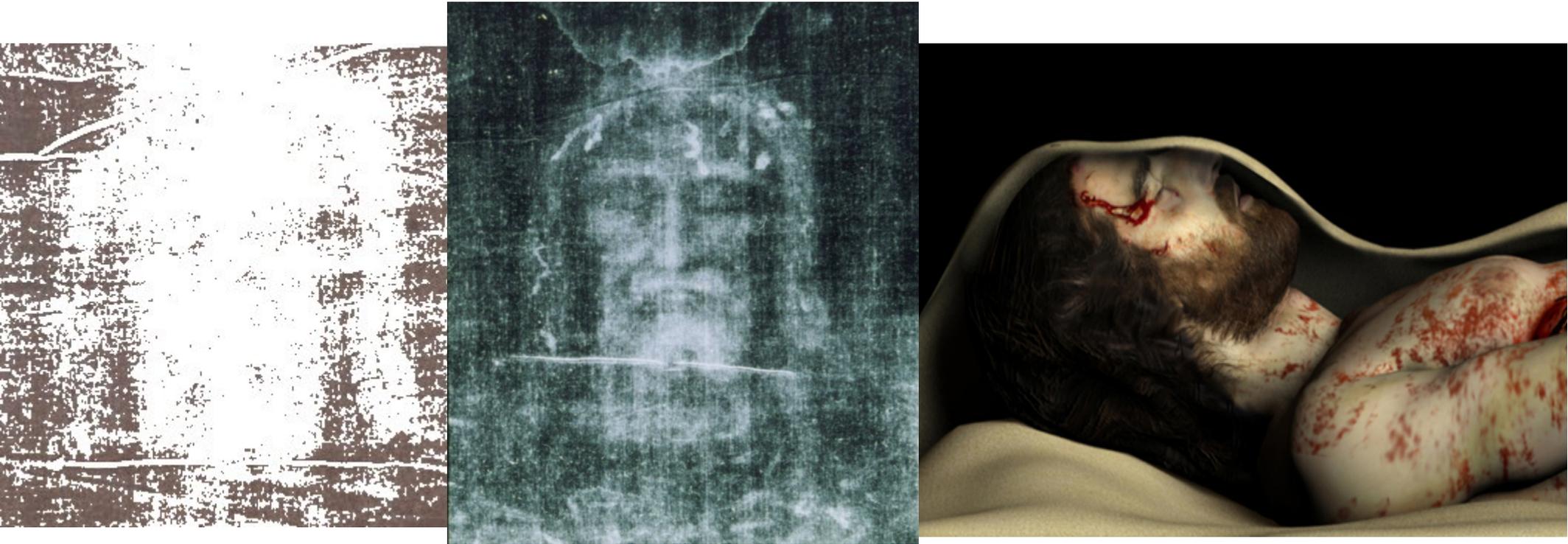
Ray Rogers in his [FAQ](#) wrote as an answer to question 7 („Why are there bands of different colored linen throughout the Shroud, and what do they prove about image formation mechanisms?”):

Bands of slightly different color can be seen in Shroud photographs. They are most visible in ultraviolet-fluorescence photographs (see Hands UV). Both warp and weft yarns show this property. Some areas show darker warp yarns and some show darker weft yarns. In some places bands of darker color cross. In other places bands of lighter color cross. The effect is somewhat like a plaid.

[...]

Where darker bands of yarn intersect image areas, the image is darker. Where lighter bands intersect an image area, the image appears lighter.

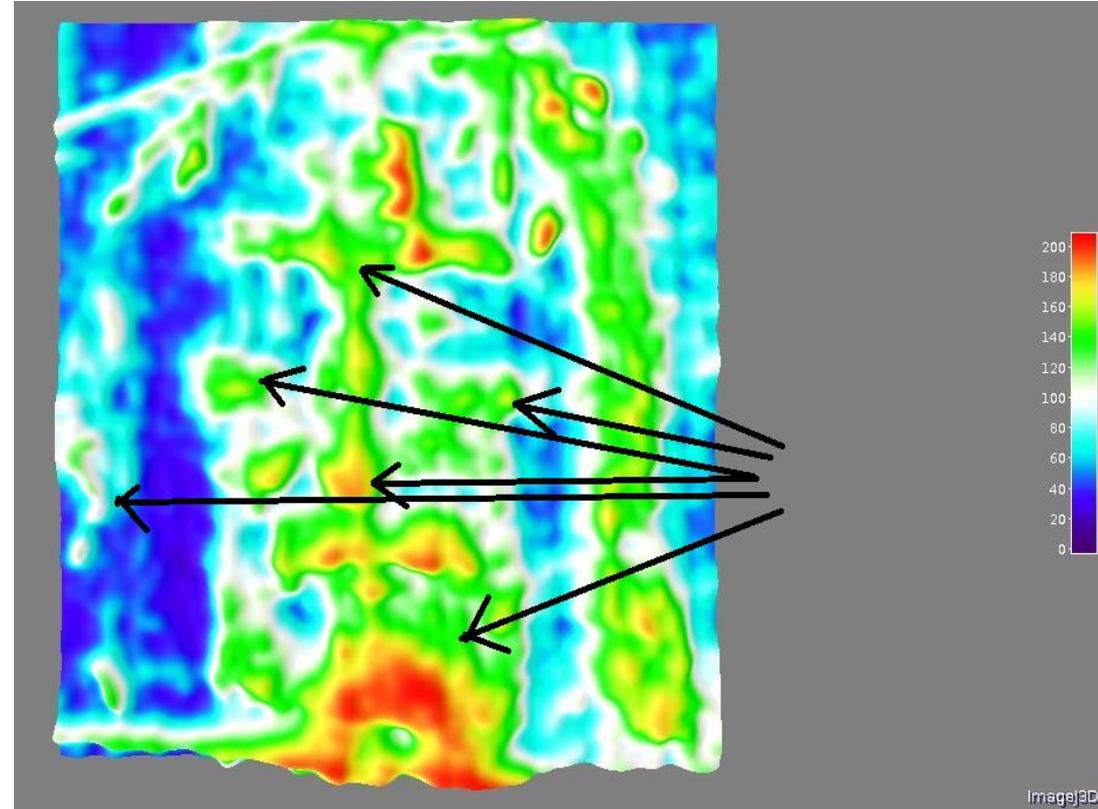
The amazing photographic quality of the Shroud face



The quality is indeed amazing -and **unexpected**. Here is the problem: let's assume that the intensity of the image depends **solely** on body-cloth distance. Had that distance been identical for all points of the face, we would see the equivalent of the leftmost image -the totally uniform face with no contrast and no details visible. Yet we see almost a **normal face-on** photography -with protrude nose, cheeks a little bit further, and hair falling down at the sides even further away.

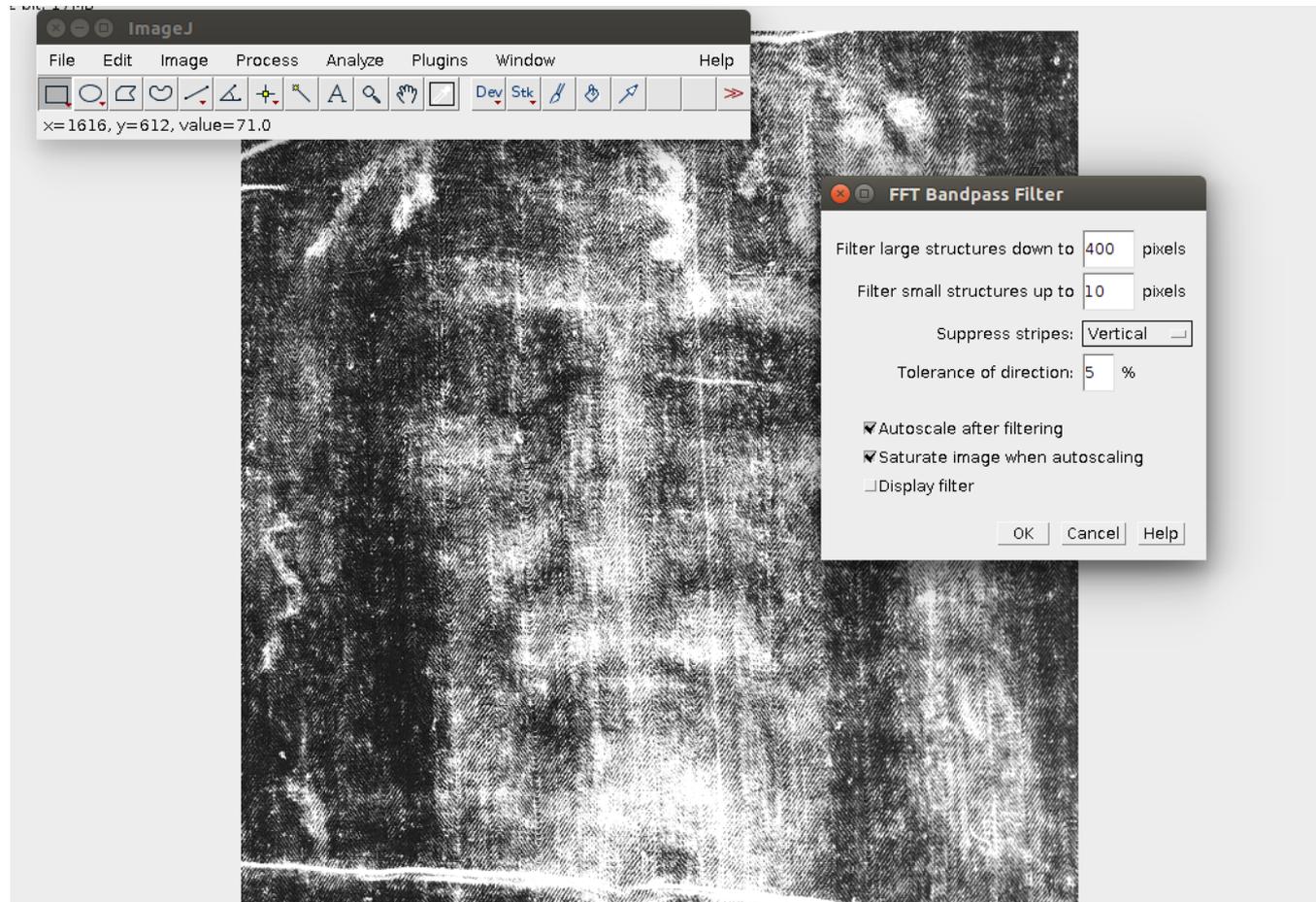
And that's something we shouldn't see!

The „fatal errors” of the Shroud face



Compare the cheeks, the brows, the nose and the hair of the Shroud Face! According to the loose sheet scenario they all should be in contact with the cloth, and have the same intensity. **This is not the case**, especially with regards to the tip of the nose, which extends far ahead -what we would expect from normal photography and not the body-cloth distance plot!

Something doesn't fit...



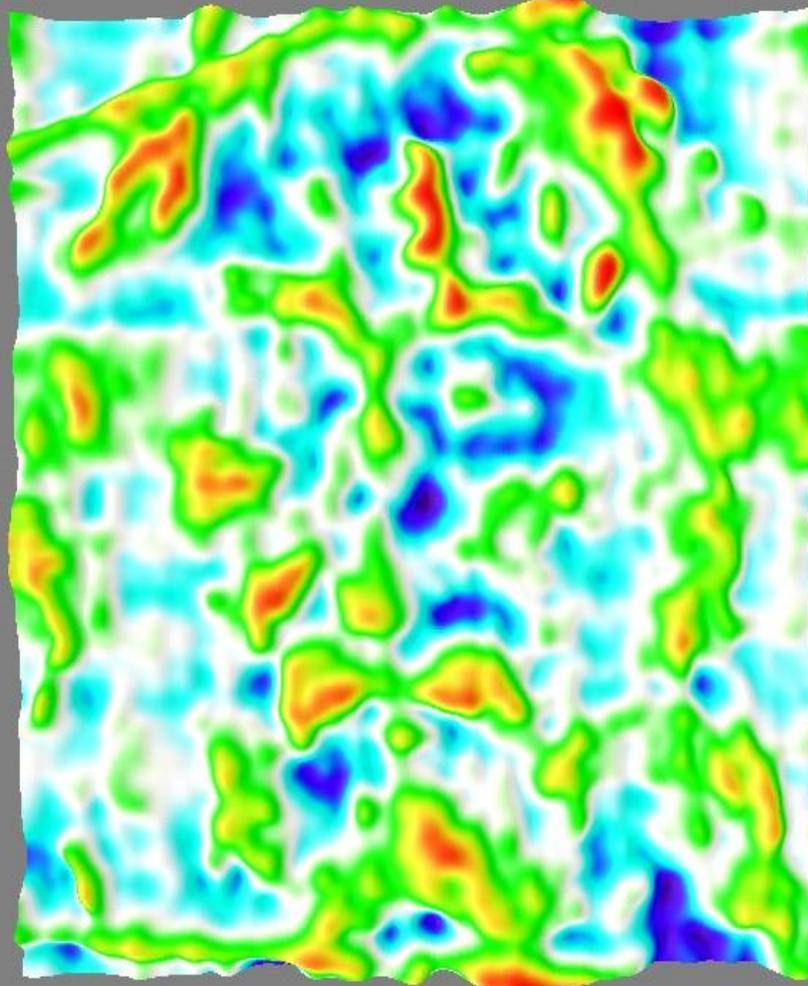
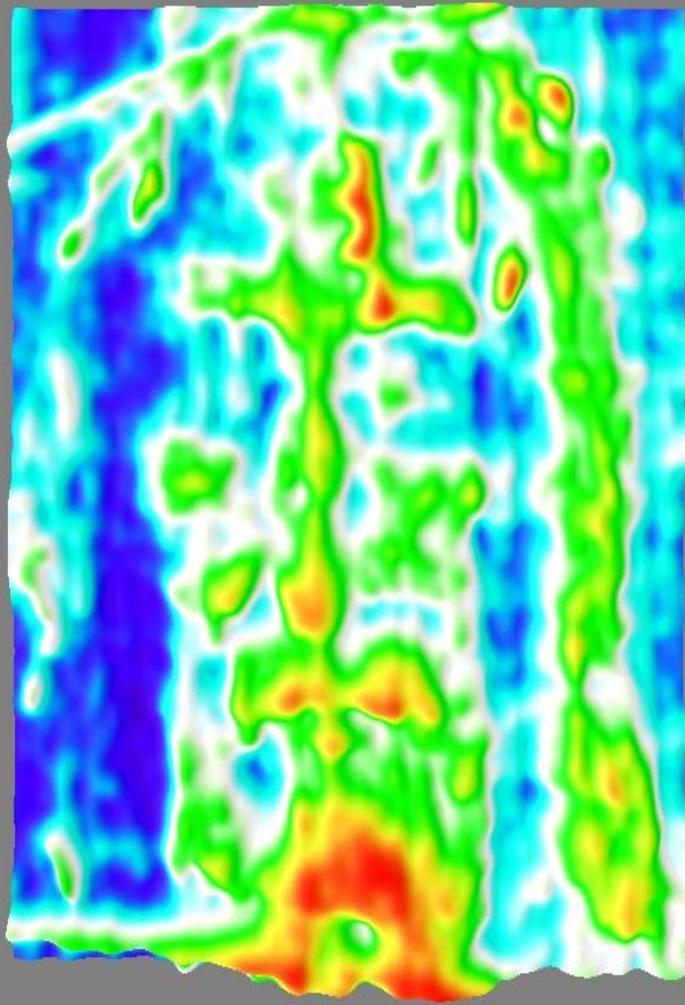
And this something is most likely connected to the bandings. So let's get rid of them using bandpass filter (ImageJ Menu: Process >FFT>Bandpass Filter). By the way we get rid of the weave structure. Twice run with suppression of both vertical and horizontal stripes.

Let's compare the results:



Original face on the left, face with filtered weave and bandings on the right (there are still some residual artifacts of the process, unfortunately, but this is not critical) What can be seen at first glance is that the right one is much **broader** and **dimmer** and **flattener**. **This is a very important observation.**

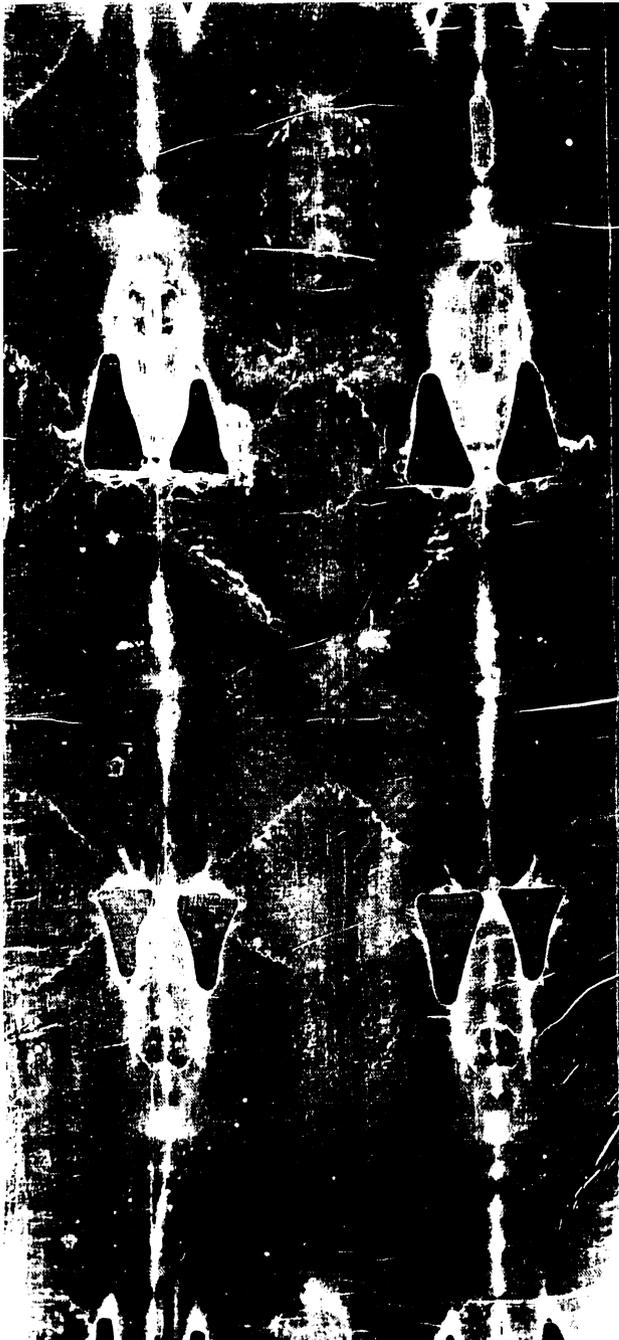
3D comparison



ImageJ3D

Looks ugly, doesn't it? But in fact the right one is **much more realistic** 3D image than on the left, reflecting how **really** looks body-cloth distance relation. The „fatal errors” have disappeared -the cheeks, the brows, the nose and the hair are roughly **on the same level**. And that's what we wanted.

An important observation nobody noticed (except some sceptics)



In **a paper** by G. Fanti et al. „Evidences for testing hypotheses about the body image formation of the Turin Shroud” from 2005 3rd International Dallas Conference, there is a very interesting note:

*A44) The **luminance level of the head** image in the positive photograph of Durante (2000) is 10% and more lower (**darker**) than that of the whole body image (Moran 2002). -original boldings.*

Similar observation concerns Enrie, as we see on the left. This inconsistency has been quite a concern, and has been used at least by one sceptic with whom **I polemicized**, as a proof that head and rest of the body images were made separately (thus the Shroud is a forgery). But now the reason is clear -this is the effect of **bandings**, which **positively modulated** intensity there. **Why?**

! Overview (very important) !

- The body-cloth distance vs intensity is actually **inaccurate** for unprocessed negative photographs of the Shroud face -which looks more like an ordinary **face-on photograph** than plot plot of such relation for loose sheet scenario.
- This is due to the **modulation of bandings**. When bandings are removed, the relation becomes once again accurate -but face apparently looks less realistic (both 2D and 3D) for the perception of a person **unused to**.
- It is **extremely improbable** for such modulation (in **exactly right places**, otherwise the face would be distorted) to be a matter of accident. This looks like **DELIBERATE** action of the Creator of the Shroud image, to obtain realistically looking face of the Man of Shroud (obtaining it with purely distance relation seemed physically impossible).
- In other words, the Creator **cheated**. But this „cheating” with modulation by the bandings was absolutely brilliant **MASTERPIECE**. The only appropriate term that comes to my mouth, is that it was „divine” genius.

- The irony is that Jackson & Jumper, from the **wrong premises** (measuring the distances with the reference to the flat surface & using unprocessed photographs) came to the **right main conclusion** (there is a body-cloth distance vs intensity relation, as Vignon suggested).
- **However**, the regression formula used by Jackson & Jumper seems **unreliable -and so max range of 3.7 cm derived from it**. Aside of any further questions about for example sample selection (and possible bias), the linear formula assumption and omission of the important factor of bandings modulation put the numerical results accuracy in serious doubt. Besides, according to measurements of the anatomy of my face (average posture male, parts like the deep of eyesockets, nose protrude etc.), the max range of image formation **cannot exceed** about 2-2.5 cm. Vignon's guess of 1 cm was more accurate than Jackson & Jumper exact formula.
- This means that image intensity is **highly susceptible** to even minor variations (1-2 mm, the size of random wrinkles on the surface of the cloth)) of body-cloth distance.
- And also the Creator might have used bandings modulation in any other parts of the Shroud besides face, to serve His purposes. The lack of sides of the body may be the result of similar process, but this still needs further examination (there may be body side images, but we are unable to perceive them).

2D distortions once again



This is one of the most famous archeological findings -the so called „Mask of Agammemnon”. An ordinary funeral mask from about 1500 BC, which was forcefully flattened when the roof of the tomb collapsed -you can see ears and sides of the head. **This is what we expect from minor 2D distortions of the face on the Shroud.**

Let's compare it with the filtered image of Shroud face -and Lavoies & Adler results:

YEAH !!!



Fig.1: A negative image of the face on the Shroud, showing the blood marks on the face and hair.



Fig.2: Tracing and cut-out of the blood marks as they appear on the Shroud image of Figure 1.



Fig.3: Frontal view of a bearded man.



Fig.4: Frontal view of the tracing and cut-out of Figure 2 aligned over the face of the bearded man.

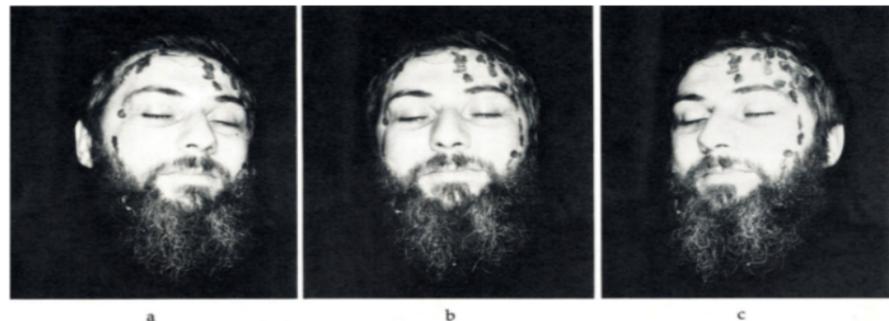
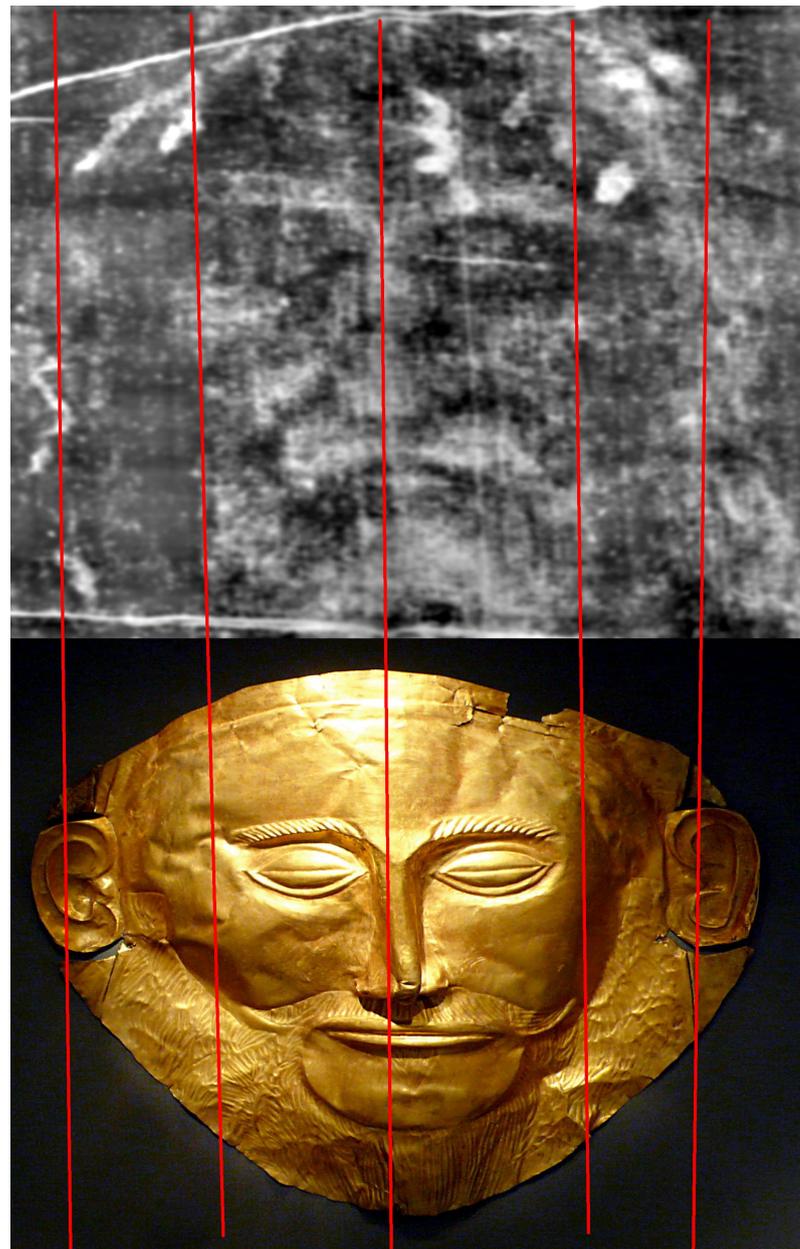
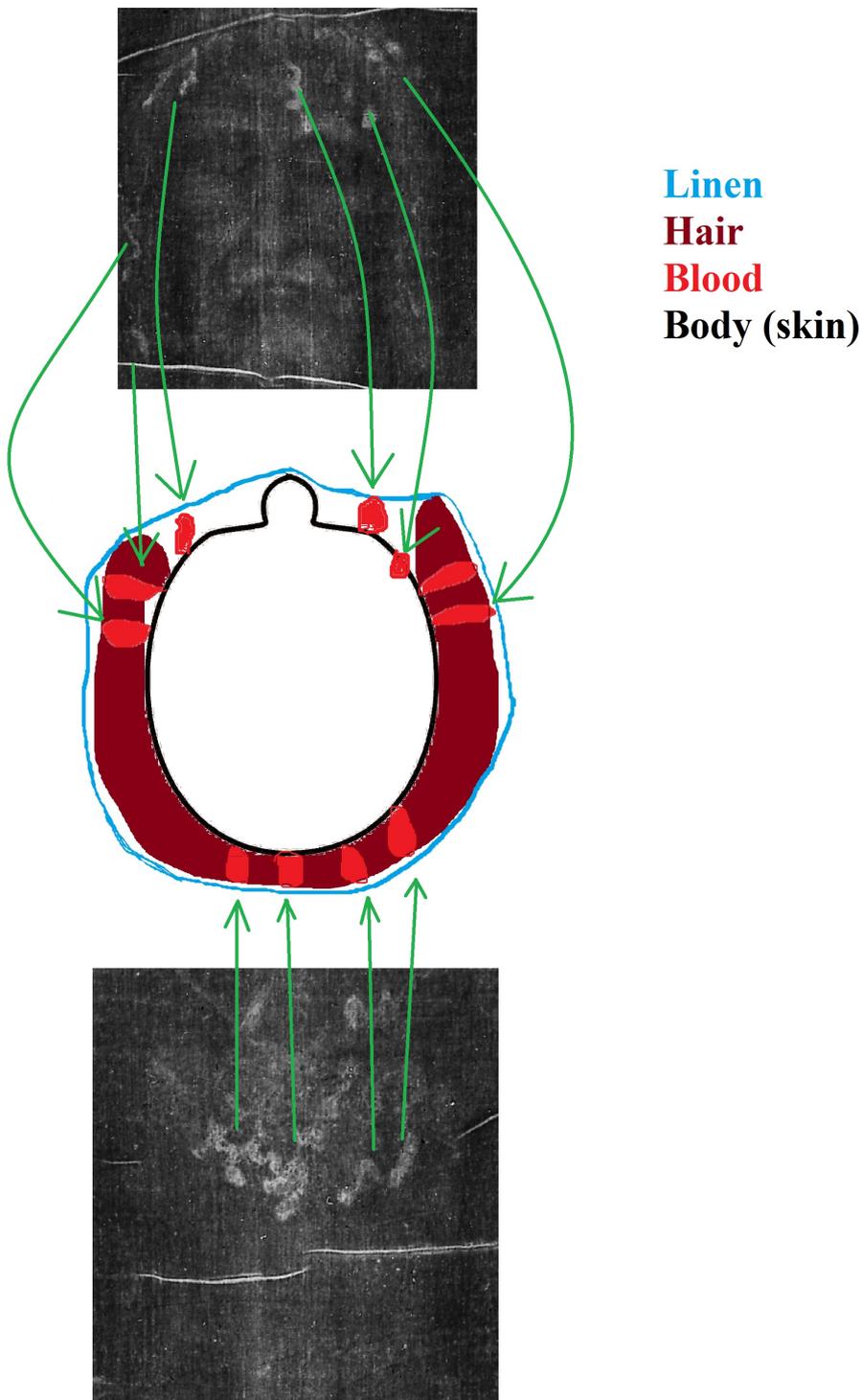


Fig. 5: Face of the bearded man after painting in the cut-outs of the blood marks.





The results presented on previous slide are **EXTREMELY IMPORTANT**.

They show that Lavoies and Adler were **both right -and wrong** with regards to their conclusions:

Right: they correctly concluded that the bloodmarks visible in the hair are actually on the sides of the head.

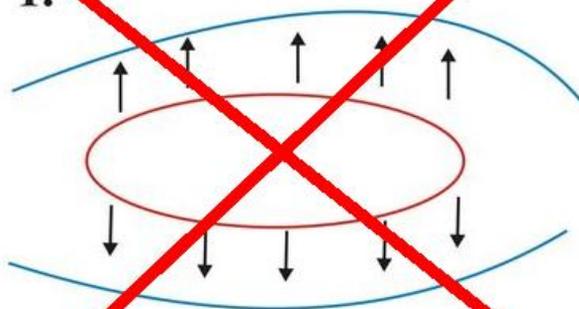
Wrong: they thought that the current position of bloodmarks in the hair is just an illusion due to the superimposition of two images (blood and body) which were created in geometrically different positions. Actually the hair are in the same position as bloodmarks -**stuck to the sides of the head**. Blood simply soaked through them, giving apparent view of blood in the hair (see diagram on the left)

This observation proves that the 3D effect is not an imitation but the Shroud actually wrapped real 3D shape, namely human body.

**This observation refutes also hypothesis
of a flattened Shroud and vertical
projection during image formation:**



1.



Overview (very important)

- There are notable, „Mask of Agamemnon“-like 2D distortions in the Shroud image, proving that the Shroud covered the real 3D-shape body.
- The hypothesis of force-flattening of the Shroud during image formation, as well as assumption of vertical projection have been refuted.
- The apparent bloodmarks in the hair are on the sides of the head, and the hair (through which the blood soaked) are there as well.
- The ordinary visual perception of the Shroud, without much using of spatial imagination, may be VERY misleading.

To be continued...