



Shroud of Turin Education and Research Association, Inc.

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Report on the STERA, Inc. - University of Arizona Radiocarbon Dating Laboratory Macro Photography - 30 August 2012

Introduction

At the beginning of the summer I was contacted by Helmut Felzmann, noted Shroud researcher and author from Germany. He asked if I would be willing to go to the University of Arizona Radiocarbon Dating Laboratory in Tucson, Arizona, one of the three labs that dated the Shroud in 1988, and photograph their remaining samples. As you probably know, each of the three laboratories saved some of their original samples and kept them in reserve. This included not only the remaining Shroud samples, but the remaining reference samples as well.

Helmut was researching the samples and had already contacted Dr. Timothy Jull, the current Director of the laboratory, to make the preliminary arrangements for the samples to be photographed. In addition to Helmut, I was also contacted by Dr. Charles Mader, who had a parallel interest in the research Helmut was doing and Holger Kersten, noted Shroud researcher and author. Helmut, Charles and Holger each made tax deductible contributions directly to STERA, Inc. to fund the travel and other expenses of the project and ultimately, I agreed to make the photographs as an official project of STERA, Inc., with the understanding that we would simply make the images available to the researchers but would not participate directly in any research in which the images were used. This is the first such project that STERA, Inc. has participated in and we appreciate Dr. Jull giving his consent for the work to be done.

The day I was to make the photographs, Dr. Jull informed me that one (or more?) remaining samples would not be available for the photography session. These were currently in the possession of Dr. D.J. Donahue, the retired former Director of the laboratory, who was away due to a family emergency. I am hopeful they can be made available at some future date so they can be photographed using the same techniques and equipment and added to the collection.

In creating the pdf version of this report, I minimized the compression applied to the images so you should be able to zoom and enlarge the photographs to 200% or more. Millimeter reference scales were included in all the macro photographs so that pixel based measurements can be performed. We plan to make a CD-ROM disc of all 51 high resolution (4256 x 2848) images and all written documentation available early next year and will announce it on the website as soon as it is available.

Equipment*

Fujifilm FinePix Model S3 Single Lens Reflex Digital Camera with 12MP Image Sensor
Nikon 55mm Micro-Nikkor f2.8 Flat Field Macro Lens
Nikon PK-13 27.5mm Extension Tube Matched to above Lens
Nikon 24-85mm f2.8-4 Nikkor Zoom Lens (for Color Rendition Chart only)
Light Source: 6" x 8" fluorescent Daylight balanced (5000° K) light box
Professional Copy Stand

*(See **Figure 6** and **Figure 7** which document the macro photography setup)

Technical Notes

The 55mm Nikon Micro-Nikkor flat field lens I used for this project is designed specifically for this type of macro photography and would typically yield a magnification of 1:2 on 35mm film (50% actual size). The PK-13 Extension Tube, designed specifically to be used with this lens, takes the magnification to 1:1. However, due to the fact that the image sensor on the Fujifilm camera is smaller than the area of coverage this lens was designed for, a factor of 1.5 must be applied to determine the effective focal length of the lens/camera combination. This results in the 55mm lens becoming equal to an 82.5mm lens and the resulting magnification being closer to 1:1. Once the 27.5mm Extension Tube is added to the optical path, the resulting magnification increases by a factor of 1.5 as well, resulting in a magnification of about 1.5:1. This works to our advantage as it results in greater magnification of the samples, but makes retaining depth of field more difficult. The higher the magnification used, the more shallow the depth of field.

I made the first set of images of the Shroud sample (**Figure 1**) without the PK-13 Extension Tube. These are at approximately 1:1 magnification. I then added the Extension Tube and photographed all the samples at the higher magnification. To insure adequate depth of field, I took multiple photographs of both sides of every sample. In some cases, I varied the focus slightly from exposure to exposure to insure that every possible area of each sample is in the sharpest focus within the frame. I am including only the best example of each different view in this report.

I also made a photograph of a standard MacBeth Color Checker Color Rendition Chart (**Figure 6**) using the same light source as the macro photographs, to serve as a visual color reference. The chart was dramatically larger in size than the macro area the light source was designed to illuminate, which resulted in an unevenly lit result, but it is still usable to gauge the overall color rendition of the photographs. One could easily observe any serious color shift, if it existed, in the gray scale of the chart. I had to use a different lens (see above) to make this single image due to the overall size of the chart.

Image Processing

I performed only a minimum amount of digital image processing to each photograph (including the color rendition chart). I simply applied the Auto Levels algorithm in Photoshop CS (Version 8.0) to each image and did nothing else. The algorithm simply corrects the color rendition slightly and optimizes the range of the levels in the RGB image. The images were not resized, so consequently, no pixels were interpolated that would degrade the image quality.

The Samples**

Here is a detailed description of the samples I photographed:

(Figure 1 and Figure 2) - Sample 1. The sample labeled Shroud of Turin, approximately 6mm x 10mm. Although I did not measure specifically, this sample appeared somewhat thicker than the other two woven samples (probably due to the nature of the herringbone weave itself).

(Figure 3) - Sample 2. Linen (sample QI.T/32) from a tomb excavated at Qasr Ibrîm in Nubia by Professor J. M. Plumley for the Egypt Exploration Society in 1964. On the basis of the Islamic embroidered pattern and Christian ink inscription, this linen could be dated to the eleventh to twelfth centuries AD. **

(Figure 4) - Sample 3. Linen from the collection of the Department of Egyptian Antiquities at the British Museum, associated with an early second century AD mummy of Cleopatra from Thebes (EA6707). This linen was dated in the British Museum Research Laboratory using liquid scintillation counting, giving a radiocarbon age of $2,010 \pm 80$ yr BP (BM-2558). This corresponds to a calendar age, rounded to the nearest 5 years, of 110 cal BC - AD 75 cal at the 68 per cent confidence level ⁵ (where cal denotes calibrated radiocarbon dates).**

(Figure 5) - Sample 4. Threads removed from the cope of St Louis d'Anjou which is held in a chapel in the Basilica of Saint-Maximin, Var, France. On the basis of the stylistic details and the historical evidence the cope could be dated at ~ AD 1290 - 1310 (reign of King Phillippe IV).**

(Photographer's Note: As Sample 4 is comprised solely of loose threads, it was not photographed on both sides like all the others, but rather in two side by side views).

** Source: Damon, P. E., et al - [Radiocarbon Dating of the Shroud of Turin](#) *Nature*, Vol. 337, No. 6208, pp. 611-615, 16th February, 1989

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Barrie Schwartz
President, STERA, Inc.



Figure 1

(Top) - DSCF3369x.jpg - Sample 1 - Shroud - Side 1 - Approx. 1:1 Magnification - 1/15 sec @ f2.8
(Bottom) - DSCF3371x.jpg - Sample 1 - Shroud - Side 2 - Approx 1:1 Magnification - 1/15 sec @ f2.8



Figure 2

(Top) DSCF3401x.jpg - Sample 1 - Shroud - Side 2 - Approx 1.5:1 Magnification - 1/3 sec @ f8
(Bottom) DSCF3402x.jpg - Sample 1 - Shroud - Side 1 - Approx 1.5:1 Magnification - 1/3 sec @ f8



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Figure 3

(Top) DSCF3409x.jpg - Sample 2 - Egypt. Tomb Linen 11-12th Cent. - Side 1 - ½ sec @ f8
(Bottom) DSCF3410x.jpg - Sample 2 - Egypt. Tomb Linen 11-12th Cent. - Side 2 - ½ sec @ f8

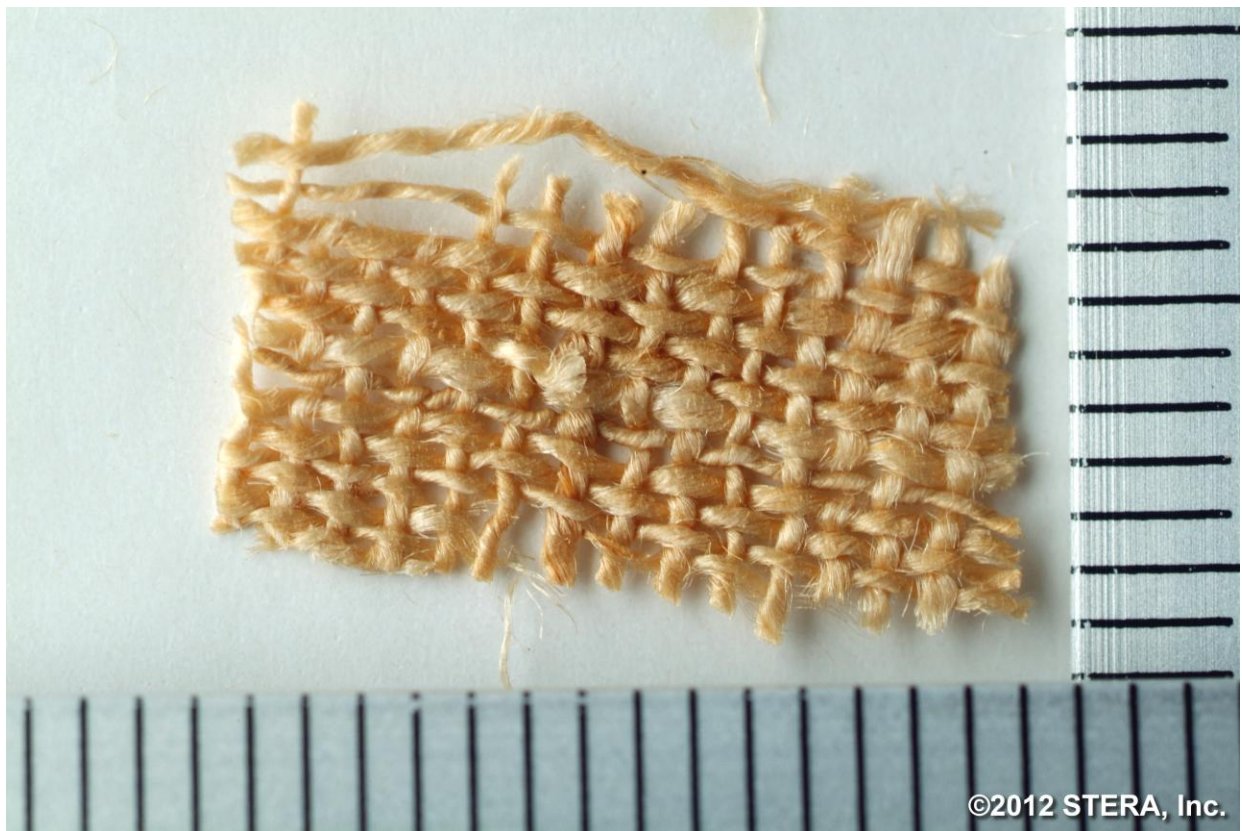


Figure 4

(Top) DSCF3421x.jpg - Sample 3 - Egypt. Mummy 2nd Cent AD - Side 1 - ½ sec @ f8
(Bottom) DSCF3422x.jpg - Sample 3 - Egypt. Mummy 2nd Cent AD - Side 2 - ½ sec @ f8



Figure 5

(Top) DSCF3428x.jpg - Sample 4 - Cope Fibers 14th Cent AD - Side 1 - ½ sec @ f8
(Bottom) DSCF3430x.jpg - Sample 4 - Cope Fibers 14th Cent AD - Side 2 - ½ sec @ f8

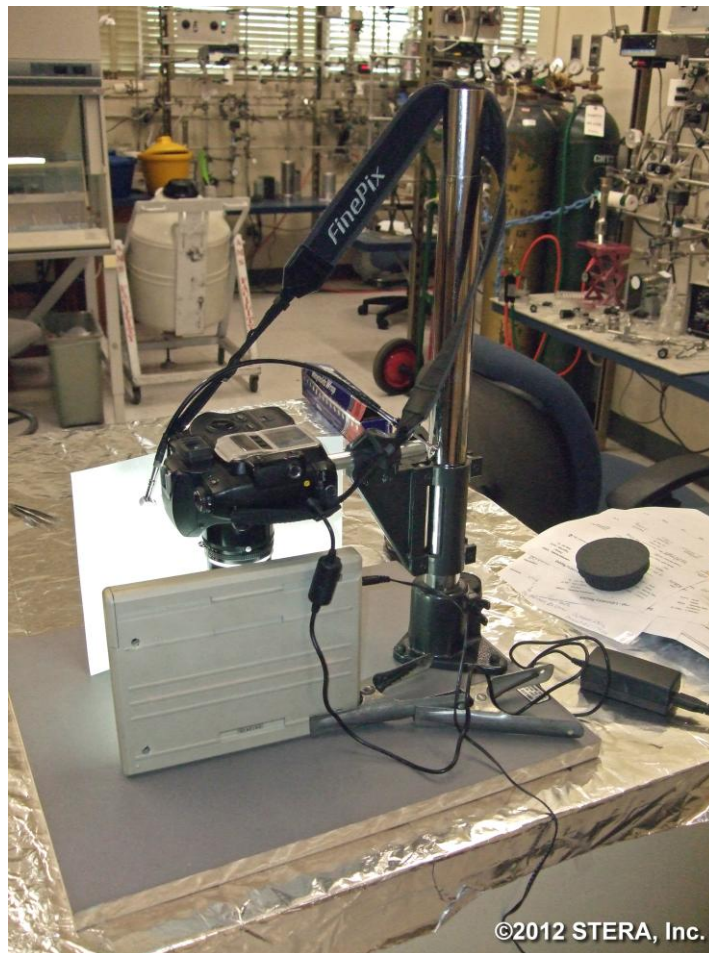


Figure 6

**(Top) DSCF3351x.jpg - MacBeth Color Rendition Chart
(Bottom) DSCF1874x.jpg - Macro Photography Setup**



Figure 7
(Top) DSCF1875x.jpg - Macro Photography Setup
(Bottom) DSCF1877x.jpg - Macro Photography Setup



Figure 8
DSCF1878x.jpg - Timothy Jull & Barrie Schwortz