

## DRAPING APPEARANCE AND PROPERTIES OF THE LINEN CLOTH OF THE TURIN SHROUD

By John Tyrer

A greater sense of objectivity for the reconstruction of the cloth drape as derived from the VP8 analysis of the frontal image of the Shroud might be possible if the draping properties of the linen could be measured directly.

To carry out appropriate draping tests, however, and any other textile performance tests upon the Shroud itself would necessitate cutting quite large samples, and its significant mutilation, in a way which would be unacceptable. In these circumstances the next best thing would be to carry out textile performance tests upon an accurate replica of the Shroud linen, then link and compare the results obtained with the nondestructive tests that have been made upon the Shroud itself.

### Shroud Replica

An accurate replica of the Shroud linen was in fact produced by the Shirley Institute, Didsbury, Manchester, for the BBC's QED programme on the Shroud as televised in November 1982. This was made up according to the details of the Shroud's yarn and weave construction as noted by Professor Gilbert Raes [1] from a small fragment of the Shroud cut away in 1973. Dr. Brian Sagar of the Shirley Institute supervised the making of the replica, and I was able to discuss the project with him at the time.

Although when examined 'face-up' the Shroud linen is a 3/1 twill, I have commented elsewhere [2] that it is modern practice to weave such fabrics 1/3, 'back-up', in order to save power. The Shirley Institute replica was woven on a handloom by an experienced weaver who commented that the weaving of the twill was easier than that of a plain, tabby 1/1 cloth because of the reduced strain on the warp when woven 'back-up' with a 1/3 lift. This may have been why twill weaves were originally developed. The replica Shroud linen was scoured and finished using methods similar to those that might have been employed both in ancient and mediaeval times, and Dr. Sagar is to be complimented on the result achieved.

### Draping Tests

It is known that the way in which a cloth drapes is related to the quality of stiffness that is appreciated by visual examination. Methods of assessing the factors involved in the draping of a cloth have been developed and published by arrangement with the Textile Institute and the British Standards Institution [3]. These techniques, involving use of a fixed angle flexometer as described in British Standard 3356: 1961, [see below] rely upon the mathematical analysis of the bending of a cantilever and involve measuring the length of a fabric which will bend under its own weight to a predetermined extent. This is known as the 'Bending Length'.

As calculated by this method the bending length of the Shroud replica fabric, using specimen widths 2.5 cm. by 20 cm. long, was determined in centimetres as follows:

Warp		Weft	
Face up	Face down	Face up	Face down
2.20	2.25	3.25	3.65
1.95	2.10	3.70	3.20
2.08	2.18	3.48	3.43

The reconstruction of the drape of the Shroud derived, from the VP8 analysis of the frontal image

A visual inspection of the drape of the Shroud linen as reconstructed by Jackson, Jumper and Ercoline [4] appears to suggest that the Shroud is stiffer weftway than warpway by a factor of approximately three to two. This matches the findings of the directly determined bending lengths of warp and weft of the replica cloth. The greater the bending length, the stiffer the fabric.

This indicates that the theoretical draping of the Shroud in the form of a mathematical grid (see Jackson, Jumper & Ercoline's reconstruction on p.12), closely corresponds to the measured draping properties of a real cloth replica of the Shroud linen. The VP8 analysis evidently has a correspondence to reality, and cannot be dismissed as originating from a 'trick' of the computer or its programming.

#### REFERENCES

- [1] G. Raes, 'Appendix B-Rapport d'Analyse, *La Santa Sindone*, supplement to *Rivista Diocesana Torinese*, January 1976
- [2] J. Tyrer, 'Looking at the Turin Shroud as a Textile', *Shroud Spectrum International* No. 6, March 1983.
- [3] British Standard Method for the Determination of Stiffness of Cloth, British Standard 3356: 1961.
- [4] J. Jackson, J. Jumper & W. Ercoline, 'Correlation of image intensity on the Turin Shroud with the 3D structure of the human body shape', *Applied Optics*, 23, June 15 1984, pp.2244-2270.