

Lepton coin diameters and a circular image on the Shroud of Turin

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The Shroud of Turin is a cloth with dimensions of 4.4 x 1.1 metres, and with an image of a person with wounds. The Shroud has attracted the interest of scientists (e.g., Delage, 1902; Miller and Pellicori 1981; Stevenson and Habermas, 1981; Jumper and Mottern, 1982) and religious communities who consider it to be the authentic cloth that covered Christ after crucifixion at the time when Pontius Pilate was procurator in Jerusalem (Wilson 1978, 1979). The dating of this cloth has been controversial. Radiocarbon dates from three independent laboratories (based at Oxford University, the University of Arizona and the Swiss Federal Institute of Technology) suggested a date of between 1260 and 1390 AD (Damon et al, 1989), but this has been questioned on the grounds that the dated samples of cloth may not be representative of the entire Shroud. An earlier date has been suggested.

Jumper et al (1978) suggested that two circular objects (apparently with a diameter of approximately 14 mm) were recognizable over the eyes of the person represented on the Shroud. It has been suggested by others (Filas 1982; Fontanille 2001; Whanger and Whanger 1985) that the objects might be coins. This was followed by image analyses which claimed (controversially) that inscriptions could be identified, as well as the image of a *lituus* or crook that was minted on coins in the time when Pontius Pilate was procurator, associated with a date of *circa* 30 AD (Filas, 1982; Fontanille, 2001).

Members of the Shroud of Turin Research Project (STURP) never denied that circular objects such as coins might be featured on the eyes of the person represented on the Shroud. However, they disagreed with the notion that an inscription could be read from the Shroud image. Although they suggested *the possibility* of an image of a crook of the kind found on Pilate leptons, they noted that the observations were “intriguing points, but to date still *inconclusive*” (emphasis added).

Further research by Don Lynn at the Jet Propulsion Laboratory, based on high resolution images of the Shroud recorded by Vern Miller, indicated that the weave of the Shroud was too coarse to resolve such fine details as an inscription; Lynn (pers. comm. to B. Schwartz) thought that what was being identified as something similar to the markings on a lepton was most likely a coincidental result of contrast manipulation of photographs. It was recognized that when a high resolution, high contrast image of the Shroud is magnified, it is possible to obtain many shapes

that can be construed in different ways. This appears to have happened in the case of photographs of the Shroud recorded by Enrie in 1931.

I start with the assumption that at least one circular image can be identified on the left eye of the person represented on the Shroud (See Fig. 1). I accept the opinion of Lynn that the weave of the Shroud is too coarse to allow the identification of inscriptions, or images such as a *lituus*.

Objectives

There are six objectives in this basic study.

1. Using a scale that was photographed on the Shroud by the STURP team in 1978, I estimate the diameter (D1) of the circular object associated with the left eye of the person represented on the Shroud.
2. Using collections of leptons minted between 29 and 31 AD in the time when Pontius Pilate was Procurator in Jerusalem, catalogued by the British Museum in London, I calculate the mean diameter of such leptons (MDL) and associated standard deviation for these coins.
3. I compare the diameter D1 with the mean diameter (MDL) for Pilate leptons minted between 29 and 31 AD.
4. I compare the diameter (D2) estimated by Jumper et al (1978) for the circular object on the eye of the Shroud, with the mean diameter (MDL) for Pilate leptons minted between 29 and 31 AD.
5. I undertake a Student's t-test (t-1) to assess whether diameter D1 obtained from the Shroud is not significantly different from the MDL mean diameter of Pilate leptons minted between 29 and 31 AD.
6. I undertake a second Student's t-test (t-2) to assess whether diameter D2 obtained from the Shroud by Jumper et al (1978) is not significantly different from the MDL mean diameter of Pilate leptons minted between 29 and 31 AD.

Results

The D1 diameter for the circular object on the left eye of the person represented in the Shroud is 14.5 mm. The mean MDL diameter of Pilate leptons is 15.0 mm (+/- 0.62 mm, n=22 measurements). These leptons are associated with the period when Pontius Pilate was procurator.

Statistical "Student" t- tests have been undertaken to compare the D1 and D2 diameters with the MDL mean diameter for leptons curated by the British Museum. A value of 0.781 has been obtained for t-1, which is the t statistic associated with the D1 diameter of 14.5 mm for the circular object on the Shroud, compared to the mean diameter of 15.0 +/- 0.62 mm for Pilate leptons (n=22 measurements). A value of 1.562 has been obtained for t-2, the t statistic associated with the estimate of 14 mm for the circular object on the Shroud estimated by Jumper et al (1978), compared to the MDL mean diameter of 15.0 +/- 0.62 mm for Pilate leptons (n=22 measurements).

Conclusions

1. There is no significant difference ($p=0.05$) between the diameter of the Shroud's circular image (D1, measured as 14.5 mm) and the mean diameter of Pilate leptons (15.0 \pm 0.62 mm, $n=22$ measurements).
2. There is no significant difference ($p=0.05$) between the diameter of the Shroud's circular image (estimated as 14 mm by Jackson et al) and the mean diameter of Pilate leptons (15.0 \pm 0.62 mm, $n=22$ measurements).

I do not conclude that this constitutes proof that the circular object on the eye of the person represented in the Shroud is in fact a lepton dated at 30 (\pm 1) AD. The results do however support a hypothesis that the circular object is a lepton minted at approximately that time.

Questions have arisen as to whether or not coins were used to cover eyelids of deceased in Palestine about 2000 years ago. In response to such criticisms, Nitowski (1986, Chapter 7) notes that the custom did exist, and gives a specific example: "The burial at 'En Boqeq on the western edge of the Dead Sea, where two silver denarii of Hadrian (ca. AD 133) were found placed over the eye orbits". This example serves to support a hypothesis that the circular image on the left eye on the shroud represents a coin, but does not by itself constitute proof.

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Fig. 1. Image of the face of the Shroud, ©1978 Barrie M. Schwartz Collection, STERA, Inc.