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TEXTILE QUESTIONS THAT REMAIN FOLLOWING THE CARBON DATING TEST

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It is known that in 1532 the Shroud was being kept inside a silver reliquary in a chapel in Chambéry, France. A severe fire broke out in the building; the intense heat melted a corner of the casket and scorched the folded linen within it, producing the now familiar pattern of burns and markings. In 1534, patches were applied to repair the Shroud and a backing of buckram [Holland cloth] was added to strengthen it.

Contaminants in the Shroud

Close examination has shown that the Shroud has various kinds of contaminants that include organically based chemical compounds that contain carbon; for example, microscopical fungi, insect debris and pollens. These are not only on the surface but also embedded into the fabric and yarn structures. There are also likely to be deposits of smoke from the fire, and hydrocarbons from the vapours of candles, all of which contain carbon compounds.

Furthermore, the carbon dating specimens were taken from a corner, close against a join close to the side strip in an area that would probably have been held during displays by hands that were possibly soiled with perspiration and greases.

This same corner shows evidence of water staining probably associated with the water used to douse the fire. There are also several stains throughout the Shroud that have evidently soaked through the folded layers that bear tide marks, perhaps from the soiling and rust of an iron water-bucket.

Because of the fire and the melting of the metal casket, the heat inside must have been intense, probably reaching a temperature in the region of 900°C. (the temperature of molten silver). In these circumstances, natural moisture in the Shroud would turn into steam in places at superheat. This would be trapped in the folds of the Shroud. Any contaminants on, or embedded in, the fabric structure would be dissolved by this steam and forced into the weave and yarn construction, and would react chemically with the molecular structure of the fibres of the flax.

Problems encountered with the cleansing of the specimens prior to carbon dating

Contaminants on the surface of the cloth, within the interlacements of the weave, on the surfaces of the yarns, and even

within their twisted structures, can be removed with suitable surface actants and ultrasonic cleansing treatments. At fibre molecular level, however, the problem of contaminants presents specific difficulties.

The fine structures of flax fibres are built up from macromolecules which are of very great length relative to their diameter. They are linked together by crossvalency bonds to form the fibre, much as individual fibres are arranged in a yarn.

Along their length the individual fibres are envisaged as consisting of zones of crystallinity (micelles), which gradually fade into regions of lower crystallinity, and ultimate amorphousness. It would appear that these amorphous regions are the main determining factors of, for instance, receptivity of dyes. As dyes are, in effect, contaminants, it would follow that other contaminating molecules can also enter and link chemically into the fine structure through what are envisaged as 'pores' in the fibre. In fact, Preston quoting Evans suggests that these are like 'trap doors'. Delph, Fothergill and Morton have indicated that these regions have a sorptive capacity for water, which results in osmotic forces tending to cause the molecular chains of the fine structures to move apart. In so doing, the molecular network is expanded and the 'trap doors' are opened to the entry of other molecules. In this way, organic molecules containing carbon would become part of the flax fibre chemistry, and would be impossible to remove by surface actants and ultrasonic cleaning treatments. More drastic methods to remove the contaminants to give a pure specimen would inevitably destroy the flax fibres themselves.

In a sense, as a result of the fire, the Shroud has been `steamed, stewed and baked' together with its carbon contaminants. The temperature would rise and fall ascending to and descending from around 900°C., varying from place to place in the reliquary and according to the foldings of the Shroud. For these reasons, we cannot accept the Shroud as a chemically homogeneous and uniform object. In fact, after the 1978 examination, it was described by Rogers and other observers as having a faintly 'mottled' appearance. Perhaps this is a visual indication of the Shroud's chemical variability.

Unfortunately, it appears that the test samples for carbon dating have been taken without these features in mind. The area involved is very small relative to the whole of the Shroud, as well as being close to a join which may contain a selvedge — something to be avoided even in routine textile testing.

Archeological implications

This problem of more recent contaminants affecting the carbon dates recorded for archeological specimens, is now being considered by archeologists. Two such cases have been referred to in correspondence I have had with the Manchester Museum:

1. The dates that have been suggested by carbon dating for Lindow Man (now a famous Mancunian) are controversial. The problem here may be that the remains of 'Pete Marsh' have been partially absorbed by the marsh, and the marsh has been partially absorbed into 'Pete'.

2. The bones of one of our celebrated Manchester mummies appear to be 800-1000 years older than her bandages. Although there is speculation that she may have been re-wrapped at a later date, the question is still open that the resins and unguents used in the mummification may have affected the carbon dates recorded.

Conclusions

As far as the Shroud is concerned, I cannot but conclude that the results of the carbon dating tests must be treated with reserve because the carbon content of the cloth was 'topped up' with contaminants of organic origin that were in it at the time of the 1532 fire. This would falsify the carbon dating results and the Shroud itself may very well be much older than has been suggested.

Further work to try to date the Shroud by other means must now be given consideration because present carbon dating procedures would seem to be an inappropriate way of arriving at the true age of the linen.

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