FROM DR. MARIE CLAIRE VAN OOSTERWYCK-GASTUCHE
- ANOTHER CONTRIBUTION TO THE RADIOCARBON DATING DEBATE...

Dr. Marie Claire van Oosterwyck-Gastuche writes:

I have followed with interest the argument between Professor Tite and Dr. Kouznetsov concerning the C13/C12 ratio. With Dr. Evin and Professor Tite I participated in the radiocarbon dating panel at the Paris Symposium of 1989, and suggested at that time that the dating of the Shroud to the mediaeval period might simply have been due to a localised enrichment of C14 brought about during the fire of 1532. I asked for appropriate thermal tests as a control. However, Professor Tite and Dr. Evin rejected the idea, arguing that the C14 dates were absolute and thus needed no control. Nor did they allude to the C13/C12 ratio as a possible alternative control, insisting instead that the statistical calculation `had brought conclusive evidence' of the Shroud's 14th century date, so that nobody with a scientific background could be in any possible doubt about this.

However, I was not convinced [Van Oosterwyck-Gastuche, 1991] The calculations in the Damon et al. paper in *Nature* raised so many doubts that I consulted a professional statistician, Dr. Jouvenroux, who subsequently presented a paper at the Rome Symposium, of which more later. In the meantime:

[1] I accept Professor Tite's assurance that the laboratories tested the C13/C12 ratio, and obtained from this the 'normal' value of circa -25 ‰. However I am more sceptical about the efficiency of this to guarantee a true C14 date, i.e. one corresponding to the archaeology, since a great many materials, including textiles such as linen, wool and cotton, have the same C13/C12 ratio, yet provide very anomalous C14 dates. The high surface areas and porosity of these materials make them very efficient absorbers of all sorts of contaminants resistant to pre-treatment cleaning [Van Oosterwyck-Gastuche, 19937. This was well-known to Prof. Tite, since the samples used in his intercomparison prior to the dating of the Shroud [Burleigh, Leese and Tite, 1986] all had anomalous C14 dates but correct C13/C12 ratios, so that with blind testing their results could only be sorted out by statistical means.

[2] I am even more sceptical of Prof. Tite's assurance that the C13/C12 ratio signifies 'that no exceptional fractionation (i.e. enrichment) of these two isotopes had occurred as a result of any fire that the Shroud might have suffered', since Prof. Tite failed to carry out any test of this by way of control. This is particularly surprising given, as is well-known, that in 1532 the Shroud was involved in a fire that caused serious burn damage, showing that it had become heterogeneous.

By contrast the samples used in the Burleigh, Leese, Tite intercomparison of 1986 were specifically chosen 'for their homogeneity and typical state of preservation'. And they were cut 'from the same area of each textile ... away from selvedges and designs'. It is even more surprising, therefore, that despite these precautions they produced anomalous dates which had to be sorted out by statistics, whereas, as we read in Damon et al., the Shroud sample was cut 'away from the charred areas.' Why such a choice if the sample was homogeneous and the heat of the fire was believed to have had no effect?

[3] The thermal tests that I asked far were finally begun in Moscow, with the financial support of the well-known French sedimentologist Guy Berthault, since other labs that I had contacted since 1989 had all declined to perform them. They began at the end of 1992 and first results were obtained April/May 1993, so Dr. Kouznetsov rightly stresses that they are preliminary. Even so they have furnished a surprising amount of information.

The aim was to reproduce the conditions of the 1532 fire which, in my view, were not only thermal, with temperatures of up to 960° [the melting paint of silver: Ed.], but also hydrothermal, that is, with a high amount of water vapour present. I wanted to find out whether such conditions could create an up to 17% alteration of the radiocarbon content of a textile, which is the amount of enrichment needed far a radiocarbon date to be shifted from the first century to the 14th century.

Over and above any isotopic exchanges occurring between the cellulose, the wood from the casket, and/or the atmosphere of the time (none of which could add up to the 17%° required), I suspected that any reaction occurring at a temperature greatly in excess of that of pyrolysis (200°), could have farmed carbon-rich derivatives which might well have caused localised enrichments of the Shroud's C14 content. Such derivatives are resistant to any pre-treatment cleaning process [Van Oosterwyck-Gastuche, 1989, 1993, 199...]

Since these high hydrothermal conditions are difficult to reproduce, I sent to Moscow for analysis a synthetic sheet which had only narrowly escaped a fire in France, and had thus suffered hydrothermal conditions not dissimilar to those encountered by the Shroud. This sheet (to be known here as Carpentras 1991), featured dark lines from former foldings that had resisted acids, alkalines and various solvents, and were therefore probably enriched with carbon.

[4] I now wish to comment on the results obtained in Moscow, which were of three kinds:

[a] Data obtained from the so-called Boukhara linen. As explained by Dr. Kouznetsov at the Rome Symposium, these seemed to confirm a definite isotopic exchange apparently derived, as I anticipated, from the presence of water vapour, since a similar experiment carried out in 'dry conditions [Moroni and Bettinelli, 1993] gave negative results.

[b] Data obtained from the 'Carpentras 1991' synthetic sheet.

These were only made available to me after the Rome Symposium, and were then dealt with in Dr. Jouvenroux's `microstat' computer programme. Although the C14 content of the synthetic fibres was low, those with dark lines were found to have been enriched by as much as 20% in the case of their C14 content, and 30% in the case of their C13 content, as compared with non-darkened fibres only a few centimetres away [Van Oosterwyck-Gastuche, 1993, 199...]

[c] Data obtained independently by the Russian scientists

For me most important of all was the Russians' discovery of a biofractionation that occurs during the flax spinning process, and which can produce an up to 40% enrichment of the

linen's C14 content, compared to its content in the original, untreated flax. This implies not only that the Shroud would appear substantially younger than its true age, but also that all other datings of linens would be subject to similar inaccuracies - including those dated by Burleigh, Leese and Tite in 1986, also Damon et al.'s control samples in 1988.

It is my view that the models used by the Russian scientists to try to recalculate the Shroud's true age may in their turn be inaccurate, partly because they ignored the last-mentioned implication, but also because they may have been too hasty in extrapolating just a few results obtained at 140° with what is known to have occurred at much higher temperatures, results which were certainly different and more comparable with those observed far the 'Carpentras 1991' synthetic sheet.

In this regard I believe it almost futile to try to calculate the true age of a textile as badly adulterated as the Shroud, not only because of the impossibility of determining the exact conditions of the 1532 fire, but also, as Dr. Kouznetsov has pointed out, because of the considerable variations that can occur in the C13 and C14 content of living plants both past and present.

To sum up, the Moscow experiments prove that the hydrothermal conditions significantly changed the isotopic content of the textiles analysed, in each instance the C13 and C14 following the same trend, so that no change in the C13/C12 ratio should be expected. The Shroud carbon-dating experts neglected to take into account the effect on the radiocarbon date of such 'mishaps' as fire, flax spinning, and various possible contaminants, hence the considerable anomalies to their calculations [Van Oosterwyck-Gastuche, 1993; 199...]

[5] The above findings raise one more question. Since all the samples analysed by Damon et al. derived from spun flax, and since we know there to be considerable variations to the radiocarbon content of such plants when they are alive, how can they possibly claim correct results? We have seen that neither the C13/C12 ratio, nor pre-treatment cleaning procedures, can guarantee the accuracy of a radiocarbon date.

There remains the statistical calculation which helped Burleigh, Leese and Tite to sort out the 'correct' dates, and to exclude the 'outliers', during their blindfold intercomparison carried out with six laboratories in 1986, before the carbon dating of the Shroud. The authors concluded regretting that 'the small number of laboratories and the relatively small number of measurements had not allowed a very detailed statistical analysis to be made'.

This is perfectly true. So I would like Professor Tite to explain why, instead of increasing the number of radiocarbon laboratories testing the Shroud, he [or someone, at least - Ed.], actually reduced their number to three? Also why he has failed ever to furnish the full statistical record behind Damon et al.'s paper? Also why the laboratories were privately advised of each other's dates? All these factors, in particular the non-availability of the raw statistical data, have made it all too easy for the laboratories to produce an apparently consistent and outlier-free mediaeval date for the Shroud.

The statistical calculations in the Burleigh, Leese Tite and Damon et al. papers are in fact very peculiar. Van Haelst, for one, has levelled criticisms of them without receiving any satisfactory response from their authors. An exhaustive analysis was presented in Rome by professional statistician Dr. Jouvenroux who showed the calculations to have been artificially developed from unsound mathematical backgrounds in order to arrive at the dates reached. With regard to the Damon et al. work on the Shroud, Dr. Jouvenroux argues that the only conclusion to be drawn is that this was specifically determined within a 'confidence interval' of circa 2000 years. He has written an English version of his paper which he has made available to Professor Tite.

[6] To conclude, the experiments in Moscow have shown that hydrothermal conditions could have caused sufficient alteration to the Shroud's C14 content to transform what should have been a first century date into a 14th century one. They also indicate the possible influence of other factors, such as the flax-spinning process, ecological conditions, etc. As Dr. Kouznetsov rightly stresses, the experiments are still incomplete. But even at this stage it would be good for other laboratories to become interested and involved ...

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