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C14 DATING OF THE SHROUD: WHAT NEEDS TO BE DONE?[1]

DATAÇÃO DO SUDÁRIO POR CARBONO-14: O QUE PRECISA SER FEITO?

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ABSTRCT – These are the author's thoughts, reactions and proposals regarding C14 dating of the Shroud at that point in time, 13 years after the dating was announced. The situation was then still somewhat fluid, and some hope remained that another round of D14 dating would be permitted, as it was most reasonable to confirm or reject the 1988 results by running additional samples. Possible scenarios that could produce a faulty date are reviewed, and a proposal for a second round of dating of Shroud samples is offered.

KEYWORDS – Turin Shroud, C14, medieval dating, alternative sampling proposal

RESUMO – Este artigo apresenta os pensamentos, reações e propostas do autor a respeito da datação por carbono-14 do Sudário naquele momento, 13 anos após o anúncio da datação. A situação ainda era um tanto instável e havia alguma esperança de que uma nova rodada de datação por carbono-14 fosse permitida, visto que era mais razoável confirmar ou rejeitar os resultados de 1988 por meio da análise de amostras adicionais. São analisados possíveis cenários que poderiam levar a uma datação incorreta e é apresentada uma proposta para uma segunda rodada de datação de amostras do Sudário.

PALAVRAS-CHAVE – Sudário de Turim, carbono-14, datação

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medieval, proposta de amostragem alternativa

It is 13 years and 13 days since the results of the radiocarbon dating of the Shroud were announced at press conferences in London and Turin. That day back in 1988 is still very fresh in my memory, for it was the culmination of several years of effort to have the Shroud dated, and equally of several years of frustration at the faulty procedures, arrogance, byzantine intrigues and influence peddling that accompanied the planning of the test.

The result was a disaster for the Shroud, and that day truly marked the demise of the Shroud in the minds of tens of millions of people who knew something of the fascinating image it held and puzzle that it posed. The image and the puzzle are still there of course, but only a tiny percentage of those millions who formerly looked upon the Shroud with a wonderment and awe do so today. For the vast majority, the C14 result was the crowning and defining event in the encounter between the venerable relic and 20th century science. It was found to be medieval, a fake, maybe at best an icon of inexplicable realism, an oddity. But it was medieval, and thus could not possibly be the burial cloth of Christ.

In the months that followed the announcement of the dating, I consoled myself with the thought that, after the tumult and emotion died down, **surely** there would be another round of testing to verify and duplicate, or otherwise, the results from the first test. What would the Church have to lose, the Shroud having been so universally branded a fake? And I proceeded to write up and submit to Cardinal Ballestrero a proposal for just such a second round, correcting all the faults and errors and hideous short-comings in the first round. As an archaeologist with (at that time) 20 years of experience in using C14 dating as a practical tool in my work, the endeavor surrounding the dating of the Shroud was to me as inexplicable as it was incompetent. My critique of the preparations, protocol and actual dating are set out in my paper (MEACHAM 2000) given at the Turin conference last year.

There was no acknowledgment of or reply to my submission from Cardinal Ballestrero, nor from his

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"right hand man" Luigi Gonella, on whom falls most of the blame for such a badly planned project. The next year Ballestrero retired, and the new archbishop of Turin made it clear that no Shroud testing of any kind was going to happen for some time. And so it was, although such an attitude was totally baffling and distressing to me. Having opened the gates and allowed a great scientific study of the Shroud to begin, why would the Church refuse further investigations, especially when it became so abundantly clear that these were needed?

1993 was an important year for the Shroud's C14 "age determination." Two viable hypotheses were proposed, backed by observations and experimental evidence, to explain how the measured radiocarbon age of the Shroud might not be translatable into calendar age. These are of course the ideas of Kouznetsov and Garza-Valdes. Whatever one might think today of the personalities of these two men, their ideas were cogent and well argued, their hypotheses certainly viable and testable. Surely, I thought, these forces are strong enough that the Church will now allow another C14 test.

Seven years later, at a meeting in Turin, I was reading a rather strongly worded critique of the Church authorities in the presence of the newly appointed archbishop of Turin, Msgr. Poletto. At one point, a quizzical expression on his face suggested that he also found the story I was recounting rather disturbing:

> What is of particular concern is why the Church has done nothing to assist the investigation. The treatment meted out to Garza-Valdes is especially baffling. Whatever may be the personalities, the rivalries, the improprieties, etc., it is nonetheless true that this man made a major discovery that has very important implications for the C14 date. If there was any doubt about the Shroud fibers he obtained, or the manner in which he obtained them, why was he not given the opportunity to work on formally certified fibers from the Shroud? Two or three tiny 5mm fibers from different points on the cloth, similar to those removed previously for Frache, Filogamo, Zina and Baima, would have been sufficient. Instead, detractors of the Shroud were given the basis to claim that the fibers Garza examined may not even have come from the relic. One can only wonder, yet again, at why Church officials seem to

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make matters worse for the Shroud!

One would have hoped that Msgr. Poletto and his advisors might by now have taken some action to rectify this, and initiated a project to determine conclusively whether a bioplastic coating is present in sufficient quantity to have an impact on the C14 date. But, alas, to paraphrase Galileo: "*eppure non si muove*" ["but still, it doesn't move"]. Perhaps soon it will.

The Three Scenarios

Until last year there were two major hypotheses to explain how the C14 date for the Shroud might be in error (see Wilson 1998 for a summary and discussion of these hypotheses). Kouznetsov and colleagues, along with Moroni and Jackson, have argued that an isotope exchange might have been induced by the fire of 1532, leading to an enrichment of C14 in the Shroud. This scenario seems the most likely to me, because if the C14 age is really 1300 years younger than the true age of the Shroud, isotope exchange is the most likely vehicle that could bring about such a massive enrichment. If the Shroud is actually 2000 years old, then it is in the probably unique position of being the only sample ever dated by C14 which was subjected to fire more than a thousand years after its manufacture. I have searched the radiocarbon literature for a similar example without success; the formation of charcoal from burning wood is of course normally contemporaneous with the cultural layer or feature from which the charcoal is obtained and for which the age is being sought. There may well be a heat-induced isotope exchange process that has not been observed in other dated samples because none have had such a separation between the original living or cultural context and the exposure to heat. This scenario would be difficult to exclude entirely through new C14 measurements, but a sampling strategy can be aimed at detecting variations in the C14 depending on the degree of heating in the fire (see the proposed testing strategy below).

Garza-Valdes and later Mattingly have claimed that a microbial bioplastic coating of the fibers is a source of contamination that could have significantly skewed the C14 date. The evidence that has been presented thus far does make this

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hypothesis a viable one, but it puts the Shroud in a different kind of unique position -- many textiles (including some which have been handled for centuries) have been dated by radiocarbon, and none have yielded results that are aberrant by the magnitude that the Shroud date is, assuming again a true age of 2000 years. Much has been written about the large amount of contamination that would be required, the percentage of the mass, etc. to skew the date by such a magnitude, but this line of discussion seems to me to lead nowhere. If there really is a substantial bioplastic coating, this is an important new dimension to be explored and it is far too early to be debating the possible percentages. What troubles me is why no major discrepancy has been detected before in the dating of textiles. Another problem with the scenario is that fibers of the Shroud were subjected to intensive scrutiny by STURP scientists, including the microscopists McCrone and Ercoline and the chemists Heller and Adler, amongst others, none of whom reported any coating of the kind described by Garza and Mattingly. Further, the physical measurements on Shroud fibers conducted by STURP, and especially the more recent Fourier Transform Infared Spectroscopy done by DeBlase (2000) on fibers from the piece cut for radiocarbon dating, revealed no indication of substances that might be associated with a significant microbial deposit. These reservations notwithstanding, the bioplastic hypothesis remains a viable one and one that can be readily and conclusively tested for and confirmed or rejected.

Recently the work of Marino and Benford (In press) has breathed new life into another possibility, viz. that the area on the Shroud from which the C14 sample was taken had been the subject of medieval reweaving, resulting as it were in an "invisible patch." This is a possibility that I discussed with the archaeological scientist Stuart Fleming in the 1980s, and he believed that it was indeed within the realm of possibility that a highly skilled medieval restorer could have achieved a rewoven repair not visible to the naked eye. However, it struck us as an extremely unlikely scenario, as most restorers would not have had the skill nor would

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they have taken the time to do a re-weaving that would not be immediately obvious to a textile expert. On the other hand, the respected scientist and former STURP member Ray Rogers reviewed the issue recently and stated that "... the evidence shows that it is highly probable that the [C14] samples were not characteristic of the Shroud and were spurious." If indeed an "invisible patch" exists on the Shroud, this would I believe be the first such case for any medieval or earlier textile. The scenario is the easiest to confirm or eliminate in new C14 measurements, by the painfully obvious and simple expedient of dating of another sample from anywhere else on the cloth. As I wrote in my paper for the Turin conference last year:

"At the 1986 Turin conference which was convened to draw up a protocol for C14 dating of the Shroud, no amount of pleading and cajoling by me and Adler could persuade the assembled radiocarbon luminaries that a minimum of two sampling sites should be proposed. They were supported by the Church representatives who naturally wanted to limit the disturbance to the relic to the barest minimum. Only Otlet and Hedges supported the proposal."

In retrospect it must be obvious to anyone that taking only one sample was a colossal error.

New C14 Dating: What Needs to be Done

At the Turin meeting last year, the radiocarbon scientists Jacques Evin and Robert Otlet made a proposal for further testing in order, as they rather quaintly put it, "to obtain additional confidence in the radiocarbon dating results for the Shroud." First, they said that tests (chemical and physical) should be done "to investigate possible spurious C14 from whatever cause occurring in the linen of the Shroud (with confirmation that pretreatment could remove it)." These tests "should be carried out on the remnant of that cut for the radiocarbon samples, already examined by Dr. Vercelli." And in their view, only after these tests were completed and the results agreed by peer group review, should further radiocarbon measurements be made.

There is a basic problem with this approach, and it is the fact that the so-called "reserve piece"

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has been separated from the Shroud for 13 years, it has been in various hands and storage conditions, and cannot be said any longer to represent either the samples which were dated or the Shroud as a whole. (Could this explain why DeBlase did not detect any evidence for the bioplastic coating in his spectra? Or was Garza given pieces of the selvage, cut away and saved by Riggi, that might be anomalous?) In addition, the chain of evidence is broken, and Vercelli (2000) has done a service by reminding us how easy it is to produce a linen that very closely resembles the Shroud. This is not to say that any stock whatsoever should be put in the conspiracy theories that have been floated, which are patent nonsense. But chain of evidence is important, to insure and be seen to insure that no tampering could have taken place. This is a point on which radiocarbon scientists seem to run afoul; the Gove/Harbottle proposal of 1979 (at first supported by STURP) called for the Raes piece to be used. McCrone and Sox attempted to obtain from Prof. Raes the sample "which was kept in what looked like an old scrapbook for postage stamps." Eventually Gove and Harbottle accepted that credibility and chain of evidence required a fresh sample to be taken from the Shroud.

Evin and Otlet went on to suggest the following C14 measurements be done:

1. on the fragment already cut
2. on a sample of scorched material taken from under one of the patches
3. on a sample of the thread used to sew together the lateral bank and the main shroud piece.

4 on a newly cut sample from another corner

After the conference, I wrote to the Turin authorities (Centro and Archbishop) to register my strong support in principle for these proposals. While the details obviously need close scrutiny and in my view some amendments, it is clear that this is the right direction and the right attitude.

My first reaction was to reject number 1 on the basis of the chain of evidence considerations discussed above. On reflection it seems that this sample could be used for a small counter dating, along with a sample of charred cloth and a fragment of patch and/or backing cloth, as a control on the AMS dating which, because of sample size considerations, will still

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constitute the main thrust of future testing.

A sample of scorched material is an obvious choice, and one which I argued vehemently **against** during the Turin conference of 1986 if there was to be only one sampling site. As a second sampling site the charred material makes perfect sense, as there is a relatively large amount and its removal does not alter the appearance of the relic at all. There is probably enough material under one or two patches to allow both AMS and small counter dating. In addition, I would urge that a study of the X-rays be made to attempt to determine if there is any uncharred material next to charred and covered by any of the patches. A twin sample of charred and adjacent uncharred would shed light on any disparity in C14 content that might be due to the fire.

Number 3 of Evin and Otlet is an odd choice, and unnecessary if the objective is to determine the radiocarbon age of the cloth. It is an interesting side question, but should be left to future investigations. I would suggest in its place a thread teased out from the middle of the cloth, between the front and back head images. This thread would probably need to be between 20 and 40 cm long to satisfy the minimum AMS sample size, and any charred portion would need to be cut away before dating. Removal of such a thread would not leave any visible mark on the cloth.

A newly cut sample from another part of the cloth is also highly desirable, but emphatically NOT from another corner, to avoid places that have been subject to the greatest handling. I would suggest the removal of the small patch at the far left beneath the dorsal feet, and its substitution with a new patch of the same size as the other three along that edge of the cloth. This operation would provide a partially charred sample, an uncharred sample adjacent to it, and a 16th century patch as a control sample. The alteration to the general appearance of the relic would not be noticeable except to a few individuals who know the Shroud in intimate detail. The addition of a new patch of equal size with the others could even be said to improve somewhat the appearance of the relic.

In summary, my proposal for the second round of C14 dating is:

1. a sample of scorched

material from under one of the large patches, and if possible a sample of uncharred adjacent to it

2. a thread from the middle of the cloth

3. a sample from the end opposite to where the first C14 sample was taken

4. the "reserve piece"

5. a sample of patch or backing cloth as control

All of these samples can be removed with such an insignificant impact on the appearance and integrity of the Shroud as a relic and artifact that it is hard to imagine any objection on those grounds. The amount of material given up for testing would be tiny; the value of knowledge gained could be enormous.

New C14 Dating: The First Step

It was very disturbing to hear comments from respected Shroud scholars at the Turin conference last year to the effect that "it is premature to conduct new C14 dating" or "there is much research that needs to be done before any further testing is contemplated." This is basically foot-dragging, and there are perhaps selfish reasons why some people want any new round of C14 dating to be delayed as long as possible, or even indefinitely. Thirteen years have passed since the dates were announced -- more than adequate time to address the problems and issues posed by the results.

Indeed, the main issues **have** been addressed. It is undeniable that the 1532 fire might have caused a shift in the C14 content of the Shroud, but no one will ever be able to duplicate exactly the conditions inside the casket during the fire, and no one will ever be able to prove that the Shroud's C14 content was augmented by the fire. Further C14 testing along the lines proposed above would enable us to establish that the radiocarbon age of the entire cloth is or is not consistent, and if variable whether such variations can be seen in scorched-to-unscorched segments. It is clear where the samples need to be taken from in order to reach this goal. Establishing these facts would be of great significance in assessing the extent to which the C14 age of the cloth might have been altered by the fire.

Furthermore, in spite of Adler's dogged insistence, the issue of microbiological contamination

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raised by Garza-Valdes and supported by Mattingly is not resolved at present, and it cannot be resolved by examining samples that happen now to be in someone's hands. However, it will not be difficult to determine the extent of the problem with new samples taken from the Shroud. This issue would have been encountered and probably resolved in 1988 if only a proper screening programme had been carried out by the labs. Last week I asked Frank DeBlase, a specialist in spectroscopy, what he thought the best physical test would be for the bioplastic coating. His reply was Raman microprobe. In my paper for the Hong Kong Shroud conference of 1986 (MEACHAM, 1987), I wrote:

> The main contamination possibility is that of carbon from organic materials ... [from] mold, mildew or fungal growths ... bacterial or insect residues ... [p.49] All samples should be subjected to elaborate pretreatment, SEM screening and testing (microchemical, mass spectrometry, micro-Raman) ... (MEACHAM, 1987, p. 53)

The first step in a new round of C14 testing of the Shroud must be to resolve once and for all the issue of the bioplastic coating. Three 5mm snippets of Shroud fibers for examination and testing by three chosen institutions would undoubtedly be sufficient to settle this issue. If there is indeed a substantial bioplastic coating, then existing methods can be perfected either to extract the cellulose or to remove the coating. All of this could be achieved within a few months if the Turin authorities allow the bioplastic testing to proceed and give a clear indication that another round of C14 measurements will follow upon the resolution of the issue of possible microbiological contamination. The full support of the Turin authorities is absolutely necessary to move this work forward, and the prospect of further C14 measurement should be welcomed by all.

Conclusion

It was painful to see the demise of the Shroud on account of badly done C14 dating. And it has been torment added to pain to see the Turin authorities do nothing to support investigation of the date, not to mention allowing new C14 dating to be done.

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Surely the time has come for a complete and proper C14 dating of the cloth, and a copy of this paper is going to Monsignor Poletto with a plea that a new round be authorized. If the Shroud is to be universally relegated to the status of a medieval oddity or forgery, at least let it be on the basis of solid and unassailable measurements of the C14 content of the entire cloth, based on samples from several sites chosen specifically to address the issues and scenarios that have been raised.

One must acknowledge that, at the end of the day, when all the measurements have been done, it is possible the C14 age of the cloth will be confirmed as generally what the first measurement indicated. This would still not be proof in any ineluctable sense that the Shroud was medieval in age, but it would be very strong evidence pointing in that direction. There is equally strong evidence pointing toward antiquity. The choice would be stark: the Shroud as a freak of history (medieval crucifixion and unknown image formation process, or medieval genius forger) or the Shroud as a freak of nature (linen 2000 years old enriched in some manner to give an C14 age of 700 years).

On the other hand, if any of the three scenarios are shown to have influenced the C14 date, a dramatic new era in the saga of this intriguing cloth will have begun.

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