

THE RADIOCARBON DATING OF THE SHROUD OF TURIN

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During my professional carrier, as a supervisor of a large petrochemical plant, I was used to judge in a split second, laboratory analyses in the parts per million range.

Back in 1989, after my first reading of the Damon et all. rapport about the radiocarbon dating of the Shroud, I spotted some obvious discrepancies, in contradiction with the claimed 95%⁽¹⁾ confidence. I used a programmed statistical analysis, to verify the Nature dates.

The F-test (Inverted Beta Distribution) value was 4.7 and the Chi² test value was 8.56.⁽²⁻⁶⁾

Table 1.

RECALCULATION OF THE NATURE DATES BASED ON TABLE 1.

(Computer analysis, strictly following Wilson & Ward)

						Table2	Computer
Arizona	590-+30	606-+41	690-+35	701-+33		646-+31	646-+17
Oxford	795-+65	745-+55	730-+45			750-+30	749-+31
Zurich	733-+61	722-+65	679-+51	639-+45	635-+57	676-+24	676-+24
						Mean	689-+16
						Chi²	6.4
						%S.L.	5
							8.56
							1.2

Without any doubt such NEGATIVE values do not support the claimed 95 percent confidence. Following Prof. Hall, Dr. Hedges, Prof. Evin and other radiocarbon experts, one does not need statistics, to see that the Shroud is mediaeval.

Until today, none of these eminent radiocarbon experts, replied clearly to my simple question: "Why were the dates, provided by Arizona and the statistical analysis, made by Dr. Morven Leese of the British Museum, reworked?"

The 3 laboratories, the British Museum and the authorities in Turin did not open the files. Even a letter the Pope John Paul II did not create some co-operation in Turin.

(See appendix 2--3--4)

Dr. Tite solved all problems, by declaning that the Nature report was written from "memory". Step by step, the mystery of the poor sampling, biased statistics and a "report written from memory" was solved.

First Arizona admitted that, at the request of the British Museum, they reworked indeed their original EIGHT data into FOUR, eliminating the much to young dates 540 and 573.

This was NOT recorded in the Nature paper.

Dr. Hedges agreed, that they should have given, at better description about the sample taking.

In 1997, Dr. Hedges (Oxford) finally, admitted: "There was a just statistically significant difference between Oxford's results and the other two laboratories. Due to an underestimation of 5-10 years of the errors by the laboratories".⁽⁵⁾

Clearly the Oxford procedure to round up errors below 40 years to 40 years, was not enough. Enlarging the Oxford errors by 10 years, shifts the overall mean to 668-+16. The Chi² value becomes 6.76, still way above the critical value of 5.99.

Table 2

VERIFICATION OF THE EFFECT OF THE OXFORD ERRORS + 10.

A: Oxford

$$\frac{795/(65+10)^2 + 745/(55+10)^2 + 730/(45+10)^2}{1/(65+10)^2 + 1/(55+10)^2 + 1/(45+10)^2} = 750 \pm 37$$

B: Overall Mean

$$\frac{750/37^2 + 676/24^2 + 646/17^2}{1/37^2 + 1/24^2 + 1/17^2} = 668 \pm 13$$

C : Chi² and % Significance level.

Chi² test = [(668-750)²/37²] + [(668-676)²/24²] + [(668-646)²/17²] = 6.76 ⇒ % S.L. = 3.4.
 A chance of only 1 in 29 times, that the Oxford dates are compatible.

Dr. Hedges should have given the following scientifically correct statement: “In the case of finding a statistically significant difference, these Oxford dates should NOT be combined, but need careful reconsideration.”

Following Drs. Wilson & Ward, in “Archaeometry” (1980): “To test the hypothesis that the series of determinations are consistent and have effectively the same age, one determines the pooled mean and then uses the test statistic T, which has, under the null hypothesis, far (n-1) degrees of freedom a chi-square distribution”.

For the Shroud n = 3, the MAXIMUM Chi² value = 5.99. Because 8.56 > 5.99 one should determine objectively which observation(s) is/are outliers, a clustering type of approach involving the likelihood ratio, as recommended by Wilson & Ward.

Following Dr. Hoel, of the University of California, even in the case of chi-square test value slightly BELOW the critical value, one should NOT draw conclusions, but ask for more and better determinations.

The real meaning of Dr. Hedges sayings, is that one should enlarge the quoted errors, in function of the wide scatter. Note that “quoted errors in AMS” are MEASURED errors, and NOT ESTIMATIONS of the statistical (counting) error, the scatter of results for standards and blanks and the uncertainty in the d13c determination.

In Rome (1993) I showed that one must enlarge the Arizona errors by a factor 3.56 and the Oxford and Zurich errors by a factor 1.94, to obtain the final error of 31 on the mean 691 RC age. My conclusion then was: ‘The wide scatter of results indicates that the samples are not representative or that something went wrong during the experiments.’

Table 3

ERROR RANGE TO OBTAIN THE NATURE DATE 691±31.

A: 590±103 606±143 690±122 701±114 **Mean** = 646±59 **Mean** = 688±31
O: 795±124 745±105±107 730±86 **Mean** = 750±59 **Chi²** = 1.67
Z: 733±118 722±109 679±99 639±87 635±111 **Mean** = 676±46 **%S.L.** = 43

Note: In spite of the enlarged errors, the Chi² value of 1.67 falls between the Chi² values for samples 3 (1.3) and sample 4 (2.4). This indicates that for sample 1, the errors are not too small, but the scatter is much the wide.

At the Turin Congress in 1998, I concluded my lecture by saying: "Oxford was saved of being rejected as so outlier, by the application of a $-d13C$ correction from 27‰ to 25‰." In the Nature report, is not noted, that this $-d13C$ analysis was NOT made by the Oxford laboratory. I estimated the mean for Oxford, based on RAW dates, not corrected for $-d13C$ to be about 785-+31. This gives an unacceptable Chi-square test value of 15.46.

In other words, the raw Oxford dates are NOT compatible with the Zurich and Arizona dates.

Shortly after the 1988 test result was announced, Prof. Hall of Oxford, questioned by the historian Noel Curver-Briggs, agreed to "correct" the Oxford date to 1237 AD.⁽⁴⁾

Converted into radiocarbon age before present, about 815 years, this leads to an unacceptable Chi-square test value of 22.95.

Strangely, Dr. S. Bottema of the University of Groningen, published in the Dutch magazine "Natuur en Techniek" Nr. 92 (1992), for Oxford, a calendar age 1132-1262 AD, making reference to List N° 11 of excellent Oxford AMS dating record, published by Dr. Hedges in Archaeometry Nr. 32.⁽³⁾

Strangely, list N° 11, contains the same 12 dates, noted in Table 1 of Nature.

I plotted the calendar age 1132-1262 AD on the calibration curve of Stuiver & Pearson, used in Nature. This corresponds with an unacceptable radiocarbon age of about 860 radiocarbon years. This leads to an unacceptable Chi² test value of 37.11.

May one assume, that Dr. Bottema, like Dr. Tite, wrote, from memory? Did Prof. Bottema make some mistakes, copying the dates?

Strangely, the paper of Dr. Bottema is illustrated by a photo showing the Oxford steel container, with the red seal of Cardinal Ballestrero, still UNBROKEN.

This indicates that Dr. Bottema had access to the Oxford files. Maybe he was briefed by Prof. Hall. Finally, Dr. Bottema, wrote to me, that his source was probably Prof. Evin.

Let me say, that I was not surprised by the fact that Dr. Hedges, Dr. Tite and Prof. Evin did not reply to my letters, asking to verify the Bottema paper.

In my opinion, the REAL Oxford date may be noted by Prof. Hall and Prof. Bottema.

I know very well, that 840 and 880 are still much to low radiocarbon ages.

Reworking the statistical analysis: with these values, show clearly that the Oxford date: are OUTLIERS. Such data should have been rejected.

At the Richmond Shroud Congress (1999) I estimated the errors range, based on the scatter, in function of a two tail Chi-square test for 95% confidence and 2 degrees of freedom. For a mean Oxford date 785, as estimated by Van Haelst, the Shroud may date before or after the age range 724- 1766 A.D.

For the Oxford dates noted by Prof. Hall and Dr. Bottema:

For 815, as noted by Prof. Hall, the Shroud may be dated before or after VII - XIX th. C. For 860, as noted by Dr. Bottema, the Shroud may be dated before or after V - XX th. C.

Table 4
COMPARISON OF DIFFERENT OXFORD MEANS.

	Oxford	Mean	Chi²	%S.L.	1 Chance in
Nature	750-+30	689-+16	6.40	5.0	20
Computer	749-+31	672-+13	8.56	1.2	71
Van Haelst	785-+31	677-+13	15.46	0.0044	2278
Hall	815-+31	682-+13	22.95	0.0001	96371
Bottema	860-+31	690-+13	37.11	0.0000009	11493722

Note: The data given by Van Haelst, Hall and Bottema are represented on graphs 1 & 2.

Conclusion:

In the case of my estimation 785-+31 being correct, there is only 1 chance in 2278 times:, that the Oxford results ere not outliers, which should have been rejected byte British Museum.

In the case of both, Prof. Hall and Prof. Bottema are right, the chances became so infinitely smell, that the whole radiocarbon dating assessment is of no scientifically value.

My conclusion remain: "The wide scatter of results indicate: that the samples taken on April 21, 1988 are not representative for the Shroud or that something went wrong during the experiments." Dr. Hedges said in 1997: "There was a just statistically significant between Oxford's: result and the two other laboratories".

One may wonder, why it took Dr. Hedges about 8 years, to say, what I told him, at the beginning of our extended correspondence. The same goes for the after laboratories, the British Museum, many radiocarbon experts, the redaction of Nature and Radiocarbon and after scientists.

It is a pity, that Dr. Hedges, made his statement in "Approfondimento Sindone", not in Nature. Nevertheless, I consider that Dr. Hedges, awarded me finally the "Oscar" for my long crusade Mr. Pierre Perrier, General Delegate of CADAS, of the "Institute de France. Academy of Sciences"; wrote the following comment of the radiocarbon dating of the Shroud, in a recent letter to Madame von Oosterwyck: "Lets us hope, that the tarnish period of the false dating of the Shroud, may be sign for the scientists, the media's and the general public, to accept the notation "uncertain", about scientifically experiments".

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References:

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3. "Origin and Age of the Shroud" Dr. Bottema. (Natuur and Techniek 1992. Page 778)
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6. "Perry's Chemical Engineers' Handbook" Fourth Edition. (McGraw-Hill.)

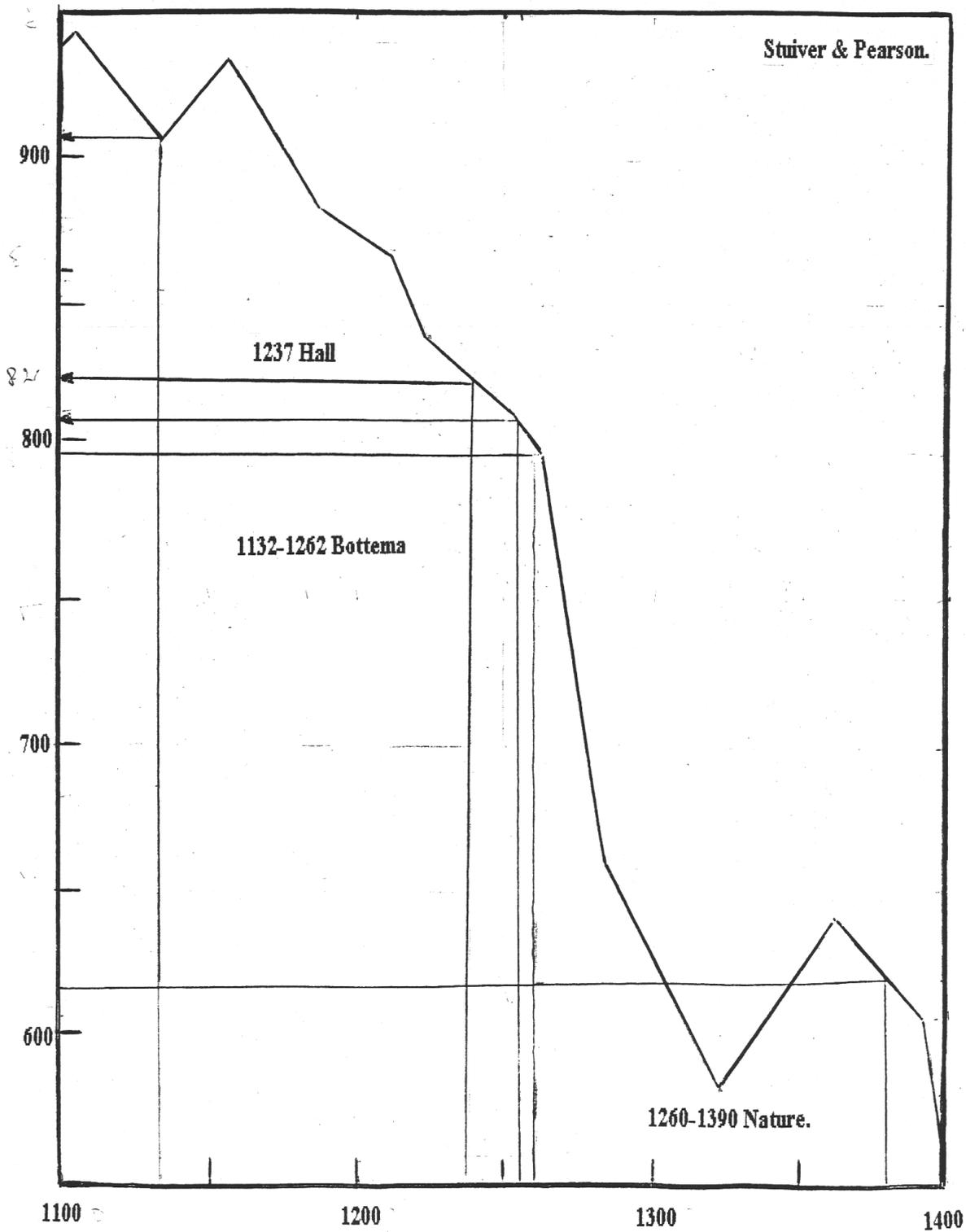
Note:

The statistical work of Remi Van Haelst, can be consulted on INTERNET.

<http://www.shroud.com/vanhelst3.htm>

Calibration of the dates given by Nature, Hall and Bottema. 25 130

Stuiver & Pearson.



Graphical representation relationship χ^2 - % Significance Level. (2 Degrees of Freedom)

All results ABOVE $\chi^2 = 6$ and Under % S.L. = 5 are statistically meaningless.

