

THE LETTER THAT 'NATURE' DID NOT PRINT...

In *Newsletter* 21 we published the letter by Dr. Thomas J. Phillips of Harvard University's High Energy Physics Laboratory to the journal *Nature* in which he argued for possible radiation from the Shroud body having affected the cloth's carbon 14 content, thereby falsifying the dating reading. BSTS member Frank Grenfell has justifiably castigated us for devoting too little space to the corresponding response from the Oxford laboratory's Dr. Robert Hedges, but while the main reason for this was insufficient space we are perhaps a little less culpable than *Nature*, who subsequently refused to print anything of Dr. Phillips' reply to Dr. Hedges.:

Sir - In a recent correspondence (*Nature* 337, 594), I pointed out that the image on the Shroud of Turin may have been-formed by a unique physical event, and this even may have also produced a flux of neutrons which affected the carbon 14 dating of the Shroud. The reply of R.E.M. Hedges to my suggestion contains a number of questionable arguments which require a response.

(1) No physical mechanism has been proposed to explain the neutron flux, and yet our ignorance of the process does not change the possibility that it may have occurred. We do not understand the cause of the Big Bang, another unique physical event, but that does not keep us from studying its consequences. To not permit the possibility that the image on the Shroud was caused by a unique physical event, which may have had other consequences including a neutron flux, is a serious scientific bias, especially when there are historical records which support the occurrence of such an event. Besides, it is precisely this possibility which makes the Shroud interesting.

(2) Hedges' argument that the neutron flux would have to be 'fine tuned' to cause the observed date has a number of flaws: (a) It relies on the assumption that all the neutrons in the body are available, yet known physical mechanisms are capable of releasing only a minute fraction of the neutrons in any sample of matter. (b) If fast neutrons were released rather than thermal neutrons, the cross section for producing carbon 14 would be significantly reduced, reducing the range of accessible dates. (c) The window of acceptable historical dates is broader than ± 100 years. Any date prior to 1203, when the Shroud was apparently seen in Constantinople by Robert de Clari¹ and others, would have been consistent with our historical knowledge of the Shroud. (d) A randomly chosen date in the interval -2000 thru 100000 years has a 1 in 510 chance of being within 100 years of any given date, and a 1 in 85 chance of being within a 1200 year interval. Of course, the historically acceptable period is not just any 1200 year interval, but the *first interval*, where the date must land if the number of neutrons emitted was not excessively large.

(3) Hedges accurately points out that nitrogen 14 will also produce carbon 14 when irradiated with neutrons. I intentionally omitted this fact from my correspondence because to my knowledge the nitrogen content of the Shroud has not been measured. The nitrogen contribution does not change the argument, only the numbers and possibly the chemical implications. Hedges conclusion that the "carbon 14 formed by neutron irradiation behaves chemically in the same way as the original carbon 14" is incorrect. The strongest conclusion that can be drawn is that the pre-treatments performed at the different labs affected the carbon 14 from nitrogen in roughly the same way. For example, if none of the pre-treatments removed any of this carbon 14 from the cellulose, then all of the labs would have gotten

equivalent results. Further tests would be required to determine the effect of the different pretreatments on the carbon 14 from nitrogen 14.

(4) Finally, Hedges points out that the flux variation over the 1 cm sample size must have been less than 1%, yet the article on the dating² indicates that with 95% confidence the variations in the dates obtained by the three labs were too large to have been caused by chance alone. An 8% variation in the flux between the samples, which is the variation expected from a naive (point source) model of the flux distribution, would explain the 100 year variation in the measured dates. Alternately the variations may have been caused by the different chemical pretreatments, as mentioned above.

If the amount of carbon 14 in the small sample taken from the corner of the Shroud has been affected by neutron irradiation, contamination, or any other means, then the inferred radiocarbon date is inaccurate. Most of these potential problems can be addressed simply by dating one or more additional samples taken from a different part of the Shroud, possibly from under one of the patches. Contrary to Hedges' opinion, there are tests which could conclusively confirm the presence or absence of neutron irradiation: a carbon 14 ratio for the above mentioned sample consistent with the ratios already measured, along with a measurement of ³⁶Cl and ⁴¹Ca concentrations to be background levels, could eliminate the possibility of neutron irradiation beyond a reasonable doubt. Until these further tests are made, we cannot conclusively state that the Shroud of Turin is medieval.

References

1. Clari, R. *de La conquête de Constantinople*, ed. P. Lauer (Champion, Paris, 1924).
2. Damon, P.E., *et al.*, *Nature*, 337, 611-615 (1989).