ORIGINAL ARTICLES (2)

RADIOCARBON RECALIBRATION

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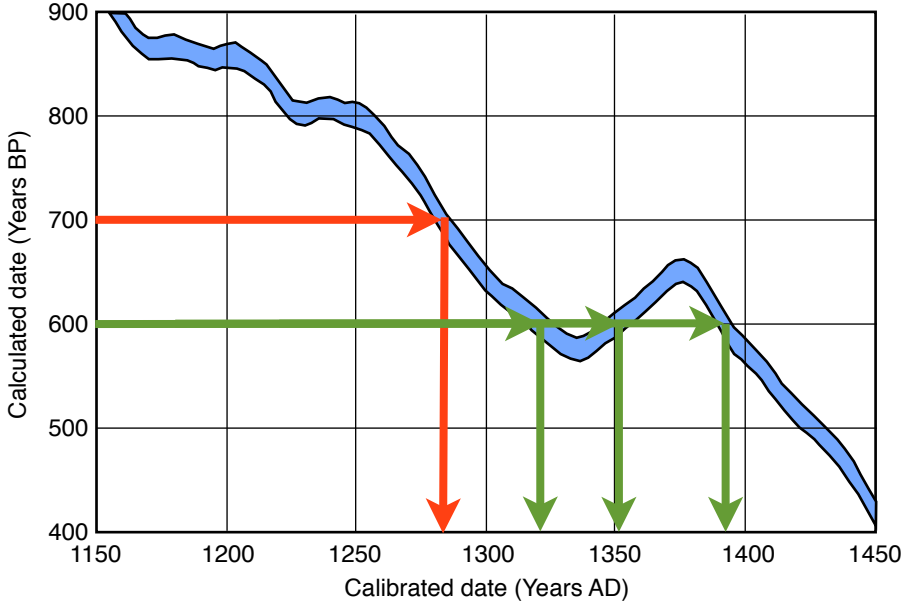
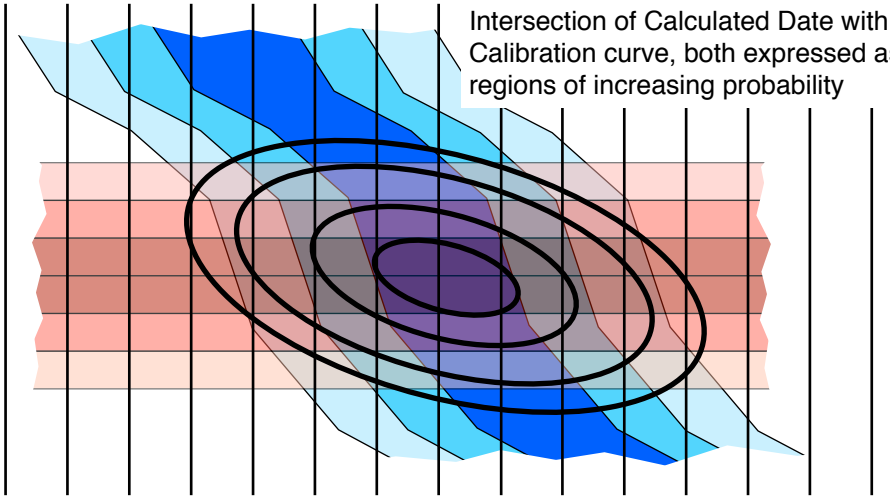
Although the decay of Carbon-14 into Nitrogen-14 with a half life of 5730 years can act as a regular counting device with which to derive a mathematically calculated age of an organic material, its actual age depends on the proportion of Carbon 14 to Carbon 12 there was in the material when the carbon atoms became part of it, and this has varied through history. In some cases, a single calculated date Before Present (BP) derived from C14 decay can convert to several possible calendar dates. We know this is true because of several dendrochronological studies, and attribute it to variations in the cosmic radiation causing variations in atmospheric C14 generation. For this reason every radiocarbon calculation must be calibrated against a recognised reference curve in order to produce an accurate calendar date. An extract from the most recent of these is shown below.(1)



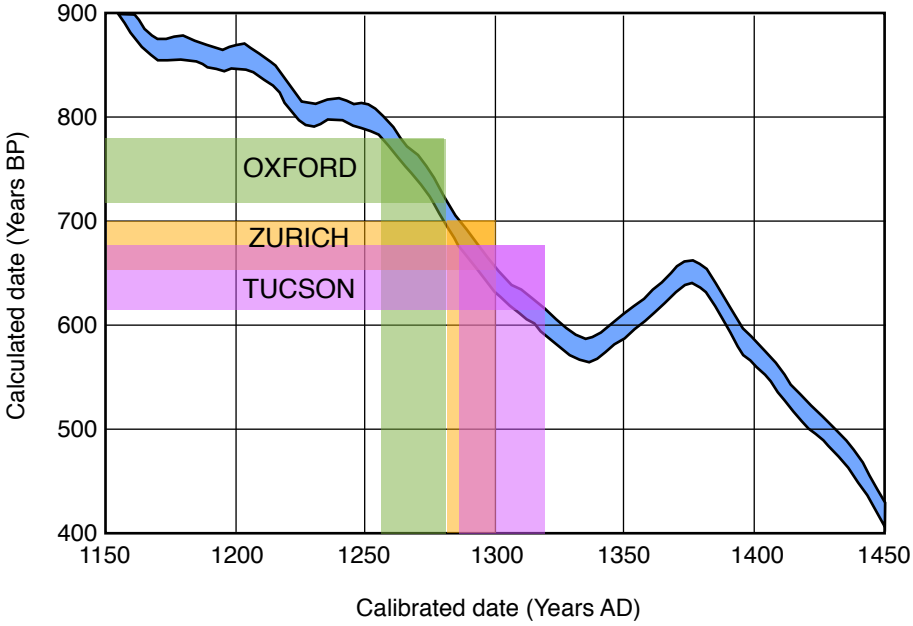
As can be seen, a calculation of 700 BP (red arrow) leads to a single calendar date (about 1285 AD), but one of 600 BP (green arrow) could mean that the artifact originated from any of three dates (about 1320, 1350 and 1390 AD), only one of which can, of course, be correct.

Furthermore, neither the C14 measurements nor the calibration curve yield exact dates. They correspond to a range of probabilities. Probabilities are usually expressed as a central "average" number, around which other dates cluster, the closer they are, the more likely they are. The intersection of a very unlikely BP date with a very unlikely Calendar date means that the chances of it being accurate are very unlikely indeed.



As it happens, all the Shroud samples tested fall into one or other of the two categories illustrated above in red and green.(2) All three labs cut their samples up, and tested each piece separately, resulting in twelve separate measurements of the C14 decay. Eight of the twelve correspond to the red arrow, and four to the green. It is therefore more likely that the Shroud dates to a time earlier than the C14 minimum at 1335, so, for the purposes of this article, the dates after that time have been discarded. All twelve calibrations include a component along the 1250-1335 gradient, and the average of them is about 1290 AD.

Looked at on a lab by lab basis, the average dates of the pre-1335 components are: Oxford - 1267 AD, Zurich - 1291 AD, Tucson - 1303 AD



Although the spread of measurements is relatively small, it is sufficient to cast doubt on the homogeneity of the three laboratories' samples, and justifies Riani and Atkinson's claim of the probability of a genuine chronological gradient across the samples (although their conclusions were based on an analysis of all twelve results, not just the three averages above.(3)

1) The curve is taken from OxCal v4.2.3, an online calibration service produced by Christopher Ramsey of the Oxford Radiocarbon Accelerator Unit, using data from Reimer et al., 2013.

2) *Radiocarbon Dating of the Shroud of Turin*, Damon et al., Nature, 1989

3) *Regression Analysis with Partially Labelled Regressors: Carbon Dating of the Shroud of Turin*, Riani et al., Statistics and Computing, 2012