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TL COLOUR: HIGH VS LOW DOSE MEASUREMENTS AND THE PRE-DOSE MECHANISM

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The following spectra were recorded using a spinning interference spectrometer (to be published, J Phys:E) from a sample of quartz extracted from Egyptian medieval pottery (ref. 506c1) that has been dated by TL as being fired around 500 years ago. The spectra were recorded in the temperature range 350 - 400°C of the glow curve and were obtained in sequence from the same sample after various beta ($^{90}Sr/^{90}Y$) irradiations. The spectra shown have been corrected for instrument response and have been normalized on the basis of total photon count. The sample was heated at 10^{o} sec^{-1} in an atmosphere of oxygen-free nitrogen to a maximum of 500°C.

Discussion

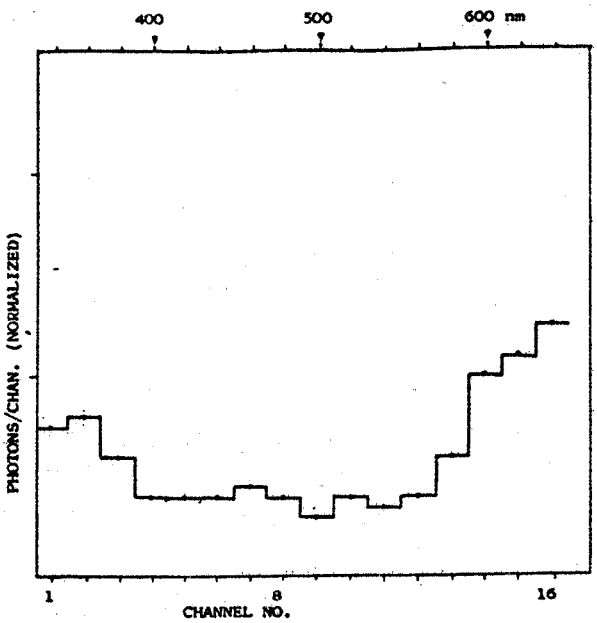
Although the test dose is large compared to the natural dose, the change in spectra shown in figs 1a and 1b is small. However, the high dose (46 krad) spectrum, fig 1c, is significantly different and would be a misleading guide to that to be expected after a dose of 5 krad. The effect of the pre-dose mechanism is shown clearly by the marked difference of fig. 1d in comparison with fig. 1b, which has given rise to a relatively higher enhancement in the blue (460 nm) region of the spectrum. The glow curve intensity after the administration of the third test dose had changed by a factor of four.

These results underline the necessity of making low dose spectral measurements and that spectra obtained at dose levels which are many hundreds of times higher than the natural dose, may be quite misleading.

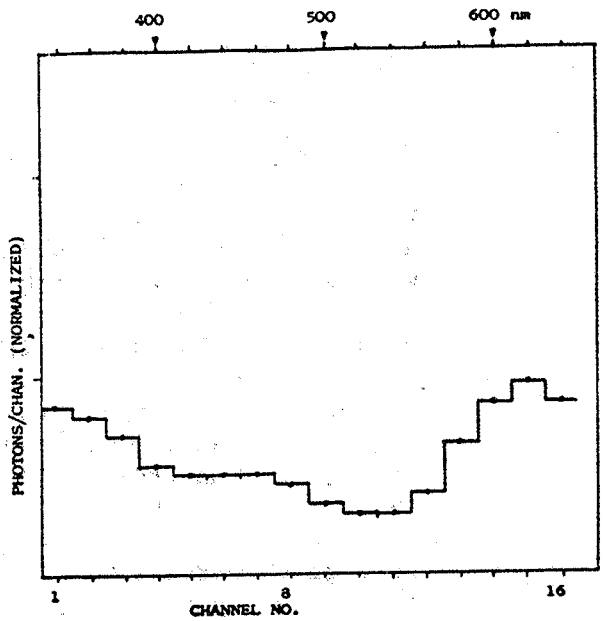
Acknowledgements

The age measurement on this sample was made by Joan Huxtable of this laboratory. The spectrometer was built with the aid of a grant from the Paul Instrument Fund of the Royal Society.

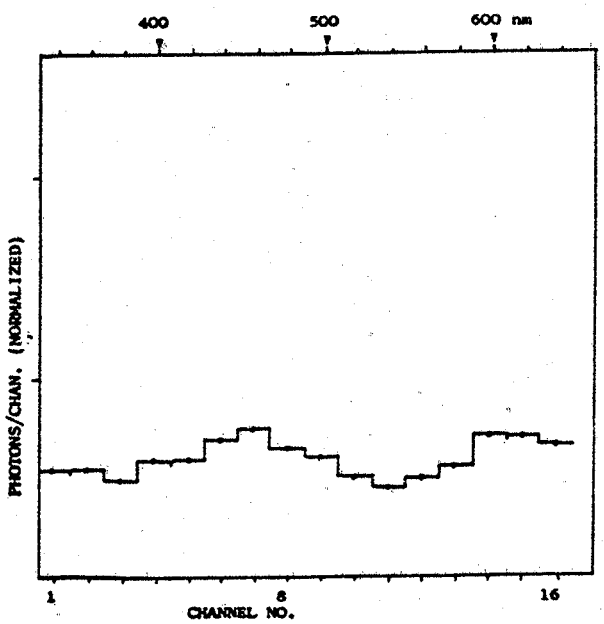
FIGURE 1 : TL SPECTRA (reproducibility ± 5%)



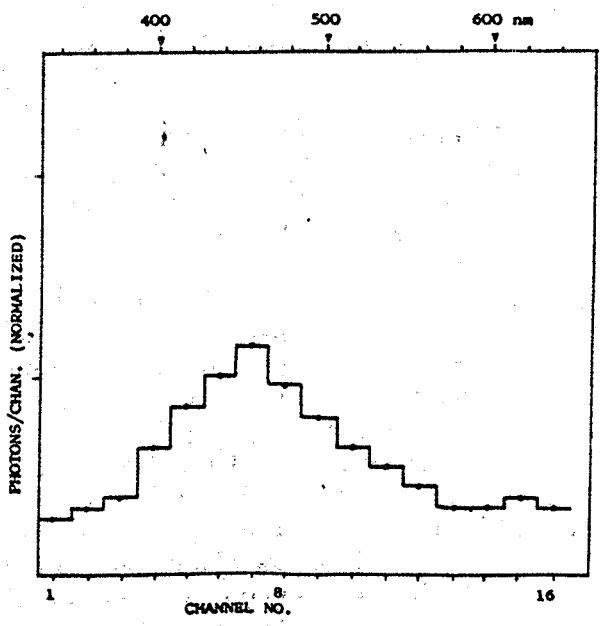
after a beta test dose of 5 krad in addition to the accrued archaeological dose equivalent to 150 rad.



b) after a beta test dose.



c) after a beta dose of 46 krad.



d) after a beta test dose.