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EMISSION SPECTRUM OF THE 'FACEY' LIGHT SOURCE

I.K. Bailiff *

Research Laboratory for Archaeology and the
History of Art, 6 Keble Road, Oxford,
OX1 3QJ, England.

A light source that is suitable as a reference for the TL detection system and based on a design by Facey (J. Sci. Inst., 1966, 43, 658) is manufactured by D.A. Pitman (Weybridge, Surrey, England). It is claimed to have good stability ($0.04\% \text{ } ^\circ\text{C}^{-1}$), blue/violet emission and low light intensity (nanolumens). The source consists of several microcuries of C-14 uniformly dispersed in a plastic scintillant. The pulse height spectrum is significantly biased towards double events and so differs from the single photon spectrum obtained for example, with a light source of the type manufactured by Saunders Roe (betalight D08; tritium and phosphor cell) that characterizes TL. However, the betalights that have been used in this laboratory have not been found to have particularly good temperature stability ($0.5-1.0\% \text{ } ^\circ\text{C}^{-1}$). We have tested a standard light source which is mounted in an aluminium holder.

The emission spectrum has been measured using a spinning interference spectrometer (see Ancient TL, 2, 1978). The spectrum measured with the source at 20°C , is shown in figure 1 (plot A). It has been corrected for instrument response and normalised on the basis of total photon count. Reproducibility was better than $\pm 3\%$. The spectrum has maximum emission in ch5 ($\lambda_{\text{max}}=420\text{nm}$). When plotted on an energy scale the spectrum remains asymmetric. This is presumed to be the result of optical absorption in the UV region by the plastic medium in which the scintillant is immersed. The spectrum was also measured after the light source had been stored for 2h at 50°C . The normalized spectrum shows a slight shift to longer wavelengths (fig.1, plot B). Over the range of the spectrometer a $6 \pm 2\%$ loss in counts was recorded. There is a spectral dependence to the loss and in the regions chs1-9 and chs10-16 the losses were 5% and 20% respectively. The former interval, containing 94% of the total count, thus showed a loss of $0.17 \pm 0.06\% \text{ } ^\circ\text{C}^{-1}$. This is higher than the Pitman figure of $0.04\% \text{ } ^\circ\text{C}^{-1}$ (below 40°C), but for TL detection systems biased towards the blue or shorter wavelengths, the variation in normal use is likely to be less than $\pm 1\%$.

* Present address

TL Dating Unit, Dept. of Archaeology,
46 Saddler St., Durham, DH1 3NU,
England.

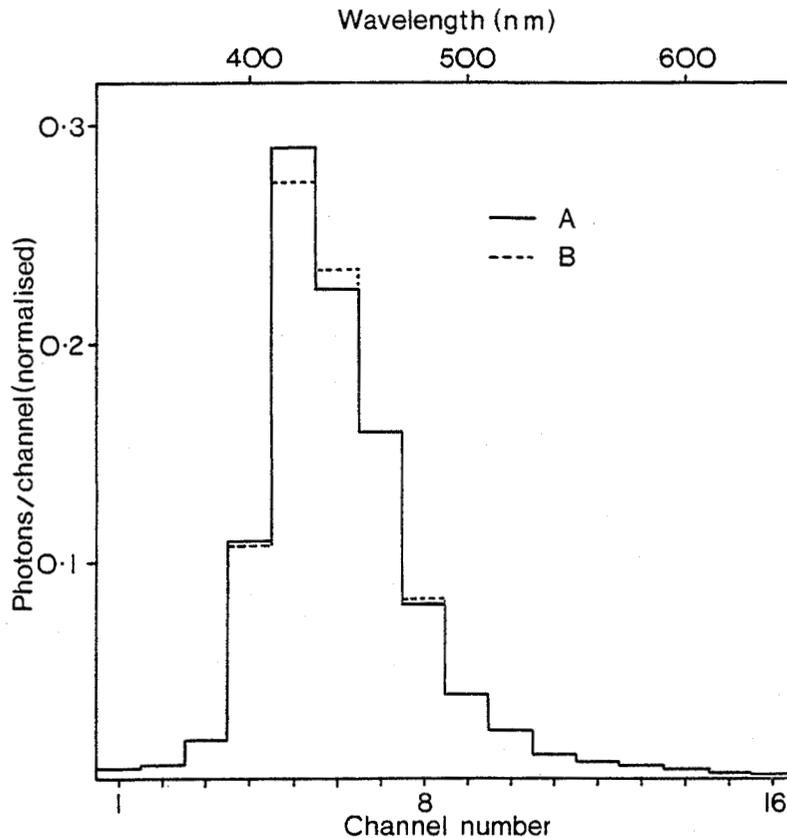


Figure 1

Plot A; corrected spectrum obtained after a 2 min. count at RT. Total number of photoelectrons counted was $3.4 \cdot 10^4$

Plot B; corrected spectrum, measured after storage of light source at 50°C for 2h.

The spectrometer comprises of 16 interference filters each of which has maximum transmission (λ_{max}) commencing at 340nm (ch 1) and progressing in 20nm intervals to 640nm (ch 16). The scanning time over the spectral range of the instrument is 125 msec.

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