A CAUTION ON LABORATORY ILLUMINATION

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As part of a broad investigation of the bleaching of sedimentary quartz it was proposed to examine the relative bleaching efficiencies of various wavelengths. Preliminaries involved identifying any sources of bias in the experimental design. One possible source considered was the laboratory darkroom illumination.

Lighting at the Adelaide laboratory is provided by white fluorescent tubes converted to safelights. This is cheaply and conveniently done by jacketing the tubes with plastic theatrical colour filters possessing suitable spectral transmission characteristics (Sutton and Zimmerman, 1978; Jensen and Barbetti, 1979).

Given the apparently innocuous nature of yellow light, and the greatly increased operator comfort compared with red light, the Rank Strand Electric filter "Cinemoid" No.1 (yellow) has been used for a number of years, with the standard safelight being one 40W fluorescent tube wrapped in at least two layers of this material.

To ascertain whether this illumination had any effect on quartz TL, two sets of quartz samples were exposed to a safelight for times of up to 72 hours. Both sets were positioned about 1.6m from the centre of the fluorescent tube.

The results are shown in figure 1. Clearly there is considerable disruption of the initial signal. Most notable are the apparent removal of the 325°C peak in (a) and the 25% reduction in peak height at 330°C in (b). In case (a) the bleaching appears strong at the 325°C peak, but the remaining peaks grow, presumably by retrapping. In case (b) the reduction is general, though to differing extents, across the entire glow curve. Both cases illustrate changes of an extent unacceptable in TL work. Mejdahl (pers. comm., 1984) also reports disruption to both quartz and feldspar glow curves by exposure to an unspecified light source(*Ed. note* : VM responds - " ... it was a 40W incandescent bulb at ~30cm from the sample.") through two layers of "Cinemoid" No. 1 filter.

Fortunately, the time required for these effects to become prominent is long (>4 hours) compared with normal laboratory operations. Nevertheless, this unexpected susceptibility of quartz TL to bleaching indicated that the safelight spectrum required further restriction, with the transmission cut-off at longer wavelengths. The "Cinemoid" line was no longer readily available, hence a number of possible substitutes were vetted. A range of "Rosco" filters were found to have excellent cut-off properties, but were marred for TL purposes by narrow "windows" of 5-20% transmission in the near UV/blue region.

Further searching revealed an ideal range of filters for safelight use, manufactured by "Chris James and Co.," of 19 New Wharf Road, London, N1 9RT, and available through local agents. The transmission curves of the more suitable filters are shown in figure 2, with a "Cinemoid" No.1 curve for comparison. As a consequence

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of the above, new fluorescent tubes were wrapped in two layers of "Chris James" No. 179 (chrome orange). This provides adequate lighting for normal darkroom operations, combined with significant reduction of <550 nm light relative to "Cinemoid" No.1, and better than 99.99% blockout of the blue/UV wavelengths. Bleaching is less than 5% in 24 hours. Further restriction of "yellow" wavelengths is possible using "Chris James" No. 105 (orange) or No. 158 (deep orange), but is probably unnecessary. The red filters No. 164 (flame red) or No. 106 (primary red) reduce the intensity to a level uncomfortable to the operator after protracted working sessions.

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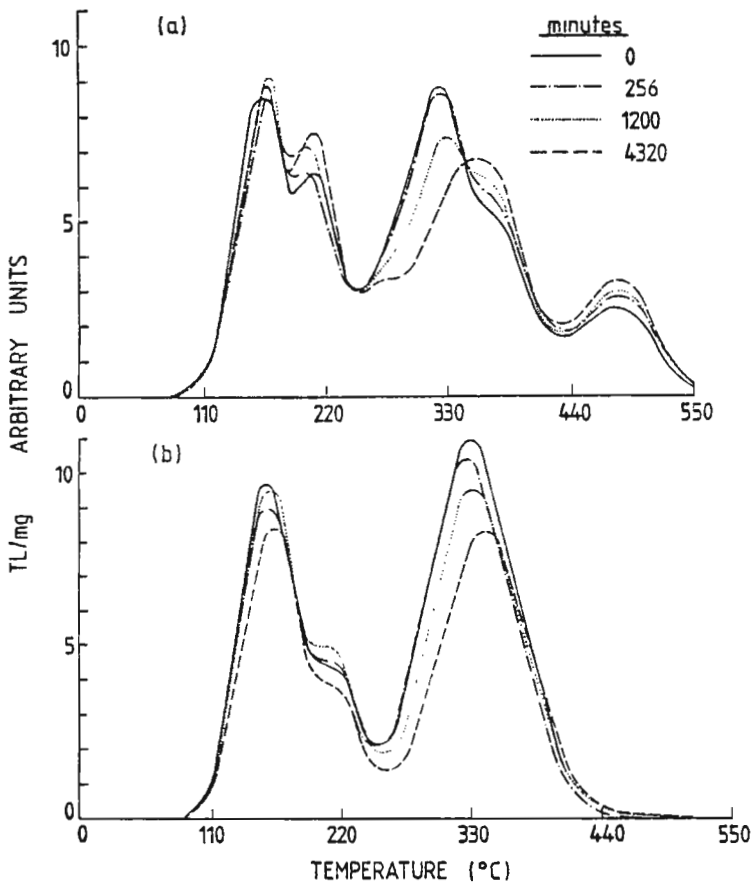

Figure1.
Shows the bleaching of Lake Woods Quartz from a 40W fluorescent tube wrapped in two layers of "Cinemoid" No. 1 (yellow) filter. The samples were positioned ~ 1.6m from the tube; exposure times as shown.
Treatments:

(a) Lake Woods (S3, TD, 1m) Quartz; pre-heated to 550°C at 5K/s to erase NTL; 74.5 Gy ^{90}Sr-^{90}Y ß irradiation; two days delay before bleaching.

(b) Lake Woods (S3, TD, 1m) Quartz; annealed at 800°C for 24 hours in air; slow cooled; 96 Gy ^{90}Sr-^{90}Y ß irradiation; two days delay before bleaching.

Prior separation steps consisted of HCl digestion, sieving for the 90-125µm fraction, magnetic separation and a 40 minute etch in 50% HF.

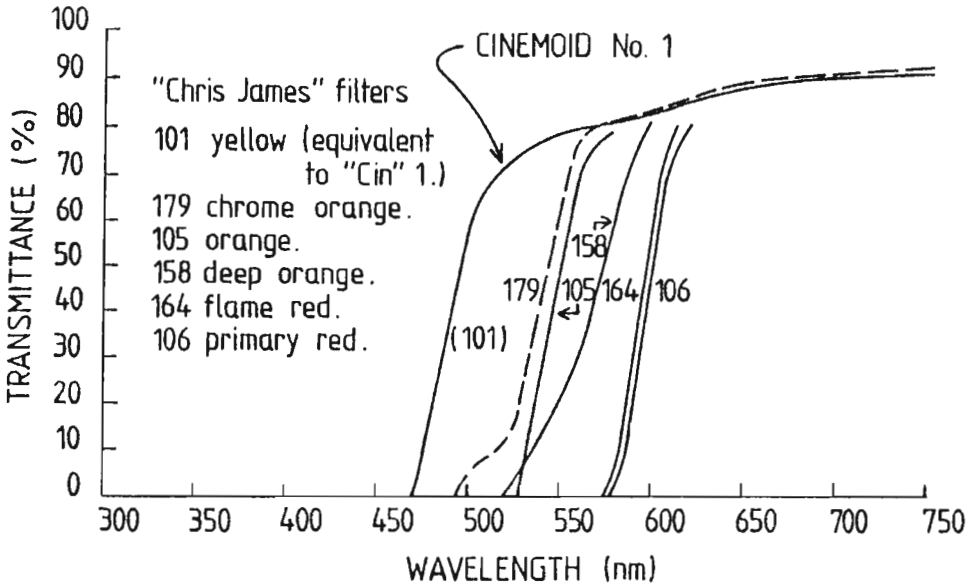

Figure 2. *Shows transmittance vs wavelength for a selection of "Chris James" colour filters. "Cinemoid" No. 1. (yellow) is shown for comparison.*

REFERENCES

Jensen, H. and Barbetti, M.(1979). More on filters for laboratory illumination. *Ancient TL* , **7**, 10.

Sutton, S.R. and Zimmerman, D.W. (1978). A blue-uv absorbing filter for laboratory illumination. *Ancient TL* , **5**, 5.

[PR] Reviewed by Vagn Mejdahl.

FURTHER NOTES IN RESPONSE TO REVIEWER'S REMARKS.

The sediment from which the quartz was separated was collected from a relic lake-shore dune at the Lake Woods site, Northern Territory, Australia. The quartz had an ED of ~50 Gy. Further details can be found in Hutton, Prescott and Twidale,(1984) *J. Soil Res.* , **22**, 15-21, . The samples received only the standard separation procedure, followed by NTL erasure then ß irradiation, as outlined in the figure captions.