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LIGHT BLEACHING OF ARCHAEOLOGICAL FLINT SAMPLES: A WARNING

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Some preliminary bleaching experiments have been done using an Oriel Solar simulator lamp to bleach fine grain discs of flint, which had been prepared from flints which had had their outer 2 mm of surface removed and only the inner part used for sample preparation. The simulator uses a 300 watt Xenon lamp which produces a collimated beam over a 2 x 2 inch square target (see Figure 1). The samples are placed in the target plane 2 inches from the collimator lens. The beam can be filtered to match the terrestrial (Air Mass one or two) or outer space (Air Mass zero) solar spectrum. In this application, the Air Mass two filter corresponding to sunlight for middle latitudes was used and spectral characteristics of this filter compared with the solar spectrum are shown in Figure 2 (normalised to one solar constant).

Bleaching experiments were begun on flint from Abri Vaufrey which had been collected during excavation and immediately transferred to an opaque black plastic bag and not exposed again except to red light in the laboratory. These showed that bleaching of natural TL occurs rapidly at first, and then more slowly as length of bleaching time increased, e.g. Abri Vaufrey (e3) as shown in Figure 3a. (Different flints bleach by different amounts of course but there is the general trend of a rapid fall followed by a slower one).

Besides these bleaching experiments on natural TL, similar bleachings were done on natural plus artificial beta dose and second glow beta-dosed discs and the bleaching responses for these different sets of discs were the same (within 3%).

These bleaching experiments were then extended to archaeological material which had been submitted for dating but which had been exposed to unknown amounts of light before arriving at the laboratory, e.g. for classification and drawing; the laboratory exposure to light has been the same in all cases.

Bleaching response of natural TL discs was compared with bleaching response of second glow beta-dosed discs (β') as a routine measure and differences between these two sets of bleachings have been found, by more than 10% in one case (see Figure 3).

For one archaeological layer from La Cotte where 5 flints have been dated, two of the five showed greater bleaching on β' discs than on natural TL discs, one by 6% and the other by 12%, suggesting that these two flints may have lost some natural TL due to light exposure. The expectation that this would be avoided because of light absorption in the outer discarded 2mm layer may not be true. These 2 discrepant flints have provisional ages approximately 20% lower than the other flints in the layer, but their environmental dose is at the moment based on alpha counting and flame photometry measurements; when gamma spectrometry evaluation of soil doses is available it may realign the five as the environment is very complex. The whole flint had been crushed to extract samples from the La Cotte flints so it was not possible to do any transparency measurements on the original.

The amount of data collected so far for a dozen flints is far too small for any definitive analysis but it may indicate that some flint in solid form can be bleached before it arrives at the laboratory for dating. Until further work disproves this conclusion, it would be prudent to treat all flints with care and collect them for dating programs with minimal exposure to light.

FIG. 1

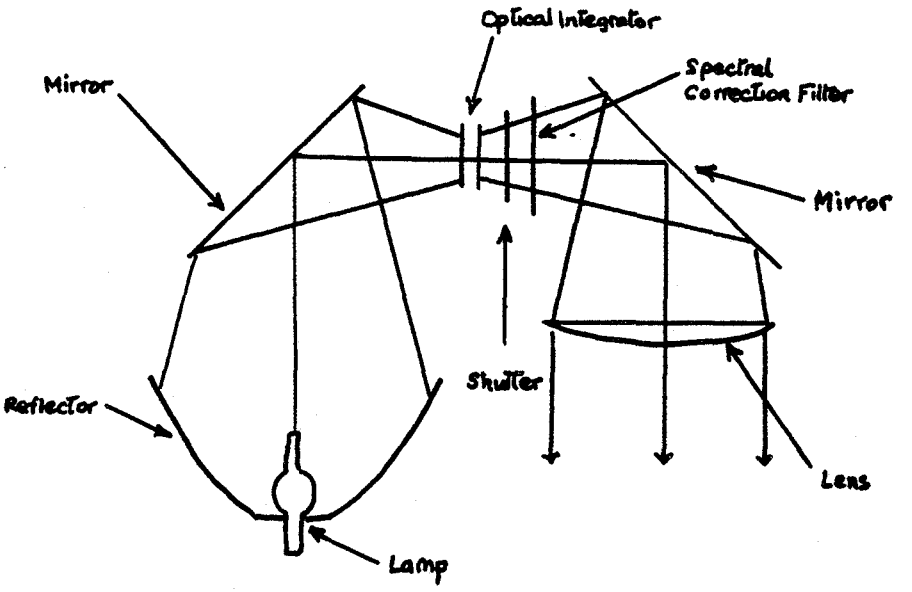


FIG. 2

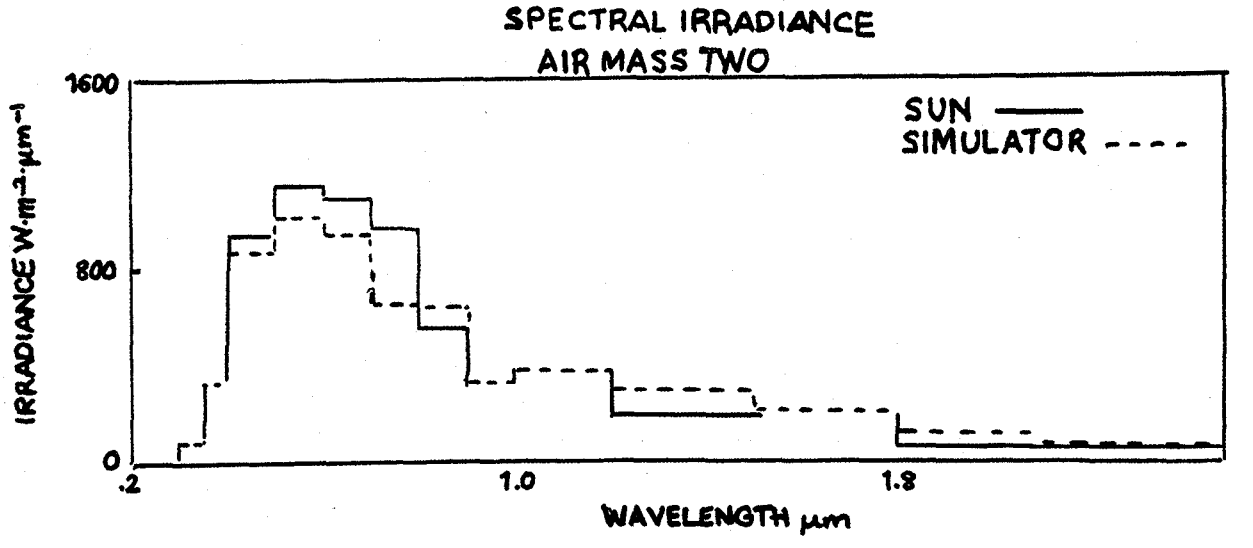
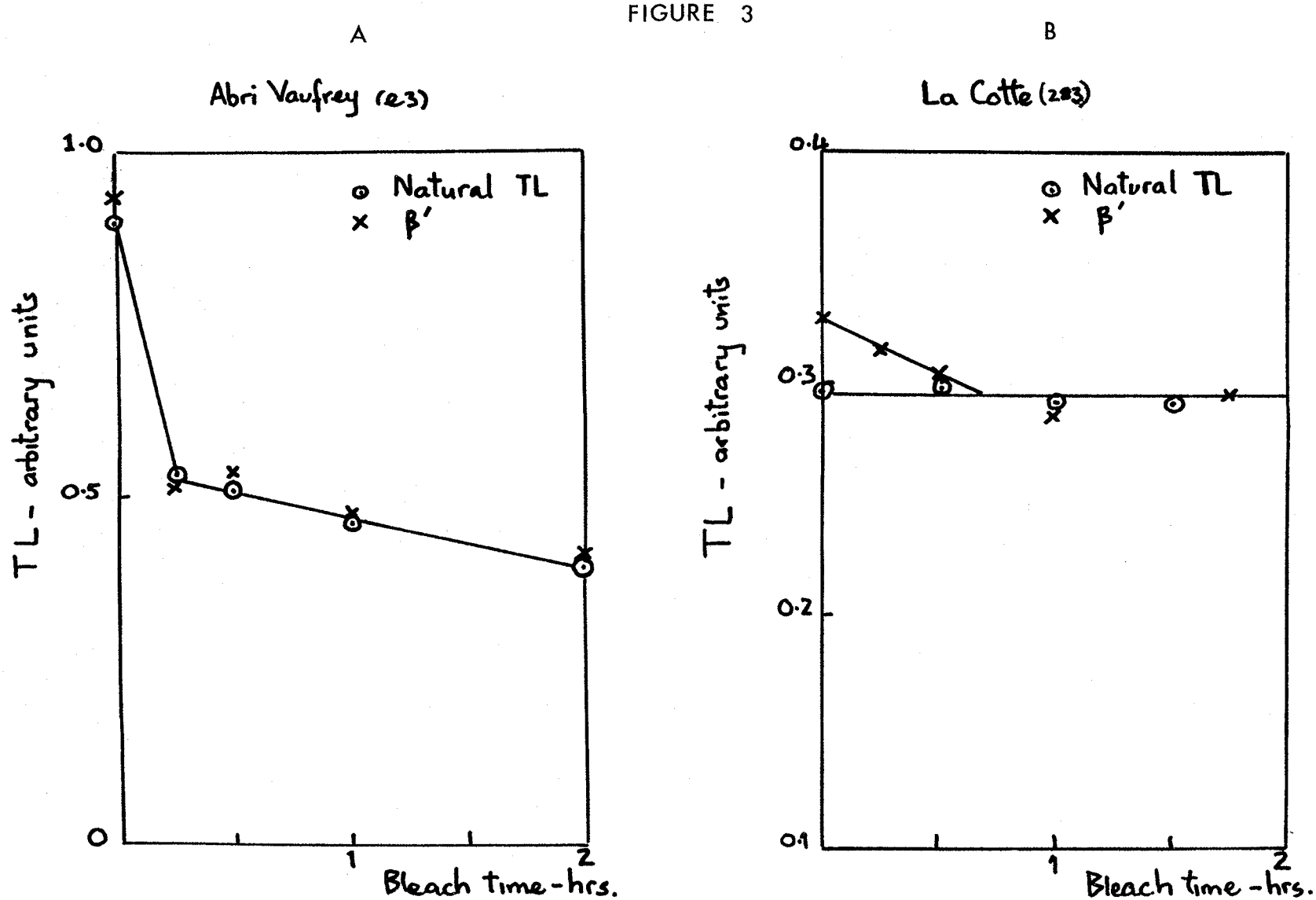


FIGURE 3


A
Abri Vaufrey (e3)
1·0
0·5
0
TL - arbitrary units
Natural TL
β'
1
2
Bleach time - hrs.
B
La Cotte (2e3)
0·4
0·3
0·2
0·1
TL - arbitrary units
Natural TL
β'
1
2
Bleach time - hrs.