LABORATORY RALF KOTALLA SINCE 1979

WORLDWIDE OLDEST PRIVATE LABORATORY SPECIALIZED FOR GENUINE ANALYSES

Question ?? Answer !!!

WHAT ABOUT AND AIRPORT X - RAYS AND RADIOGRAPHY ?

Since the TL age is proportional to radiation dose, it is logical to be concerned about the effect of airport security x-rays and radiography done to examine the object. **In general it is not a problem!** Airport security x-rays devices use very high sensitivity detectors so that the x-ray dose is in fact quite small, perhaps adding a week or month to the age, well below the uncertainty of dating. Radiography, if many films are taken, may be more of a problem, but not for the common practice authenticity -test!!* For a real dating not common Tl- test I recommend that samples be taken prior to exposure. It may also be possible to compute an approximate correction, but in **almost** every case **the effect is small**.

SHOULD I BE CONCERNED ABOUT ARTIFICIAL IRRADIATION ?

There have been rumour circulating lately about recently fired Chinese pottery being artificially irradiated to circumvent TL dating. While this is certainly something we watch for, there is little real cause for concern. There are several reasons why this dose tampering is **difficult to impossible** to achieve successfully. First, it is difficult to get the dose right without considerable research into the properties of the clay and access to expertise in TL measurements. Second, it is very difficult to get that dose sufficiently uniform over the extent of the entire object. It also and obviously requires a sophisticated means of irradiation, not easily available here, let alone in China. There are many considerations that we will not detail so as not to offer 'aid and comfort to the enemy'. The '**impossible**' part is that different size grains in the clay actually have different doses in a naturally irradiated ceramic, but will have the same dose in the artificially irradiated example. This fortunate phenomenon is due to the heterogeneity of pottery clays, which are a mixture of fine grains (silt) and coarser grains (sandy inclusions). The radiation dose we measure in the lab is due to a mix of different kinds of radiation: alpha particles (which are heavy and have a very short range in matter--typically about 25 micrometers or 1 thousandth of an inch), beta particles (which are light and travel up to several millimetre or 1/16 to 1/8 inch), and gamma rays (which can pass through up to 30 cm or one foot of mineral material). The major part of the natural radiation dose is due to alpha particles, and the alpha emitting nuclides--uranium and thorium and their daughters--are primarily found in the fine grains. Because of this, the fine grains have the maximum dose, while the larger sandy grains have that dose only on their surface, and a considerably smaller dose in their interior. If the different size grains are measured, and the dose is found to be the same, there is good evidence of dose tampering, and the converse is true as well. When all these considerations are taken together, it is extremely difficult to get an artificially dosed object past routine TL dating. Given the quantity of older pottery available in China, your concerns should be directed more toward pastiches and assembly of new objects out of old fragments. There is one problem area, however, and that is porcelain. This material is so high fired that it actually becomes a glass with small islands of quartz usually remaining (which makes TL dating of porcelains possible). In theory, there should be a difference in measured dose between small and large quartz grains, but the glass matrix makes it extremely difficult to extract the grains intact. It is unfortunately not practical at this time to do differential dosimetry on porcelain, and it becomes more difficult to tell for certain when irradiation has been attempted.

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Lit. Daybreak Nuclear and Medical Systems, tl- authenticity and dating company V.J.Bortolot

* Adequate for the purpose of authentication - fired antiquity or recently ! (+/- 15-25 per cent error on date)

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