BIMODAL IR DISTRIBUTION IN THE CANYON DIABLO METEOROID. John T. Wasson, Institute of Geophysics and Planetary Physics, University of California, Los Angeles, CA 90024.

The impact of the Canyon Diablo (=CD) meteoroid created the 1.2-km Meteor Crater; CD meteorites represent fragments detached during atmospheric passage or spalled from the trailing surface during the impact. Estimates of the meteoroid energy and velocity (Shoemaker et al., 1989) yield diameters in the 30-80-m range. It is plausible to assume that the surviving fragments originated from widely separated regions of the surface, thus the study of numerous CD fragments offers the unique opportunity to assess the compositional variation over 10s of m in a single meteoroid.

To maximize our chance of sampling widely separated parts of the meteoroid we chose four samples from known "plains" locations 5-7 km distant from the crater; some, possibly most, plains specimens detached during atmospheric passage. We also studied eight other CD fragments (four having masses ≥20 kg are probably plains specimens). As shown in the Figure, Ir shows a bimodal distribution in this sample set. Duplicate analyses of each specimen agreed well and low- and high-Ir samples were included in the same irradiations, thus the differences are firmly established. Student's t test indicates a probability <1% that these belong to the same statistical population. We analyzed one CD specimen 18 times and, with one exception, all samples are in the range 2.03-2.29 μg/g near the low-Ir peak. There are no significant correlations between Ir and other elements. The Au range (1.49-1.58 μg/g) is remarkably small.

Canyon Diablo is a typical, a low-Ni member of iron-meteorite group IAB. Because IAB irons contain chondritic silicates and planetary-type noble gases it seems clear that they were never part of a core (or other km-size magma body); Wasson et al. (1980) suggested that they formed as impact-generated melt pools. Even a 10-m size pool will undergo chemical fractionation if it cools slowly, thus one goal was to search for negative As/Ir or Au/Ir trends indicative of such a process; none was found. This absence of fractionation is consistent with the rapid cooling required to trap silicates.

The CD meteoroid may have been so large that it encompassed two or more melt pools, and these might differ in detailed composition because of differences in the distribution of elements between melt and the silicate residue associated with differing formational conditions, especially temperature. The bimodal Ir distribution appears to support such a model, but the sparsity of samples with intermediate concentrations could als statistical sampling fluctuation. It may be possible to evaluate the adequacy of sampling by the analysis of additional samples and by establishing a possible relationship between composition and the recovery locations around the crater. If two or more melt pools were involved we should eventually find samples of the silicate-rich intervening materials.

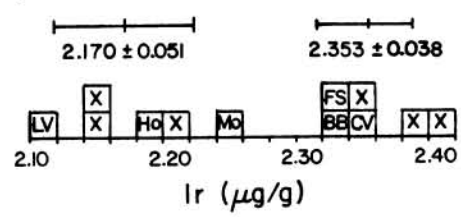

Fig. 1

References: Shoemaker, E.M., Wolfe, R.F. and Shoemaker, C.S. (1989) Geol. Soc. Amer. Spec. Paper, in press. Wasson J.T., Willis, J., Wai, C.M. and Kracher, A. (1980) Z. Naturforsch **35a**, 781-795.