RAMAN STUDY OF OLIVINES IN THIRTY SEVEN HEAVILY AND MODERATELY SHOCKED ORDINARY CHONDRITES; D. Heymann, Dept. of Geology and Geophysics, Rice University, Houston, TX 77251.

Olivine has long been known to be a good shock-indicator as it becomes finely polycrystalline, if not cryptocrystalline for shock pressures above 15 GPa[1-4]. Hence, olivine X-ray patterns show a progression from patterns of spots to smooth rings, which can become so broad that the mineral appears X-ray amorphous. In the course of my Raman studies of shocked minerals, I have found that shocks also can alter the Raman spectrum of olivine appreciably [5]. Especially telling was the appearance of a strong, broad, and new Raman feature near 1100 reciprocal cm. This feature was interpreted as due to the formation of "glass" with considerable three-dimensional Si-O-Si linkage.

Judging from the study of Hoerz and Quaide[4], the heavily shocked black chondrites should have been shocked into a pressure range where this Raman feature should appear. In order to test this hypothesis, I have obtained olivine Raman spectra <u>in situ</u> from thirty seven ordinary chondrites. For comparative purposes, I have included in my study not only black chondrites such as Farmington and McKinney, but other D-(shock) class meteorites such as Ramsdorf, and also B,C,and A-class meteorites such as Ergheo, Brownfield, and Elenovka. The spectra were taken at the Raman facility of the Department of Chemistry of Rice University. The primary radiation was the 488nm line of an Ar ion laser which delivered about 100 mW on a spot of the sample about 0.1 mm across. Most spectra were taken in the delta wavenumber range 500-1200 cm^{-1}. The scattered radiation was collected at an angle of 45° and analyzed with a SPEX 1403 double monochromator. Whenever available, chips with freshly broken surfaces were mounted directly on the sampleholder.

Raman lines of olivine and orthopyroxene were found in all spectra. **Not a single one of the meteoritic olivines showed any detectable trace of an 1100 cm^{-1} feature.** The spectra, if anything, were "boringly" similar and identical to spectra of unshocked terrestrial olivine. My preferred interpretation of these results is that the annealing which occurred during the cooling of the meteorites from high post-shock temperatures has resulted in the restoration of short-range (Raman)-order, but not in much, if any restoration of long-range (X-ray) order.The observation that shocked olivines show very strong luminescence, but the meteoritic olivines do not is consistent with this hypothesis.

References: [1] Fredriksson,K.;DeCarli,P.,and Aramae A.(1962) <u>Proc. Intern. Space Sci. Symp. 4th</u>,675. [2] Heymann, D.(1967) <u>Icarus</u> 6,189. [3] Taylor, GJ and Heymann, D. (1969) <u>Earth Planet Sci. Lett</u> [4] Hoerz, F. and Quaide WL. (1973) <u>Moon</u> 6, 45-82.[5] Heymann, D. and Cellucci, T. (1988) <u>Meteoritics</u> 23,353.