HETEROGENEOUS PLAGIOCLASE COMPOSITIONS IN THE MARALINGA CK4 CHONDRITE. Lindsay P. Keller, SN4 NASA Johnson Space Center, Houston, TX 77058.

Introduction. One of the characterisitic features of CK chondrites is the wide compositional range displayed by feldspar grains in matrix relative to the narrow range of compositions exhibited by the highly equilibrated olivines and pyroxenes [e.g. 1, 2]. Recently, it was suggested that these heterogeneous feldspar compositions may have been strongly influenced by shock metamorphism [3]. In this report, it is shown that the apparent range of feldspar compostions in Maralinga probably results from annealing during parent body thermal metamorphism rather than shock.

The majority of matrix feldspars in Maralinga are typically 50 um in size and are compositionally zoned, with oligoclase cores (~An40) and bytownite rims (~An80). The contact between core and rim is sharp and abrupt and is readily observed in backscattered SEM images (Fig 1).

Experimental. Over 40 plagioclase grains with distinct rims were analyzed from three polished thin sections of Maralinga. Quantitative electron microprobe analyses were obtained using a rastered beam over a 4 um X 4 um square region in order to minimize Na loss. Analyses were collected so that the errors associated with counting statistics were <1% for Na, Al, Si, and Ca.

Regions of matrix were extracted from the polished thin sections and ion-thinned to electron transparency for transmission electron microscope study of the feldspar microstructures.

Results and Discussion. Figure 2 is a histogram showing the frequency distribution of matrix plagioclase compositions from Maralinga. The cores of the plagioclase grains cluster around An44, but range from An34 to An52. The rim compositions range from An76 to nearly end member anorthite (An98), but are strongly peaked at An84. These preferred compositions are consistent with the inferred subsolidus relations in the plagioclase solid solution series proposed by [4]. Grove et al. [4] suggested that at equilibrium, a miscibility gap occurs between ~An40 and ~An90 in the temperature range 400 to ~575C. Within this gap, intermediate plagioclase compositions probably result from metastable spinodal decomposition within either the Boggild or Huttenlocher gaps [4]. The overgrowth relation of An84 on more sodic cores is consistent with the production of the calcic rims by prograde reactions during thermal metamorphism on the Maralinga parent body. Equilibrium has not been completely attained however. The initial TEM examination of the matrix plagioclase shows that the calcic rims display the distinctive diffraction effects (i.e. the presence of *e*- and *b*-reflections in [001] electron diffraction patterns) associated with the presence of Huttenlocher intergrowths.

Conclusions. An equilibration temperature of 720 C was calculated for Maralinga using the Lindsley two-pyroxene geothermometer [1]. The presence of "equilibrated" plagioclase compositions coupled with the high degree of Fe-Mg-Ni equilibration of Maralinga olivines suggests that the thermal metamorphic event was of long duration. This conclusion is also supported by measurements of trace elements, particularly Zn [5].

Detailed analysis of the compositions of matrix plagioclase grains in Maralinga indicates that the heterogeneous compositions result from subsolidus equilibration during thermal metamorphism. The formation of the heterogeneous plagioclase compositions in Maralinga matrix by shock metamorphism as proposed by [3] is not consistent with the observed level of shock effects in Maralinga.

References. [1] Geiger, T. and Bischoff, A. (1991) *Meteoritics* 26, 337. [2] Kallemeyn, G. W. *et al.* (1991) *GCA* 55, 881. [3] Rubin, A. E. (1992) *GCA* 56, 1705. [4] Grove, T. L. *et al.* (1983) *Amer. Min.* 68, 41. [5] Lindstom, D. J. et al. (1993) *LPSC XXIV*, this volume.

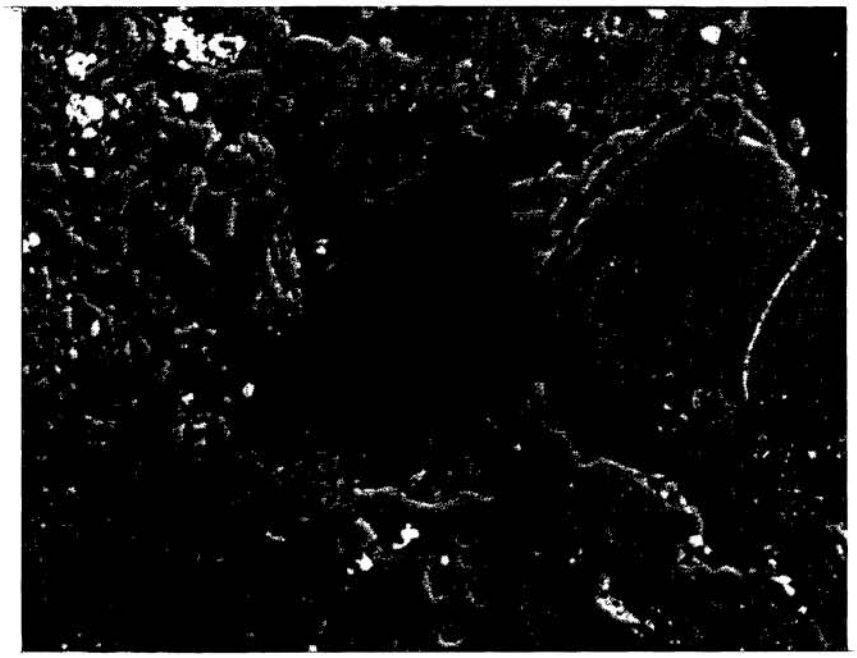

FIGURE 1. Backscattered SEM image of a typical matrix plagioclase grain in Maralinga

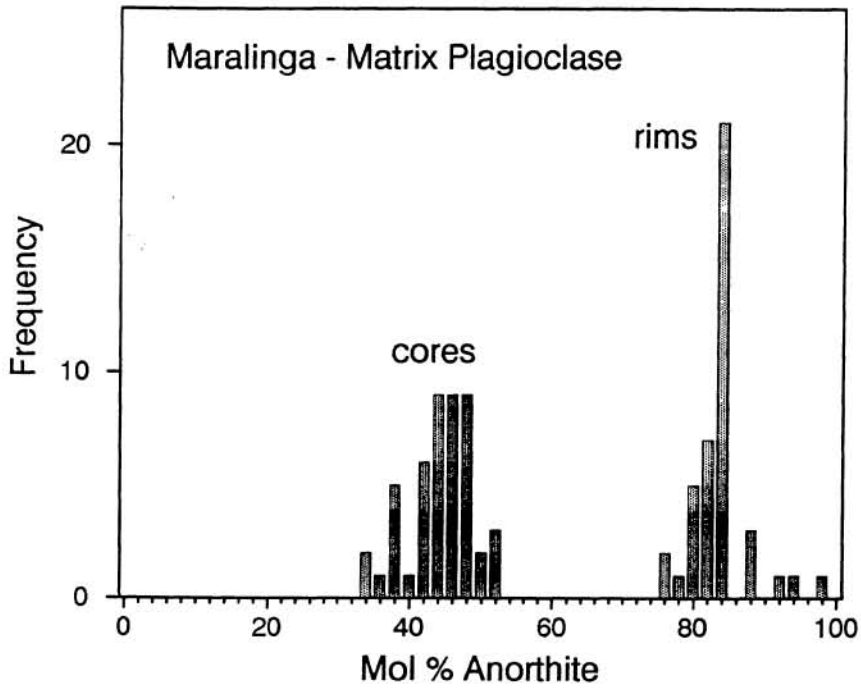

FIGURE 2. Distribution of compositions for Maralinga matrix plagioclase grains.