We have determined the nature of these double transformations in Pu-Ce alloys. Slide 8 shows the delta phase microstructure in a 4 a/o Ce alloy after heat treatment. Slide 9 shows a transformation structure in the same alloy after compression through the first, lower-pressure transformation, which was found to be irreversible delta-to-beta. This method can be used to retain beta phase plutonium at room temperature and to make beta phase alloys that are free of voids and micro-cracks, since the denser beta phase is caused to form under compression. Slide 10 shows the final transformation structure in the 4 a/o Ce alloy after compression through the second, higher-pressure transformation, which was found to be irreversible beta-to-alpha. This alloy is also free of voids and microcracks since the denser alpha phase was formed under compression.

The volumes of transformation for both the first and second transformations are shown in Slide 11 plotted against atomic per cent cerium. In both cases, the volumes of transformations vary linearly with cerium content. Slide 12 shows that the transformation pressures also vary linearly with atomic per cent cerium for both transformations. The extrapolations to zero transformation pressure occur at 3.4 a/o Ce for the first, lower- pressure transformation and at 1.9 a/o Ce for the second, higher-pressure transformation.

Slide 13 shows densities plotted against atomic per cent zinc, cerium, and aluminum. The lower curve on each figure shows the densities of the heat-treated alloys and the upper curve on each figure shows the densities of the same alloys after compression. The Pu-Al figure at the bottom of the slide shows that delta-stabilized alloys in this system will not transform at