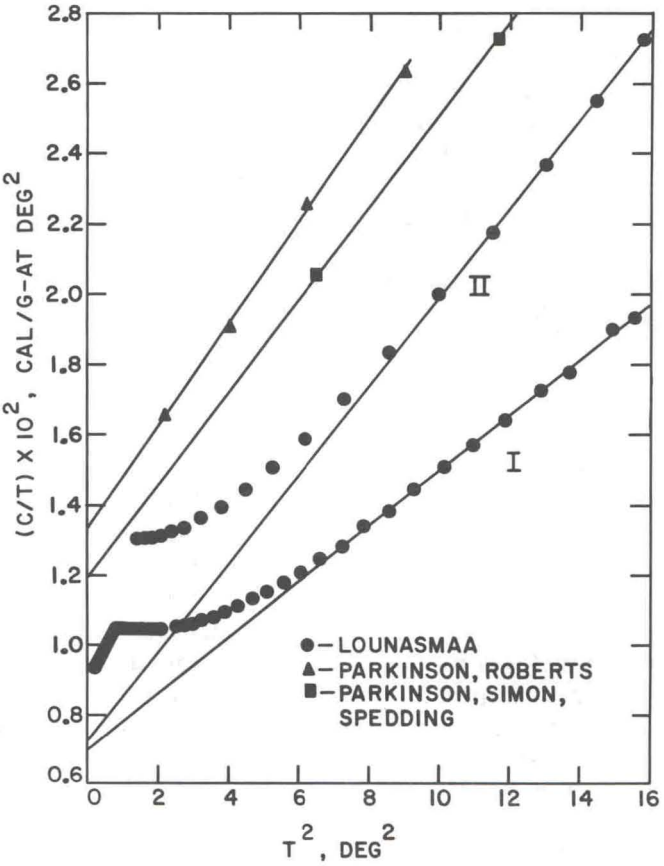

Fig. 7. Plot of C/T vs T^2 of the very low temperature specific heat of cerium. Although only two of Parkinson's, Simon's and Spedding's data points are shown in this plot, additional values at higher temperatures indicate that the straight line passes through these two points as drawn. Lounasmaa's data were taken on two samples containing different amounts of α and β-Ce.

they state: "It has been found that, besides the 4f-electron contribution to the total paramagnetism of any one of the rare

earth metals--except, possibly, europium--a small, approximately temperature-independent paramagnetic susceptibility of magnitude 1 x 10^{-6} g^{-1} cm^2 [*sic*, same as emu/gm] exists, and this originates from the conduction electrons." From this it is seen that the magnetic susceptibility data of γ-Ce do not require the density of states of γ-Ce to be any larger than those of other rare earth metals.

From the above discussion it is concluded that the experimental resistivity and magnetic susceptibility data are consistent with the band structure proposed herein for γ-Ce as shown in Fig. 6a.

7. 2 α-CERIUM.

The non-integral value proposed for the valence of α-Ce [3] suggests that about 60 per cent of the 4f electrons no longer occupy the one electron 4f band and are probably in the 5d band. A band structure which would take this into account is shown in Fig. 6b. In this model one would expect high density of states (much larger than 2. 0 states/eV/atom) since the Fermi level would lie slightly below the middle of the 4f band. An examination and an analysis of the published low temperature specific heat data indicates that the density of states is indeed very large. (Fig. 7) At low temperatures ($< 100°K$) cerium consists of a mixture of α and β phases. Because of this, γ values, which were obtained as the intercepts of the straight lines in Fig. 7, were assumed to be equal to the weighted sum of the γ value of each phase, i. e.:

$$\gamma = w_\alpha \gamma_\alpha + (1 - w_\alpha) \gamma_\beta \qquad (16)$$

where w_α is the faction of α in the sample. The electronic specific heat constant of β-Ce (γ_β) was assumed to be 18 cal/g-at. deg^2, the same as that of γ-Ce. The data of Parkinson *et al.* [41] yield a value of 131 x 10^{-4} cal/g-at. deg^2 for the electronic specific heat constant of α-Ce; the data of Parkinson and Roberts [36] for their sample which had been cycled 50 times yield 200 x 10^{-4}; and the data of