the observed lattice constants (for higher than trivalent cerium) reaches a pronounced peak near $CeRu_2$. He explains this qualitatively by assuming that the $4f$ electron in a fraction of the atoms has been squeezed into the valence shell. This suggests that the cerium is probably more nearly tetravalent in $CeRu_2$ than in any other CeM_2 compound. $LaRu_2$ and $PrRu_2$ were examined as controls.

EXPERIMENTAL

Alloys were prepared by arc-melting together weighed amounts of the components. Filings for X-ray examination were taken from the arc-cast buttons and loaded into quartz capillary tubes, which were subsequently evacuated and sealed off. The filings were annealed at 450°C for 15 min to relieve stresses due to mechanical working before X-ray patterns were taken.

Two Unicam high-temperature X-ray powder cameras (190 mm diameter) were used to obtain X-ray diffraction patterns between 20 and approximately 550°C. A Central Research Laboratory (CRL) high-temperature X-ray powder camera (114.59 mm diameter) was used to obtain diffraction patterns at higher temperatures to 900°C. Specimen temperatures in the Unicam cameras were determined from calibration data relative to the furnace temperature, which was determined directly by means of thermocouples and potentiometric records. The calibration of the Unicam cameras was based on the lattice constants of pure silver as given by HUME-ROTHERY AND REYNOLDS[4] for a number of temperatures. The specimen temperatures in the CRL camera were determined from a power-setting *versus* temperature calibration curve, which was checked before and after each run. The calibrations were accomplished by placing a thermocouple in the sample position and noting the temperature corresponding to each power setting. No change in the calibration was observed throughout the experiment. Although the Unicam and CRL cameras were thus calibrated in different ways the lattice parameter data are in very good agreement where the temperature regions overlap (Fig. 1). Furnace temperatures were controlled within ± 2°C during each film exposure.

The lattice parameters were determined from Cu $K\alpha$ radiation back reflection doublets by using the φ $\tan\varphi$ extrapolation procedure. More than two-thirds of the lattice parameter measurements had standard deviations of ± 0.0005 Å or less; five had standard deviations greater than ± 0.0010 Å, the largest being ± 0.0015 Å. All lattice parameters were corrected for refraction.

CALCULATIONS

The temperature *versus* lattice constant data were fitted to an equation of the form

$$a = A + Bt + Ct^2 \tag{1}$$

by a least squares treatment. In eqn. (1) a is the lattice constant in Ångstrom units, t is the temperature in °C and A, B and C are constants. The average linear thermal expansion coefficient, $\bar{\alpha}$, is defined as

$$\bar{\alpha} = \Delta a/(a_0 \Delta t) \tag{2}$$

where a_0 is the lattice parameter at temperature t_0. Substituting eqn. (1) into (2) $\bar{\alpha}$