This discontinuity has usually been attributed to instability of bonding or of the crystal structure because of size differences from the lanthanide contraction. It seemed reasonable that the application of very high pressure might force the elements close enough to allow bonding to occur that would not be possible under ordinary pressures. It was hoped that these bonds would remain stable or at least metastable after the pressure was released.

Recent studies on rare earth antimony compounds have provided a convenient test for this hypothesis (1). The RSb_2 compounds, where R is a rare earth metal, exist in an orthorhombic crystal structure from La to Sm but the diantimonides of Gd to Ho could not be synthesized by the ordinary high vacuum techniques. It seemed worthwhile to see if high pressure, high temperature techniques could extend the series into the unknown region.

The syntheses were carried out in a tetrahedral anvil press at pressures up to 70 kilobars and temperatures to 1800 °C. The known orthorhombic structure was extended two elements to $GdSb_2$ and $TbSb_2$. A different type structure was obtained which could also be indexed as orthorhombic for $GdSb_2$, $TbSb_2$, $DySb_2$, $HoSb_2$, $ErSb_2$, $TmSb_2$ and YSb_2. No diantimonides of La, Ce, Eu or Lu could be synthesized.

The rare earth sesquioxides have long been known in both cubic and a more dense monoclinic form. The cubic