## APPENDIX

The total <u>temperature</u> dependence of the elastic constants consists partly an explicit temperature change and partly an implicit change in volume with temperature. In other words

$$\left(\frac{d\ln C}{dT}\right)_P = \left(\frac{d\ln C}{dT}\right)_V + \alpha\left(\frac{d\ln C}{d\ln r}\right)_T \qquad (1A)$$

where $\alpha$ is the linear coefficient of thermal expansion. The left hand side of equation (1A) is the observed temperature dependence[2] while the first term on the right hand side represents the explicit temperature dependence which may be found since values for $(d\ln C/d\ln r)_T$ are now known. Table 1A lists the resulting breakdown of the temperature dependence for tantalum. The explicit temperature dependence of the isothermal bulk modulus, $(d\ln B_T/dT)_V$, was computed by the following relationship:

$$\left(\frac{d\ln B_T}{dT}\right)_V = \left(\frac{B_S}{B_T}\right)\left(\frac{d\ln B_S}{dT}\right)_V - 3\gamma\alpha \qquad (2A)$$

where $\gamma$ is the Gruneisen constant. This expression is valid for $T \gg \theta$ ($=250^\circ K$) where $\gamma$ and $C_V$ are temperature independent.

The quantity $(d\ln B_T/dT)_V$ is not approximately zero for tantalum as it is for other materials[14]. The reason can be traced to the fact that $(d\ln B_S/dT)_V$ is <u>not</u> positive as it is for all other materials for which this calculation has been performed. The reason for this apparent anomaly in tantalum is not known. Probably not much significance should be attached to it until both the temperature and pressure measurements have been repeated with better crystals.