The pressure dependence of the phonon spectrum is such as to increase T_c and will be roughly the same for all elements since γ_G has, in general, values between 1 and 3. Since $\ln 0.85\, \Theta_D/T_c$ lies in the range 2.5 to 6.5 for most superconductors the sign and magnitude of $\partial T_c/\partial P$ is determined by φ. Rohrer[17] has pointed out that for non-transition metal superconductors φ is roughly constant and equal to 2.5 ± 0.5. However, when we consider the behavior of the transition metal superconductors there is considerable variation both in the magnitude and the sign of φ.[18,19] Olsen and his co-workers[18-21] have made extensive studies of the correlation between φ and the isotopic mass dependence of T_c. In the BCS formalism the role of the phonon spectrum in the attractive interaction leads to a mass dependence of $M^{-0.5}$. This has been termed the 'normal isotope effect.' Now deviations from a coefficient of 0.5 may be written as $0.5(1 - \zeta)$ where ζ is taken as a measure of the departure from the 'normal isotope effect.' The largest values of ζ have been observed in the transition metal superconductors.[22] Swihart,[23] Morel and Anderson[24] and Garland[22] have been able to explain these deviations by using a more realistic value for the cut off energy of the Coulomb interaction than that employed in the BCS formalism.

The theory of Morel and Anderson[24] leads to the simple expression,

$$\zeta = \left(\frac{K_c^*}{K_p - K_c^*}\right)^2 \qquad (8)$$

where $K_p - K_c^*$ replaces the $N(0)V$ of the BCS relationship; K_p and K_c^* representing the phonon and screened Coulomb interactions respectively. For the non-transition metal superconductors ζ is almost zero and it follows, therefore, from (8) that K_c^* must be very small compared to K_p. The importance of K_c^* in the transition metal superconductors may be inferred from the larger values of ζ observed.[22] It has been suggested by