are involved instead, we expect

$$\sigma_0 = \sigma_{00}\left(1+\frac{C_0^{e'}}{C_0^{e}}P\right) \tag{3}$$

where $C^e = G/(1-\nu)$, with $\nu$ being Poisson's ratio.

In order to observe the pressure variation of the yield stress of metals we have (i) constructed a device capable of accurately measuring the stress–strain curve at pressure, and (ii) chosen a metal with a small shear modulus, since it is known that the pressure derivative is approximately the same for all materials. Potassium was therefore chosen. The bulk shear modulus for potassium at liquid nitrogen temperature is only 20·8 kbar (this should be compared with the value of 828 kbar for steel at room temperature).

The stress–strain curve was obtained at liquid nitrogen temperatures in the manner shown schematically in figure 1. The change in length of the specimen, $x_1$, is directly measured. The force is obtained from the stretch of the spring $(x_2 - x_1)$ and the known spring constant which is appropriately corrected for the pressure variation of the moduli and the dimensions of the spring material. The piston C is actually high-pressure tubing which slides within the static piston. The constant rate of motion of this piston is controlled by an electrically-driven screw machine. The hollow piston C extends a considerable distance above the pressure vessel, at which point the tubing is sealed.

The displacement $x_1$ is measured as follows: a thin nonmagnetic rod is attached to the grip at point a and passes into the nonmagnetic pressure tubing at point b and extends upward above the pressure vessel. A magnetic core is attached to the upper end of this rod. The position of the core is obtained by use of a linear variable differential transformer (LVDT) placed over the pressure tubing at atmospheric pressure. This technique has previously been used in making high pressure creep studies (Butcher *et al.*, 1964) and equation-of-state studies (Lincoln and Ruoff, 1973). The displacement $x_2$ is also measured with the use of an LVDT system. The combined

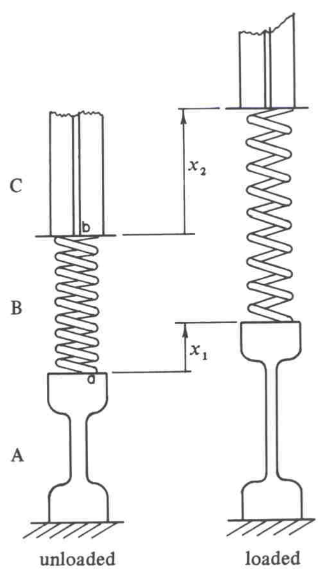


**Figure 1.** Schematic diagram of the measuring device. A specimen in grips; B spring; C nonmagnetic moving hollow piston. The thin rod which extends from point a into the hollow tube and which holds the magnetic core is not shown.

and Wang and Wright (1974). We calculated the Raman spectra of phase IV and of the two suggested structures of phase V (Garland and Young, 1968) using the method proposed by Geisel and Keller (1975). A further phase transition IV ⇌ V, which should be accompanied by changes in the frequencies or intensities of Raman bands, is not observed (figure 3). Comparison of the calculated spectra with our measurements and with those reported by Ebisuzaki (1973) and Wang and Wright (1974) shows that, in the $P, T$ range where phase V was expected, actually only phase IV was observed.

The Raman scattering experiment was performed in a high-pressure He cell kept in a temperature controlled cryostat. Near the triple point in $NH_4I$ a hysteresis between 3–4 K and 100–200 bars was found.

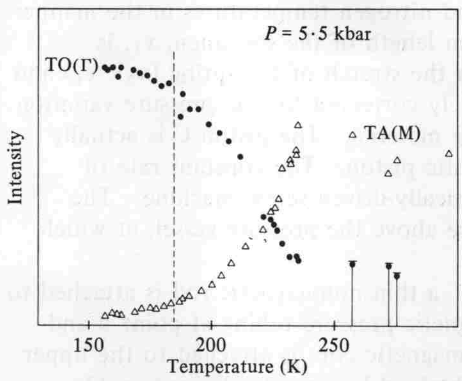


**Figure 3.** Variation of the scattering intensities of two modes in $NH_4Br$ at 5·5 kbar. The dashed vertical line shows the suggested IV ⇌ V phase transition which was not observed.

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## Elastic scaling parameters in the yield stress of metals

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If the yield stress of a metal is determined solely by the motion of screw dislocations in an isotropic medium, it is expected to vary with pressure according to

$$\sigma_0 = \sigma_{00}\left(1 + \frac{G_0' P}{G_0}\right), \tag{1}$$

inasmuch as

$$G = G_0\left(1 + \frac{G_0'}{G_0} P\right) \tag{2}$$

accurately represents the pressure variation of $G(P)$. Here $\sigma_{00}$ is the yield stress at zero pressure, $G_0$ is the shear modulus at zero pressure, and $G_0'$ is the pressure derivative of the shear modulus evaluated at zero pressure. If edge dislocations only