$$\sigma = ne^2 \frac{\tau}{m} = ne^2 \frac{\ell}{p_F} = ne^2 \frac{\ell}{\hbar k_F}$$

where ℓ is conduction electron mean free path, p_F is electron momentum at the Fermi surface, and n is conduction electron density. Since the area of a spherical Fermi surface is

$$S = 4\pi k_F^2 = 4\pi(3\pi^2 n)^{2/3}$$

we may write

$$\sigma = \frac{e^2 \ell}{12\pi^3 k} S \quad .$$

From this we can assert that $\rho \propto S^{-1}$ for free electrons in isotropic metals. When a metal is hydrostatically compressed, the Brillouin zone and Fermi surface in reciprocal space expand, implying a decrease in resistivity.

Let us use the above resistivity relation to gain understanding in cases where the Fermi surface is not spherical. For instance, noble metal Fermi surfaces (Fig. 5) have necks which contact the Brillouin zone boundary, reducing the Fermi surface from that of an equivalent spherical Fermi surface. This reduced area would imply increased resistivity. (Electrons in the neck contact areas are Bragg reflected, and hence do not conduct.)

Experimental measurements to 25 kbar of the silver Fermi surface show increasing distortion with increasing pressure.(Templeton, 1966). (See Brandt, Itskevich, and Minina (1972) for a review of such work.) For the belly cross-section, A_1, $\frac{d \ln A_1}{dP} = 0.503 \times 10^{-3}$/kbar; for the neck cross-section, A_2, $\frac{d \ln A_2}{dP} = 4.40 \times 10^{-3}$/kbar for the range

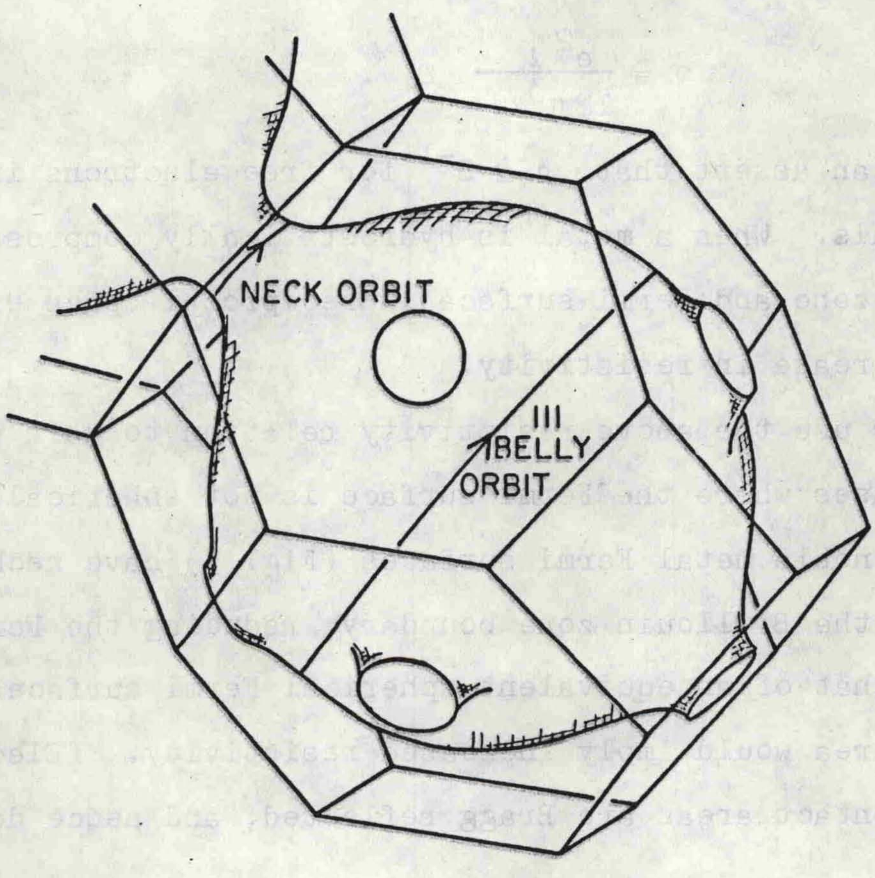

Fig. 5. Noble metal Fermi surface and first Brillouin zone. (After Dugdale (1965).)