the scattering potential is independent of volume. As can be seen by the variety of values for $\mathrm{d} \ln \varrho_0 / \mathrm{d} \ln V$ for the noble metal–noble metal alloys [3], this model is too simple.

The Fermi surface of the noble metals consists of a spherical belly and necks which contact the [111] zone faces. If it is assumed that the conduction electrons can be represented by a two-band model [8] (the conductivities of the individual carriers are additive), then the volume derivative of the residual resistivity can be expressed as follows

$$\frac{\mathrm{d} \ln \varrho_0}{\mathrm{d} \ln V} = \frac{\varrho_0}{\varrho_0^{\mathrm{B}}} \left(\frac{\mathrm{d} \ln \varrho_0^{\mathrm{B}}}{\mathrm{d} \ln V} \right) + \frac{\varrho_0}{\varrho_0^{\mathrm{N}}} \left(\frac{\mathrm{d} \ln \varrho_0^{\mathrm{N}}}{\mathrm{d} \ln V} \right), \tag{4}$$

where the superscripts B and N refer to the belly and neck electrons, respectively. From Dugdale and Basinski's [8] estimate of the ratio of the neck conductivity to the belly conductivity for impurity scattering in dilute Ag–Au alloys, $\varrho_0/\varrho_0^{\mathrm{B}}$ and $\varrho_0/\varrho_0^{\mathrm{N}}$ were calculated to be 0.75 and 0.25, respectively. Thus, the belly term is more heavily weighted than the neck term; however, this does not necessarily mean that effect of the neck electrons can be neglected without further justification. Ziman [14] has argued that in the case of uncharged impurities the perturbation due to the impurities is confined to the immediate vicinity of each impurity atom. Since the neck electrons move in between the atoms, this implies the belly electrons are predominantly scattered and the relaxation time for the neck electrons is greater than the relaxation time for the belly electrons. (For strongly charged impurities the scattering tends to be more isotropic.) Thus the neck electron term in (4) can be neglected to a first approximation.

The cross-sectional area of the bellies for Ag and Au are of nearly the same size, while in the case of Cu the cross-sectional area of the belly is about 25% larger. The cross-sectional area of the belly for Au, however, is less sensitive to pressure than in the case of Cu and Ag [12, 13]. Since $\mathrm{d} \ln \varrho_0 / \mathrm{d} V$ was nearly the same value for both the dilute Ag–Cu and Au–Cu alloys, it appears that the effect of pressure on the belly areas does not have a significant effect in determining the differences in the sign and magnitudes of $\mathrm{d} \ln \varrho_0 / \mathrm{d} \ln V$ in the noble metal–noble metal alloys.

In any theoretical calculation of $\mathrm{d} \ln \varrho_0 / \mathrm{d} \ln V$ for these alloys the use of a spherical Fermi surface is probably a good approximation. Du Charme and Edwards [15] have shown on the basis of a pseudo-potential formulation that the form of the effective scattering potential is an important factor for accurately predicting the volume derivative of the residual resistivity in dilute noble metal alloys containing monovalent and higher-valent impurities. In the case of the dilute Cu–Ag and Ag–Cu alloys good agreement between theory and experiment was found, however, for the dilute Ag–Au and Au–Ag alloys the theory predicted the wrong sign.

Recently Haga [16] has calculated (using a screened square well impurity potential model) the nuclear specific heat and other phenomena related to nuclear magnetic resonance experiments for concentrated Ag–Au alloys. He obtained good agreement between theory and experiment. In this model it is assumed that the unscreened impurity potential has the form: $v_0(r) = -U$ for $r < r_s$ and $v_0(r) = 0$ for $r > r_s$, where r_s is the radius of an atomic cell. The