between the estimated value and the observed one is not so remarkable.

The value of $\sigma_s^{-1}(\partial\sigma_s/\partial p)$ at 100°K ($T/T_c=0.16$), where no measurement has been made, and also those at 200°K and 273°K may be obtained from eq. (3) in which C_1 and C_2 are the estimated values and A is 8.6×10^{-6} deg.$^{-3/2}$.[12] The values thus obtained are plotted with triangles in Fig. 2. At 100°K, the value appears to lie on a curve extrapolated from the observed curve back to 0°K, while at 200°K and 273°K, the values differ from the observed values in such a way as is shown. This result seems to be satisfactory, because eq. (3) derived from the spin wave theory is applicable only at low temperatures and the magnetization falls rather parabolically in the intermediate temperature range, as already mentioned.

Fe: The temperature dependence of $\sigma_s^{-1}(\partial\sigma_s/\partial p)$ for Fe[1,2] appears to be type B_3, although the temperature range actually employed was not wide enough to conclude definitely. The discussion on this point will be made in the next section where the data on the forced volume magnetostriction will be investigated.

Cu-Ni alloys: The observed values of $\sigma_s^{-1}(\partial\sigma_s/\partial p)$ and the estimated value of C_1 for 13.3 at. % and 23.8 at %. Cu-Ni alloys are plotted in Fig. 3. Two curves belong to type B_1, but the curve for 23.8% Cu-Ni is more typical, because the Curie temperature of that specimen lies in a temperature range capable of the measurement of the pressure effect on σ_s. The curve for Ni shown in Fig. 2, therefore, will take the similar form to that of 23.8% Cu-Ni alloy in Fig. 3, in case where the measurement could be made up to T_c for Ni.

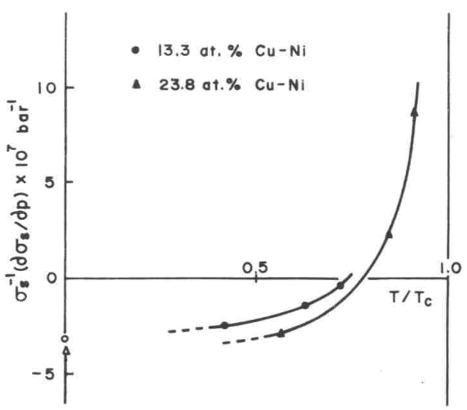

Fig. 3. A plot of temperature dependence of σ_s^{-1} $(\partial\sigma_s/\partial p)$ for 13.3 and 23.8 at.% Cu-Ni alloys. The points ● aod △ represent observed values, and ○ and △ are estimated from obseruation equations.

Since $\Delta T_c/\Delta p$ has been measured on Cu-Ni alloys[11], C_1 may also be obtained directly from eq. (2b) in such a way as (I_b). For 24.7% Cu-Ni of which curve is not shown in Fig. 3, C_1 thus obtained is -4.2×10^{-7} bar^{-1}, where the values of $F(T)$ and $G(T)$ observed at 200°K and the observed value of C_2, being 2.5×10^{-7} bar^{-1}, have been used in eq. (2b). This value of C_1 is fairly in good argreement with -4.0×10^{-7} bar^{-1} estimated from observation equations.

For ferromagnetic Cu-Ni alloys with Cu content larger than 34 at.%, the sign of C_2 has been found as negative,[11] and the sign of C_1 appears to be still negative judging from the curve of C_1 versus Cu contents[2,3] in which the available data have been plotted. Therefore, it can be expected that the curves $F(T)$ for these alloys are type B_3, in case the measurement could be made.

Pd-Ni alloys: The observed values of $\sigma_s^{-1}(\partial\sigma_s/\partial p)$ for 74 at.% Pd–Ni alloy are given by solid circles in Fig. 4, together with C_1 estimated from observation equations. The curve in this figure is type B_1, but it is comparatively flat in a wide temperature range. It is expected, therefore, that the curve will become type B_2 and then B_3 when Pd content increases to some extent, judging from the dependence of such curves on Pd contents,[4] in other words, the Curie temperature would be expected to decrease with pressure.

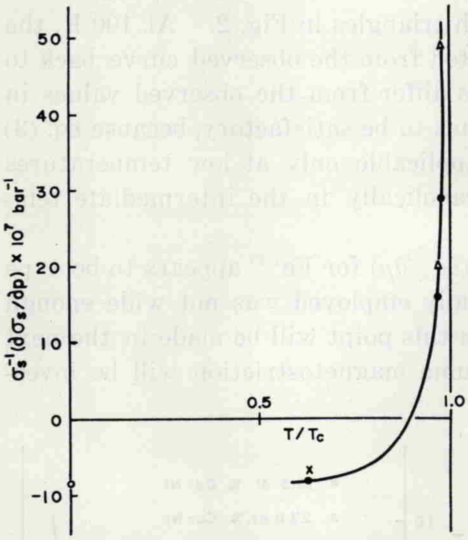

Fig. 4. A plot of temperature dependence of $\sigma_s^{-1}(\partial\sigma_s/\partial p)$ for 74 at.% Pd–Ni alloy. The closed circles ● represent observed values. The points ○, △ and × are estimated from observation equations, eq. (4a) and eq. (2b) respectively.

Assuming that eq. (4a) is applicable to the case of Pd-Ni alloy, the value of $\sigma_s^{-1}(\partial\sigma_s/\partial p)$ in the neighborhood of T_c may be obtained from eq. (4a) where C_1 and C_2 are the estimated and the observed value, respectively. For 74% Pd–Ni for example, the value of C_2 is 2.3×10^{-7} bar^{-1} resulting from the direct measurement which will be reported in the near future and the values of $\sigma_s^{-1}(\partial\sigma_s/\partial p)$ thus obtained are also plotted in Fig. 4 with triangles. Since the slope of the curve is very steep in the neighborhood of T_c, the disagreement between the estimated and observed value in this figure is not serious. The value of $\sigma_s^{-1}(\partial\sigma_s/\partial p)$ plotted with cross in Fig. 4 is the one obtained from eq. (2b) where C_1 is the estimated value and C_2, $G(T)$ are the observed values.

Comparison with the forced volume magnetostriction

From thermodynamics, the basic relation between the pressure effect on σ_s and the forced volume magnetostriction is given by[13)]

$$\left(\frac{\partial\omega}{\partial H}\right)_{P,T}=-\rho\left(\frac{\partial\sigma_s}{\partial p}\right)_{H,T}, \qquad (6)$$

where $\partial\omega/\partial H$ is the forced volume magnetostriction, the volume strain per unit field strength in a strong magnetic fields, and this volume strain is associated with the field induced increase in spontaneous magnetization.

The data on the temperature dependence of $\partial\sigma_s/\partial p$ in previous papers, therefore, may directly be compared, by the use of eq. (6), with the available