Using Eqs. (3)-(7) we can express T_c as a function of the bandwidth W where we assume $T_F \sim W$. Then using the value of $T_c = 572°K$ and the value of $\overline{I}_{max}$ from Table I for MnSb, we can calculate T_c as a function of W. The results of these calculations are shown in Fig. 7. These results are independent of the value of I/I_b,[31] but do not include effects of any volume dependence of I_b. Note the critical bandwidth such that for $W/W_o \geq 1.206$ we do not have FM order, and note the quadratic dependence of T_c on W for $W/W_o \lesssim 1.206$ Using the available x-ray data[32] to estimate W/W_o and using the experimental values for T_c we show, in Fig. 7, the experimental results of T_c as a function of W/W_o. For $x = 0.25$ we calculate $T_c = 474°K$ and $\overline{I} = 1.110$ in fair agreement with the experimental values. For the solid solutions $x > 0.25$ the agreement is only qualitative. The disagreement is not too surprising because of the large differences in unit cell volumes for the various compositions. For these large volume differences one might expect significant changes in the crystal field splittings, and consequently significant changes in the electronic wave functions. Any volume dependence of I_b would modify the results shown in Fig. 7. Lacking specific heat, susceptibility, and magnetostriction data for these materials, we cannot determine $N(\varepsilon_F)$, I, I_b, and any volume dependence of I_b individually. In addition, as we shall point out below, we expect rather large electron-lattice and exchange-striction interactions for these materials, particularly for the solid solutions $x \gtrsim 0.80$. Electron-lattice and exchange-striction effects have not been included in the calculations displayed in Fig. 7.

Sirota and Vasilev[4] have observed a Curie-Weiss type of behavior in the PM region for MnSb, with a Curie constant, $C_M = 1.3$ emu $\text{mole}^{-1}\text{Oe}^{-1}{}^\circ\text{K}^{-1}$. According to the itinerant FM model of Wohlfarth[9] the susceptibility in the temperature region $T_F \gg T > T_c$ can be written as

$$\chi = 2\chi_o[T^2/T_c{}^2 - 1]^{-1} \quad , \tag{16}$$

where

$$\chi_o \equiv \frac{N N(\epsilon_F)\mu_B{}^2}{\overline{I} - 1} \tag{17}$$

Here N is the number of atoms per unit volume. For temperatures near T_c, Eq. (16) can be expanded

$$\chi \simeq \frac{\chi_o\, T_c}{T - T_c} \quad , \quad T \gtrsim T_c \quad , \tag{18}$$

which is a Curie-Weiss type of behavior where the Curie constant C_M is given by

$$C_M = \chi_o T_c \quad . \tag{19}$$

For MnSb χ_o can be calculated from Eq. (19) to give $\chi_o = 0.227 \times 10^{-2}$ emu mole^{-1}Oe^{-1} as compared to $\chi_o = 1.38 \times 10^{-2}$ emu mole^{-1}Oe^{-1} for $ZrZn_2$.[24] This difference in χ_o between MnSb and $ZrZn_2$ is consistent with the values of $\overline{I}$ for these materials. For $ZrZn_2$ [9] $\overline{I} = 1.0042$ and from this work for MnSb $\overline{I}_{max} = 1.206$; thus from Eq. (17) χ_o for MnSb should be smaller. A detailed comparison, however, can only be made if $N(\epsilon_F)$ for MnSb were known. For $x > 0$, χ_o cannot be reliably extracted from the experimental data because the susceptibility has a complicated temperature dependence[4] which is thought to be due to exchange-striction effects.

The localized and the itinerant, or collective, descriptions of magnetic electrons have been investigated by Goodenough.[33] He considered the case of one d-electron per relevant d-orbital which corresponds to a half-filled band or to half-filled localized orbital, and the magnetic order is antiferromagnetic (AFM). In the absence of competing exchange interactions, the Néel temperature,