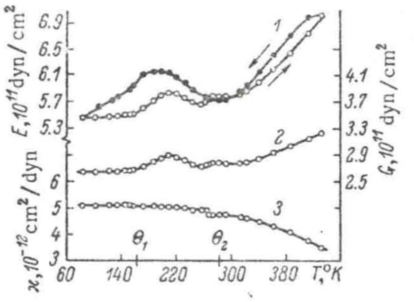

Fig. 2. Temperature dependence of Young's modulus E (1), shear modulus G (2), and compressibility $\varkappa$ (3) of Mn_3Ge_2.

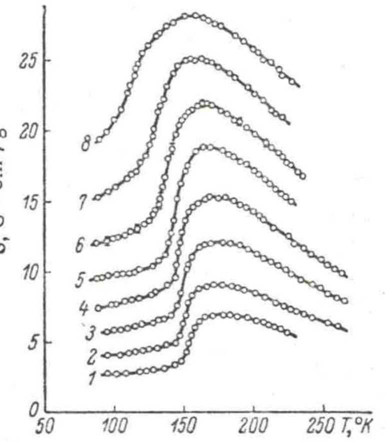

Fig. 3. Temperature dependence of magnetization of Mn_3Ge_2; field in kOe: 1) 20; 2) 30; 3) 40; 4) 50; 5) 60; 6) 80; 7) 100; 8) 130.

normal behavior of E and G in the paramagnetic region with rising temperature and the low values of the Poisson ratio in magnetically ordered states. In the Θ_1 magnetic transition region the Poisson ratio of Mn_3Ge_2 is 0.030.

Figure 3, which shows the temperature dependence of specific magnetization σ in fields from 20 to 130 kOe, indicates that the sharp rise in σ corresponding to the low-temperature magnetic transition in Mn_3Ge_2 is field-dependent and shifts to lower temperatures with increasing H. Using the temperature and field dependence data of magnetization we have plotted Θ_1 as a function of the external magnetic field intensity. Figure 4, in which Θ_1 has been plotted as a function of H from our data and from the data of [7] and [13], shows that the experimental data do not agree. Moreover, our measurements do not confirm the presence of a magnetization discontinuity at T < 100°K in strong magnetic fields, which has been reported in [13].

As seen in Fig. 4, the dependence of Θ_1 on H is nonlinear and can be represented as $\Theta_1 = a - bH + cH^2 - dH^3$, where the numerical values of the

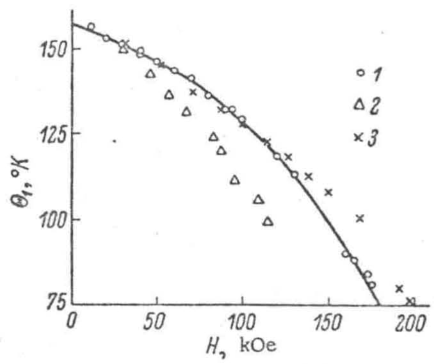

Fig. 4. Magnetic transition temperature Θ_1 as a function of external magnetic field intensity: 1) our data; 2) data of [7]; 3) data of [13].

coefficients have been determined by the method of least squares as a = 158.2, b = 0.240, c = 0.357 · 10^{-3}, and d = 0.921 · 10^{-5}. The derivative $d\Theta_1/dH$ is (at H = 0) equal to

$$\frac{d\Theta_1}{dH} = -(2.4 \pm 0.2) \cdot 10^{-4} \text{ deg/Oe}.$$

The effect of pressure on the low-temperature magnetic transition in Mn_3Ge_2 has been determined by measuring the temperature dependence of magnetization at atmospheric pressure and at a pressure of 10,000 atm in fields of 3, 6, 9, 12, and 15 kOe. As an example, Fig. 5 shows σ(T) curves plotted during heating and cooling in 6- and 15-kOe fields. The curves indicate that at a pressure of 9700 atm (dashed curves) the magnetic transition temperature shifts by 3° in the low-temperature direction so that

$$\frac{d\theta_1}{dP} \simeq -0.3 \cdot 10^{-3} \text{ deg/atm}.$$

It should be noted that the results of measurements taken in rising and falling temperatures are not the same, i.e., a hysteresis is observed whose width decreases with a decreasing rate of σ(T) measurements. The magnetic transition temperature obtained in very slow measurements, i.e., under nearly equilibrium conditions, is equal to 158°K.

Table 1 lists thermodynamic data characterizing the low-temperature magnetic transition in Mn_3Ge_2. The transition entropy ΔS and latent heat ΔQ were calculated from the Clausius-Clapeyron equation. The two forms $\Delta S_1 = -\Delta\sigma_S(dH/dT)_P$ and $\Delta S_2 = \Delta V(dP/dT)_H$ of this equation were used. $\Delta\sigma_S$ has been determined from the temperature dependence of spontaneous magnetization σ_S(T). For this purpose we have used the results of measurements of magnetization isotherms that had the form