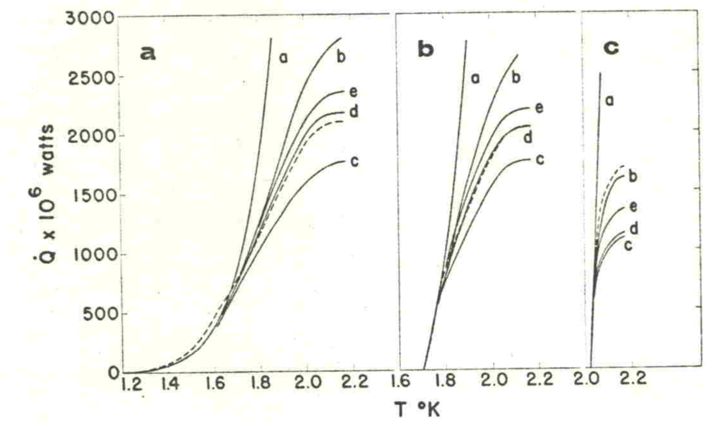

FIG. 1. Comparison of experimental heat flow curves with calculations based on several theories using Eq. (15) and (26); $d = 3.36\ \mu$. a—$T_0 = 1.2$°K; b—$T_0 = 1.7$°K; c—$T_0 = 2.1$°K. Curves a—linear theory ($\alpha\, d^2\bar{q}^2 = 0$); curves b—$m = 3$, $\mathbf{v}_c = 0$, $A = 50$ cm-sec/gm; curves c—$m = 4$, $\mathbf{v}_c = 0$, $A = 50$ cm-sec/gm; curves d—$m = 3$, $\mathbf{v}_c = 0$, A as given by Vinen (*4*); curves e—$m = 3$, $\mathbf{v}_c$ as given by Dash (*16*), A as given by Vinen; ----experimental curves (*1*).

seek plausible explanations for those instances where the "best" theory deviates from the observations.

Examples of the type of theories investigated in the present work and comparison with some experimentally determined heat flows are shown in Fig. 1, where all curves and points refer to Slit III′ (width $= 3.36\ \mu$, breadth $= 1$ cm, and length $= 1.9$ cm). We recall that the experimental curves are obtained by starting with the cold reservoir in contact with the He bath at some fixed reference temperature, T_0, and then adding successive increments of power $\dot{Q}$ to the thermally isolated reservoir, measuring at each step the equilibrium temperature T_1 attained by the latter reservoir. A heat flow curve is obtained then for given $T_0(\dot{Q} = 0)$ as the variation of T_1 with $\dot{Q}$. Considering first the results for $T_0 = 1.2$°K, Fig. 1a, it is clear that for $T_1 > 1.7$°K the experimental points deviate markedly from the predictions of the linear theory (curve a) and that large correction terms are necessary to describe the observed effects. The Gorter-Mellink force term (Eq. (15)) has been used in a variety of forms in attempts to describe the departure from linearity. The simplest and often used form takes $m = 3$, $\mathbf{v}_c = 0$, and $A = 50$ cm-sec/gm (constant with temperature), although some experiments (e.g. see (*15*)) have indicated that a better fit might be obtained by taking $m = 4$. Curves b and c represent such calculations: curve b with $m = 3$ is seen to be uniformly too high; and curve c with $m = 4$ is uniformly too low. A number of experiments have suggested that A might be temperature dependent and possibly velocity dependent. The first precise measure-