id measurements may not be appro-
power inputs. For T_0 less than about
hat region the experimental data indi-
ellink term is negligibly small when l
en $l < d$; however, for T_0 near the λ
r power inputs. Hence, according to
ions of T_0 near T_λ and low $\bar{q}$ we should
ory and experiment, which is indeed
n in which the Gorter-Mellink term
ence for the larger heat flows the for-
the proper values of $A(T)$ becomes
d fit in this region.
point the vortex-line model as pres-
equate description for the very com-
hence the above considerations, al-
y do not describe the sole mechanism
V we have already mentioned another
velocity dependence of the mutual
rs. Furthermore, the above argument
degree of turbulence in the fluid is
e to the velocity field of a neighboring
ional to the average relative velocity
ment is open to question.
results presented here are described
noted that application of this model
s certain additional difficulties, some
wing:
ameter $A(T)$ as given by Vinen are
kers, even for channels with $d > 10^{-3}$
Kramers (*22*), to which may be added
(*17*). For $d > 10^{-3}$ cm values of $A(T)$
temperature dependence as those of
as a factor of ± 2 or 3 (see Table II);
verse temperature dependence. As al-
descriptive for isotropic turbulence
rhaps for "small" channels. Such re-
l in practice to a given experimental
he experiments are compatible with
d to the results of I and II and the
made to ascertain whether the theo-
discussion in Section II of this paper

and the foregoing remarks about vortex line spacing it appears probable that the conditions are properly met, although the possibility cannot be completely excluded that our agreement with Vinen's findings is partially fortuitous. Further, the possible inadequacy of the theory must be added to the list of uncertainties by taking note of the serious objections to the vortex-line model raised by Lin (*23*) as well as of the conclusion by Townsend (*24*) that a satisfactory description of turbulence in thermal flow of liquid He II is not yet available. Finally, no adequate accounting for wall-effects has been given.

Whereas there still remains considerable divergences in the various experimental measurements concerning the nature of turbulence once it is developed in the flow of liquid He II, there appears to be rather more agreement with respect to determining the point at which turbulence begins. This is not to say that the onset of turbulence at some critical velocity is well understood, nor that such onset is experimentally clear-cut. But it is possible to correlate the critical superfluid velocities obtained from a variety of different types of experiments over a range of eight decades of the characteristic geometric distance, d, associated with the apparatuses used. One such correlation has been given by Atkins (*25*) for $T = 1.4°\text{K}$. It can be shown that values of $\bar{\mathbf{v}}_{s,c}$ at this temperature obtained from the present work, shown in Table III, are in good accord with the results of other investigators as represented by Atkins' graph.

On the other hand general agreement is not found experimentally for the manner in which $\bar{\mathbf{v}}_{s,c}$ depends on temperature for a given geometry. Although several investigations, e.g. those of Staas *et al.* (*26*) and of Winkel *et al.* (*27*), indicate that for 4×10^{-5} cm $< d < 2.6 \times 10^{-2}$ cm $\bar{\mathbf{v}}_{s,c}$ passes through a maximum somewhere between 1.5°K and the λ point, the preponderance of evidence suggests that for this range of d, $\bar{\mathbf{v}}_{s,c}$ increases with rising temperature. The latter behavior is demonstrated by the measurements from Slits I and III′ listed in Table III. Because of the conflicting experimental results noted above, it is not clear whether $\bar{\mathbf{v}}_{s,c}$ becomes large or approaches zero at the λ-point. In this matter, however, some observations made with the smallest channel, Slit II ($d = 0.28\ \mu$), may be helpful. As noted in the earlier papers (I and II) no dissipation effects were evident from the experiments with Slit II, even at very large temperature differences; hence it has not been possible to determine critical velocities for this size channel. However the lowering of the λ-point observed in the fountain pressure measurements appeared to indicate a premature (with respect to temperature) destruction of superfluidity which may be associated with large superfluid velocities near the λ-point. To explain the experimental results an argument consistent with these ideas as well as with those of the vortex model may be constructed as follows: Near T_λ the superfluid fraction becomes relatively small and in order that heat currents of the order of 0.3 watts/cm^2 (as calculated) be maintained the superfluid must flow rather rapidly (>5 cm/