urements and at the same time to claim the observations are fitted best by a
theory which does not include the critical velocity. However, the situation is
not as inconsistent as it may appear. As indicated above, q_c has been determined
from the point of first perceptible deviation of the observations from the linear
theory; at this point the calculations involving the Gorter-Mellink term with
$v_c = 0$ lie generally about 5% below the experimental data and the linear theory.
From the manner in which the observed points deviate from the linear theory
it is reasonable to suppose that for $\bar{q}$ less than q_c the Gorter-Mellink term does
not play a significant role, but that near q_c the full mutual friction force begins
to contribute. For wide slits Vinen has observed a similar behavior and has given
a rather detailed discussion of it in relation to the possible existence of "sub-
critical" mutual friction (19).

In principle the procedure just described for deriving critical velocities from
the experimental data ought to be applicable to the computed curves; and it
should be possible thereby to obtain graphically values of the "critical velocity"
even though the thermohydrodynamical equations used in the calculation do
not include critical velocity effects. When we attempt to do this, certain qualita-
tive differences between the calculated and experimental curves emerge rather
clearly: whereas in detail the experimental results permit visual recognition of a
region in which the character of flow is changing, from which one may infer a
critical velocity, the theoretical curves are substantially smoother and a critical
velocity does not suggest itself so readily. (A comparison of curves a, d and the
dashed line in Fig. 1a illustrate this point nicely.) This is to say that although
the theory reproduces the major features of the experimental results, it fails to
reproduce the subtleties. Nevertheless, with the aid of reasonable arbitrary cri-
teria we may continue the exercise, the results of which are instructive and per-
haps reflect upon an area in which the experimentalist may readily be led astray.

Our prescription for computing v_c from calculated curves in which no v_c is
used is as follows: For given values of T_0, curves computed with and without
inclusion of the Gorter-Mellink term are compared; the heat current corre-
sponding to some arbitrarily chosen deviation of the curves from each other,
say 5%, is defined as the "critical heat current"; from this a "critical velocity"
may be calculated. Using this prescription results are found in remarkably good
agreement with the critical velocities determined from the experimental curves
for temperatures below about 1.8°K. However, above 1.8°K the "critical veloc-
ity" obtained in this manner falls toward zero, in contrast to the observed values,
thereby pointing up the inadequacy of our prescription. Yet the existence of this
spurious "critical velocity" criterion may serve as a warning to the experi-
mentalist that care must be exercized in interpreting changes in the character
of the solutions of the flow equations in relation to changes in experimentally
measured quantities. In passing we note that the criterion used above essentially