Bunkov and Timofeevskaya Reply: The Comment by Schiffer *et al.* [1] on our Letter [2] is mainly a defense of the baked Alaska model (BAM) proposed earlier by Leggett. The validity of the BAM has never been seriously discussed owing to the lack of an alternative model. Now an alternative model exists and we are able to compare the pros and cons of each model. It seems to us that there is no unambiguous experimental evidence in favor of the BAM.

There is no doubt that the *A*-*B* transition can be triggered by neutrons, or some other radiation, which locally heats the ^{3}He into the normal state. There is a subsequent fireball of normal ^{3}He which cools by the expansion of excitations. There are two questions under discussion: (i) The temperature distribution after the event [(a) the usual diffusion distribution or (b) an inverse temperature front (BAM)]. (ii) The transition to the superfluid ^{3}He state [(1) single valued or (2) multiseeded (our "cosmological" scenario)]. Consequently there are four different scenarios, shown schematically in Fig. 1.

During the cooling by diffusion, the locus of T_c first expands and then contracts. In the single-valued case the superfluid ^{3}He-*A* just follows the locus, so that there is no possibility of a new phase creation (a1). To solve this paradox, Leggett proposed an inverse temperature distribution which sheltered the internal space, so that the new phase could be created and then expanded to above the critical dimensions (b1).

In Grenoble, we have made accurate measurements of the energy deposited in ^{3}He by a nuclear reaction with a thermal neutron [3]. We have found that the quasiparticles do not carry out all of the reaction energy of 764 keV. A significant part of the energy is lost to vortex creation and corresponds well with the theory of Zurek [4] developed for cosmic string creation. Vortex creation by neutrons has been also shown in Helsinki [5]. All this suggests that after local heating the superfluid transition in ^{3}He occurs simultaneously in many causally independent seeds with dimensions of a few coherence lengths. It is possible that the cosmological-type transition follows the BAM temperature distribution (b2). However, Kibble and Volovik [6] have shown that the diffusion temperature front moves so fast that the *A* phase lags far behind and seeds of new states appear (a2). In the case of neutron heating, the dimensions of the hot spot are considerably larger than the critical nucleation radius discussed in the Comment. Once conditions are such that the *B* phase percolates across the spot, it would then not face the surface tension barrier and would not need a BAM structure to grow.

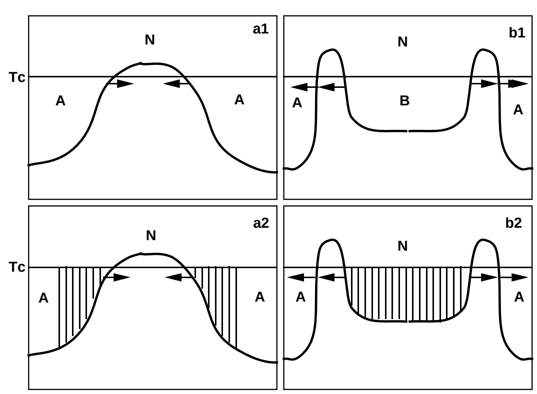

FIG. 1. The different scenario of transitions after a local heating. Vertical lines indicate a region of independently nucleated superfluid seeds.

In response to the Comment about the validity of the BAM theory (see Ref. [2] of the Comment [1]) we should draw attention to an intrinsic contradiction in the BAM pointed out by Volovik [7]. If the average quasiparticle energy during the thermalization is $E(t)$, then after a local event with energy deposition E_0, quasiparticles should occupy a space larger than radius $R \sim (1/p_F)[E_0 E_F/E^2(t)]^{1/3}$, where E_F is the Fermi energy. The BAM process can take place if the shell radius is about the dimension of the mean free path $l \sim (1/p_F)[E_F^2/E^2(t)]$. To deposit all quasiparticles inside the BAM shell, the condition $R < l$ needs to be fulfilled, which can be rewritten as $(E_0/E_F)^{1/3}[E(t)/E_F]^{4/3} < 1$. If we take E_0 to be $10^9 E_F$, as in the neutron case, then this condition is not fulfilled, certainly during the earlier stages of the thermalization process. In consequence one cannot consider the fate of one isolated particle, and the dominant process is mutual scattering among the excited quasiparticles within the hot spot leading to fast local thermalization, and differing from the outward-moving spike of ballistic quasiparticles as conjectured in the BAM.

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