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REPLY TO "COMMENTS ON 'ON THE EXISTENCE OF TWO "TRANSITION" BOILING CURVES'"

WE ARE grateful for R. H. S. Winterton's useful addition to our paper on transition boiling. He has pointed out additional data which show that large contact angle, non-wetting behavior eliminates the nucleate boiling region. On the basis of these observations he suggests Fig. 2 as a proper boiling curve.

Figure 3 is our version of a boiling curve that would correctly reflect this "contact angle $>90°$" behavior.* While it differs in some aspects from Fig. 2, we feel that it correctly reflects this phenomenon that we overlooked in our paper.

Such jumps appear never to occur in the data that Mr Winterton has brought to our attention. A film boiling mode is retained as long as there is boiling. This strikes us as a most interesting verification of our suggestion that there exists a film-transition boiling region. The "non-wetting" data of Nishikawa *et al.* [6] seem to fit our notion of a film-transition curve quite well, while their "normal" data appear to fit our "nucleate-transition" curve. Both curves lead to obvious nucleate boiling data points as the surface temperature

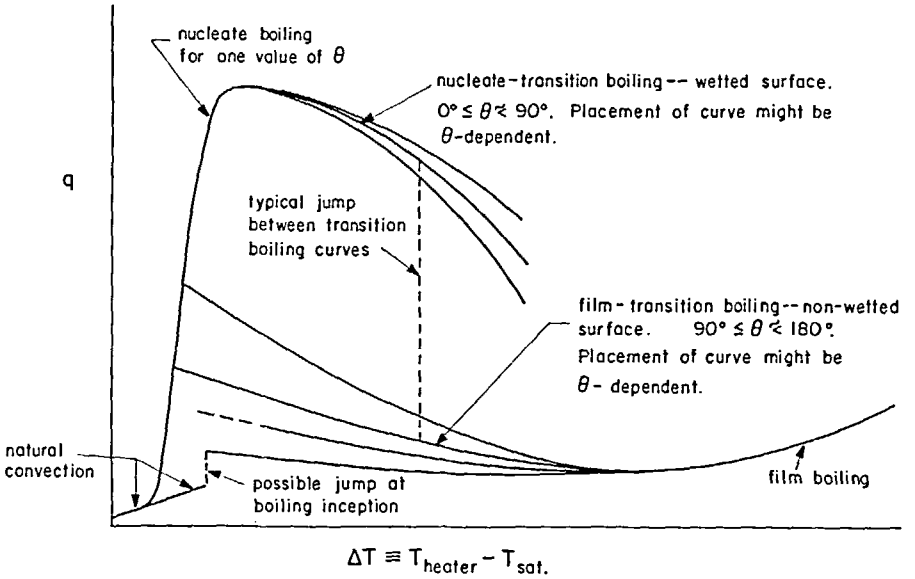

FIG. 3. Boiling curves *for a given liquid* but *for different heating* surfaces.

In our paper we carefully circumscribed our claim that there were two transition boiling curves by saying this would be *for a given heater surface and liquid combination.* Mr Winterton suggests that there might be a great multiplicity of curves for a given liquid as the contact angle, θ, is allowed to vary, and we would tend to agree.

However, for precisely specified heater-liquid combinations, we still believe that there are just two curves and that these are not both reachable under all conditions. Indeed we suspect that "wettability" probably decreases as most heaters become hotter, thus favoring a jump somewhere in the transition region.

decreases, so that some degree of wetting must exist for both cases, however. This appears not to be the case for mercury, which is truly non-wetting.

It is clear that there is a serious need for more data in the transition boiling regimes—data supported by careful surface chemistry control and photographic observations. While we regard Mr Winterton's data as support for our original claims, there is enough speculation embedded in all of this to cry out for more data.

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* We accept the "$>90°$" identification as more figurative than literal. The point of departure might be some other angle of the order of 90°.