DISCUSSION

G. L. Kulcinski[1]—Have you noticed a change in the degree of truncation as you examine areas in the foil closer to the end of path for the protons? Recent work at Pacific Northwest Laboratories by Dr. Laidler has shown that hydrogen can change the morphology of voids in quenched nickel, in general reducing the degree of truncation in the (100) planes.

D. W. Keefer (authors' closure)—We have observed no change in the degree of truncation of voids produced at different positions along the proton pathlength, nor have we noted changes in truncation with increasing proton fluence.

G. J. C. Carpenter[2]—In studies of void formation under neutron irradiation, the zones adjacent to grain boundaries are normally denuded with respect to voids and dislocation loops. This implies that the boundaries act as sinks for the irradiation induced defects. Your observation that there is no denuded region after proton irradiation seems to suggest that the grain boundaries are not acting as sinks. Strictly, for there to be *no* denuded region, voids must be situated *on* the grain boundaries. If no voids occur on the boundaries, there is of necessity a "denuded region," although it may be small. This could be due either to slow diffusion kinetics (a low irradiation temperature) or to a restriction on the ability of the grain boundaries to absorb point defects. Is there any reason to suppose that in your ion bombardment experiments the denuded region was smaller than observed for neutron irradiation at a comparable temperature? If there is a large difference, perhaps account should be taken of the stresses that must build up in the region of maximum swelling, where the ions stop, resulting from the constraint imposed by the surrounding material.

D. W. Keefer (authors' closure)—I disagree with your statement that, in the absence of a "denuded region," voids should be found on grain boundaries. I feel that the absence of such a region is defined by the average void-boundary distance being no greater than the average void-void separation. As I mentioned, in our experiments no such denuded region was observed. I feel this observation, compared to the neutron results,

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most likely can be attributed to the higher defect production rate in our experiments.

D. J. Mazey[3]—The concentration of hydrogen is expected to be high near the end of the protons range in the steel. Do you think this hydrogen is influencing void formation?

D. W. Keefer (*authors' closure*)—In the absence of preinjected helium, we find that the void concentration is lower by several orders of magnitude. We infer from this that hydrogen does not have a significant influence on void nucleation. The possible influence of hydrogen on void growth has yet to be determined.

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