

Chan *et al.* Reply: In our Letter,¹ we reported the observation of power-law behavior for the superfluid density of helium completely filling the pores of Vycor, xerogel, and aerogel. Power-law behaviors are also found for thin helium films plating the pores of Vycor² and xerogel.³ Although a bulklike exponent is found for ⁴He confined in Vycor, distinctly different exponents are found for the other two substrates. These findings and the observation of sharp heat-capacity peaks⁴ at T_c for thin films are evidence of three-dimensional genuine critical rather than a smeared out Kosterlitz-Thouless (KT) transition. Recent models for the superfluid transition of helium films in porous media, focusing on the role of vortices on a lattice of multiply connected cylinders, also arrive at the conclusion that as $T \rightarrow T_c$, the transition becomes a 3D critical phase transition.⁵

Inasmuch as power-law behavior provides a good description for the superfluid density near T_c , there is no obvious "knee" in the ρ_s vs T curve of Vycor and xerogel to be compared with the KT line. If we were to normalize each curve by $\rho_{s,0}$ (ρ_s at $T=0$) and T_c , the KT lines as depicted by Williams would not cross each curve at the same point. This is particularly acute in the case of films on xerogel at the lowest and highest coverages. The highest coverage film studied by us has a $T_c = 1.8$ K (Ref. 3) and it is not shown in Fig. 1 in the preceding Comment.⁶

We do not understand why the superfluid density exponent of helium in xerogel and aerogel is different from that of helium in Vycor and bulk helium. We think the

key lies in understanding the nature and the role of disorder imposed by these porous glasses.

Moses H. W. Chan
Department of Physics
Penn State University
University Park, Pennsylvania 16802

K. I. Blum, S. Q. Murphy, G. K. S. Wong, and J. D. Reppy
The Laboratory of Atomic and Solid State Physics
and the Material Science Center
Cornell University
Ithaca, New York 14853

Received 14 September 1989

PACS numbers: 67.40.Kh, 64.60.-i, 67.40.Hf, 67.40.Yv

¹M. H. W. Chan *et al.*, Phys. Rev. Lett. **61**, 1950 (1988).

²D. J. Bishop, J. E. Berthold, J. M. Parpia, and J. D. Reppy, Phys. Rev. B **24**, 5047 (1981).

³K. I. Blum *et al.*, Jpn. J. Appl. Phys. **26**, Suppl. 26-3, 275 (1987); K. I. Blum, Ph.D. thesis, Cornell University, 1989 (unpublished).

⁴D. Finotello, K. A. Gillis, A. Wong, and M. H. W. Chan, Phys. Rev. Lett. **61**, 1954 (1988).

⁵J. Machta and R. A. Guyer, Phys. Rev. Lett. **60**, 2054 (1988); F. Gallet and G. A. Williams, Phys. Rev. B **39**, 4673 (1989); T. Minoguchi and Y. Nagaoka, Prog. Theor. Phys. **80**, 397 (1988).

⁶Gary A. Williams, preceding Comment, Phys. Rev. Lett. **64**, 978 (1990).