Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Smoothness and Vortex-Wall Interactions in Superfluid Helium RENA ZIEVE, CYNTHIA FREI, DEANNA WOLFSON, University of California, Davis — We study two aspects of the interaction between a surface and a single vortex line terminating on the surface. One is pinning, when a moving vortex becomes caught at some point on the wall. The second is the energy dissipation as the vortex moves, which appears to be dominated by a vortex-surface interaction. When we reduce the surface roughness through mechanical polishing, we find that the energy loss decreases, as expected if the dissipation comes from a "friction" force which is weaker for smoother walls. The change is small, about a factor of 3 for several orders of magnitude difference in surface roughness. This is consistent with the very small vortex core size in ^{4}He since even our highly polished surfaces are "rough" on the scale of the vortex core. A more surprising finding is that the vortex is *more* likely to pin on the smooher walls, suggesting that this vortex-surface interaction is stronger for smoother walls. We will discuss how a mesh of small vortex lengths pinned along the container surface may contribute to these observations.

Rena Zieve
University of California, Davis

Date submitted: 01 Dec 2004 Electronic form version 1.4