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Flow mechanisms of solid ^{4}He near melting[1] JOHN BEAMISH, JAMES DAY, Department of Physics, University of Alberta — In our recent experiments, we saw no evidence of pressure induced flow of solid helium, neither in the pores of Vycor nor in bulk, in the temperature range where non-classical rotational inertia (NCRI) has been observed; however, we did observe mass flow close to the melting points of our samples. Mass can be transported in crystals through vacancy movement or via the motion of extended defects like dislocations. The high temperature flow of helium confined in Vycor is quite different from that of bulk helium; different mechanisms appear to be involved. In bulk helium the flow is irreversible and is consistent with the creation of defects like dislocations during plastic flow. Plastic flow and dislocation creation cannot occur in nanometer scale channels, and so it is not surprising that we see different behavior for helium in the pores of Vycor. The thermally activated mass flow in Vycor must be due to motion of vacancies or similar point defects. In this talk we will describe the nature of observed flow and possible mechanisms, and discuss its relevance to the NCRI experiments.

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James Day
Department of Physics, University of Alberta

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