Session 23W

Quantum Turbulence **23W1**

W. F. Vinen

School of Physics and Astronomy, University of Birmingham, Birmingham B15 2TT, UK.

The paper will be concerned with turbulence in a superfluid, in which flow is strongly influenced by the quantum effects that give rise to two-fluid behaviour, frictionless flow of the superfluid component and restrictions on rotational motion. There is now significant experimental evidence relating to turbulent flow in superfluid ^{4}He in circumstances where comparison is possible with an analogous flow in a classical fluid. The similarities and differences will be analyzed, and the evidence will be assessed for quasi-classical behaviour at large length scales in the quantum case. Dissipative processes at small length scales in the superfluid will be discussed; they will be shown to lead to an effective viscosity but to be based on novel quantum processes. The need for further experiments, especially at very low temperatures and in superfluid ^{3}He-B, will be emphasized.

Impurity Phases of Superfluid ^{3}He in Aerogel **23W2**

W. P. Halperin[a], G. Gervais[a], K. Yawata[a], N. Mulders[b]

[a] *Northwestern University, Evanston, Illinois 60208 USA*
[b] *University of Delaware, Newark, Delaware, 19716 USA*

Discovery of impurity phases of superfluid ^{3}He, produced by silica aerogel, provides a new approach to investigate the effect of disorder on unconventional pairing. A simple model that assumes homogeneous, isotropic scattering is in qualitative agreement with experiment including suppression of the superfluid transition temperature, the amplitude of the order parameter, and a phase diagram of magnetic field, temperature, and pressure, with the feature that the polycritical point vanishes in a 98% porous aerogel. We also find a metastable equal-spin-pairing state in zero field although such a phase does not exist in equilibrium. Additionally, it is puzzling that two different superfluid condensates, one disordered and the other pure, do not appear to be coupled by the proximity effect at their interface.