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Lévy Flights and Anomalous Diffusion in Liquid ^{3}He-Aerogel[1]
JAMES SAULS, Northwestern University — The transport of heat by liquid ^{3}He impregated into silica aerogel is limited at low temperatures by elastic scattering of quasiparticles by the aerogel. The gossamer structure of silica aerogel is a realization of a random fractal - a solid with no long-range order, but power-law scaling of the density correlation function. Complementary to fractal scaling of the particle-particle correlation function is the appearance of a power law distribution of *free flight paths*. The open structure shown in the DLCA simulations of low-density aerogel leads to a distribution of exceedingly long flight paths governed by a Lévy distribution. I describe a theory for anomalous diffusion of quasiparticles in which the Lévy distribution of long free paths is interrupted by inelastic collisions between quasiparticles. These rare events lead to finite temperature corrections to the thermal diffusion coefficient of the form, $\kappa/T = K_0 - K_1\,(T/T^\star)^\beta$, where $T^\star$ is the temperature at which the elastic and inelastic mean free paths are equal and β is related to the fractal dimension of the Lévy distribution.

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James Sauls
Northwestern University

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