$$\kappa_{eff} = - J_T/\text{grad}\ T$$

(J_Tは熱流）を実測し，　Ahlers & Pobell[4]の質量拡散係数の実験値を用いて，濃度勾配の無いときの熱伝導度を得ている。この振舞いは，予想通り $T \to T_\lambda$ で，

$$(\kappa_T)_{\text{grad}\ X_3=0} \propto \varepsilon^{-1/3}$$

でほゞ与えられる。且つ，この臨界指数の値 1/3 は ^{3}He濃度にほとんど依存しない。

^{3}He－^{4}He系での熱伝導に関連しては，この他，熱拡散係数と質量拡散係数の２つの自由度から決まる２つの eigenmodes のことなど幾つか重要なことが有るが，ここでは割愛させていただく。

文　　献

くわしくは，例えば，

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DYNAMIC SCALING IN NORMAL AND SUPERFLUID HELIUM

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The critical thermodynamics of the λ transition in liquid ^{4}He result from fluctuations of the two-component order parameter. The components correspond to the real and imaginary parts of the superfluid condensate wave function. The critical dynamics depend additionally on fluctuations of the entropy density. Kubo relations provide two integral equations relating γ_ψ and γ_S, the order parameter and entropy decay rates, respectively. Dynamic scaling predicts that at the λ poind the ratio $\gamma_\psi/\gamma_S = \omega$ should be a constant, independent of wave number. J. K. Bhattacharjee and I have studied the conditions for the vanishing of ω. We found that this may actually happen in liquid helium, signifying a breakdown of dynamic scaling. The breakdown is mainly of academic interest, however, because it occurs in a very small region of parameter space, experimentally inaccessible. The experiments are carried out mainly in the van Hove region, or precritical region, where the theory simplifies greatly. We are consequently able to obtain closed expressions which give a good account of the thermal conductivity, the light scattering spectrum, and the damping of second sound. The damping of first sound involves the fluctuations referred to above less directly and has necessitated the development of a new general theory for critical ultrasonic attenuation. Bhattacharjee and I have arrived at such a theory by going back to the basic idea introduced by Laplace almost two hundred years ago. In 1816 Laplace corrected Newton's calculation of the speed of sound by noting that a pressure wave in a fluid produces adiabatic heating and cooling. Over one hundred years later Rice and Herzfeld pointed out that these temperature variations produce sound attenuation in polyatomic gases. This is because the internal vibrational modes require time to come into equilibrium, resulting in hysteresis and energy dissipation. J. K. Bhattacharjee and I have built our theory of critical ultrasonic attenuation based on this very same idea. In place of internal vibrational modes we are dealing with the Fourier components of the order parameter having a continuous distribution of relaxation rates. The mathematical details of this theory are contained in the frequency dependent specific heat, which is determined **a priori** from thermodynamic and hydrodynamic data. The resulting predictions of critical attenuation and dispersion are in excellent agreement with experimental measurements.

動的スケーリング則からのはずれ
−液体 ^{4}He のラムダ点近傍における超音波吸収の場合−

名大・理　　三　宅　和　正

動的臨界現象に対して，動的スケーリングの考え方およびその微視的な基礎を成すと考えら