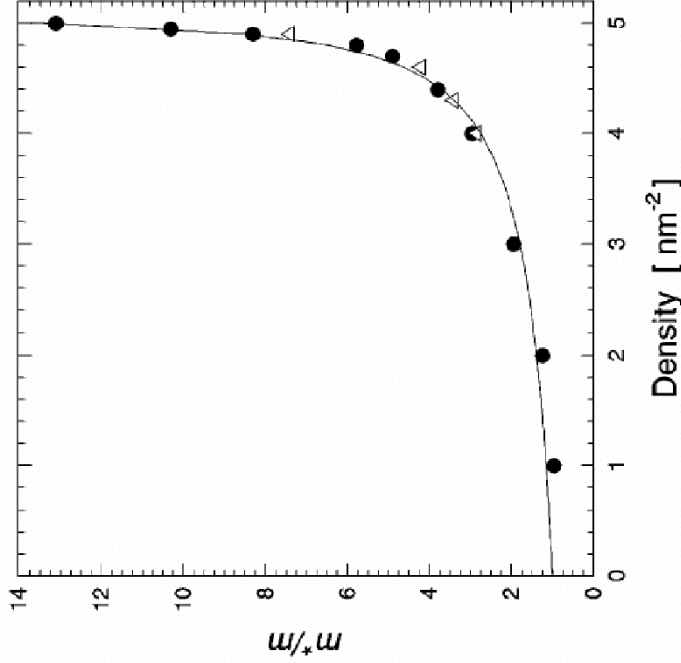


Divergence of the effective mass in 2D He3

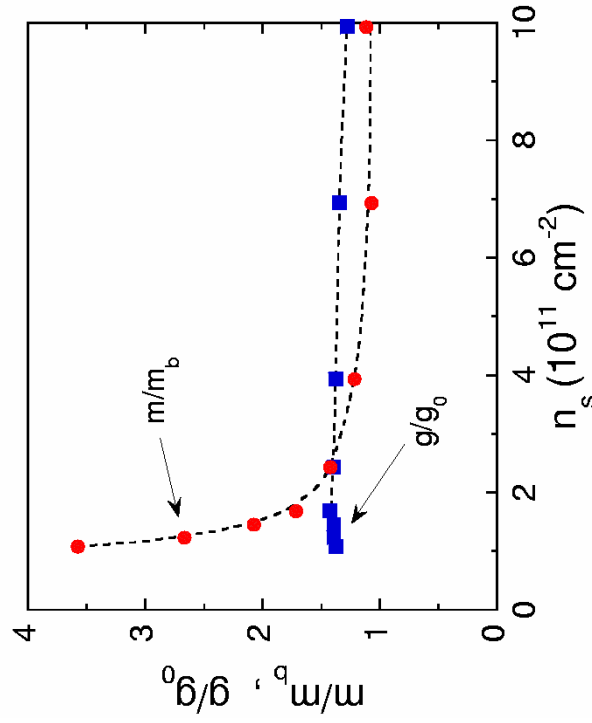
Casey, Patel, Nyéki,
Cowan, Saunders, PRL
90, 115301 (2003)



Divergence of effective mass is precursor to the **crystallization transition** from liquid to solid He3.

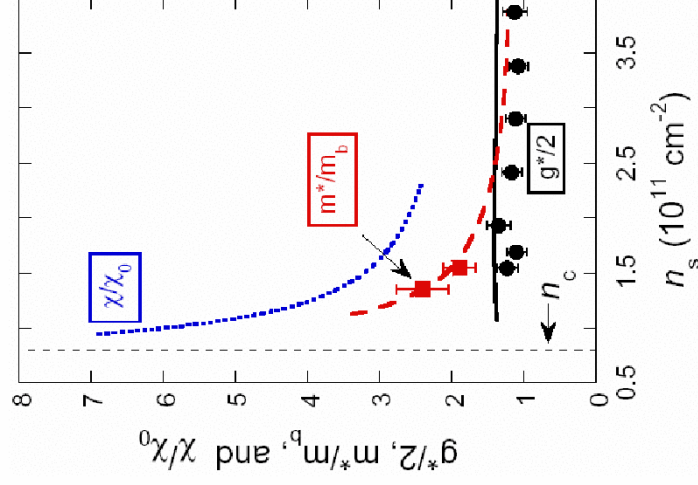
FIG. 2. Effective mass ratio as a function of ³He fluid density inferred from heat capacity (●), magnetization (△), showing apparent divergence. Solid line is fit to data (see text).

Divergence of the effective mass in 2DEG



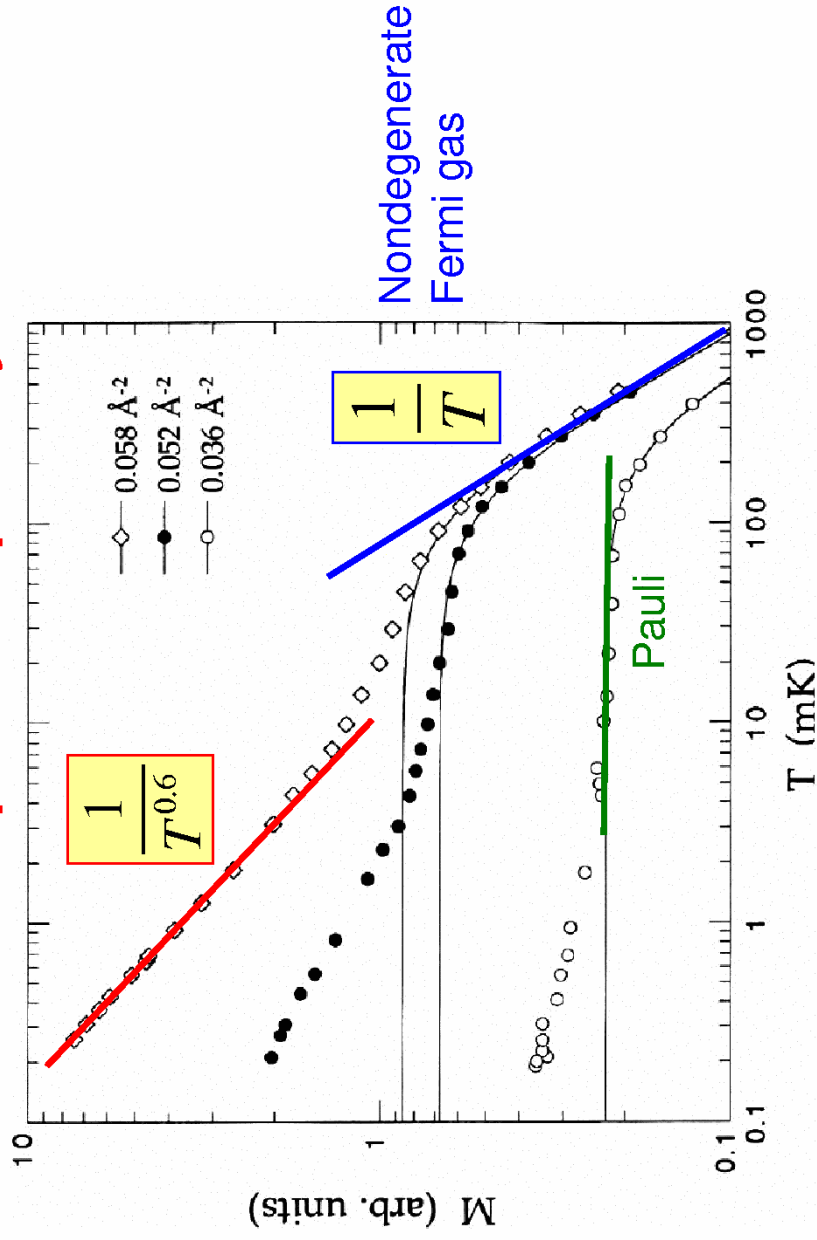
Shashkin, Kravchenko, Dolgoplov,
Klapwijk, PRB 66, 073303 (2002)

Effective mass divergence is precursor to the **metal-insulator transition** in 2DEG.



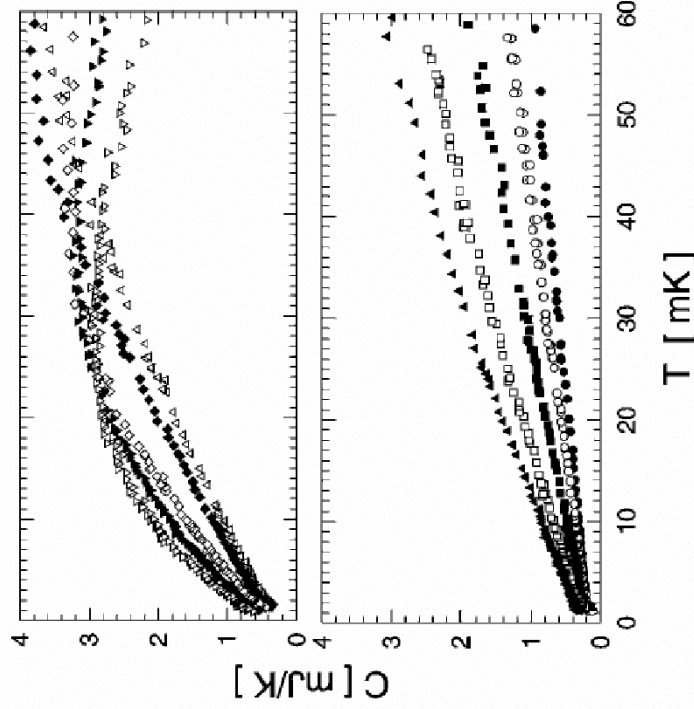
Anissimova *et al.*,
cond-mat/0503123

Nuclear spin susceptibility in 2D He3



Bäuerle, Bunkov, Chen, Fisher, Godfrin, JLTTP **110**, 333 (1998)

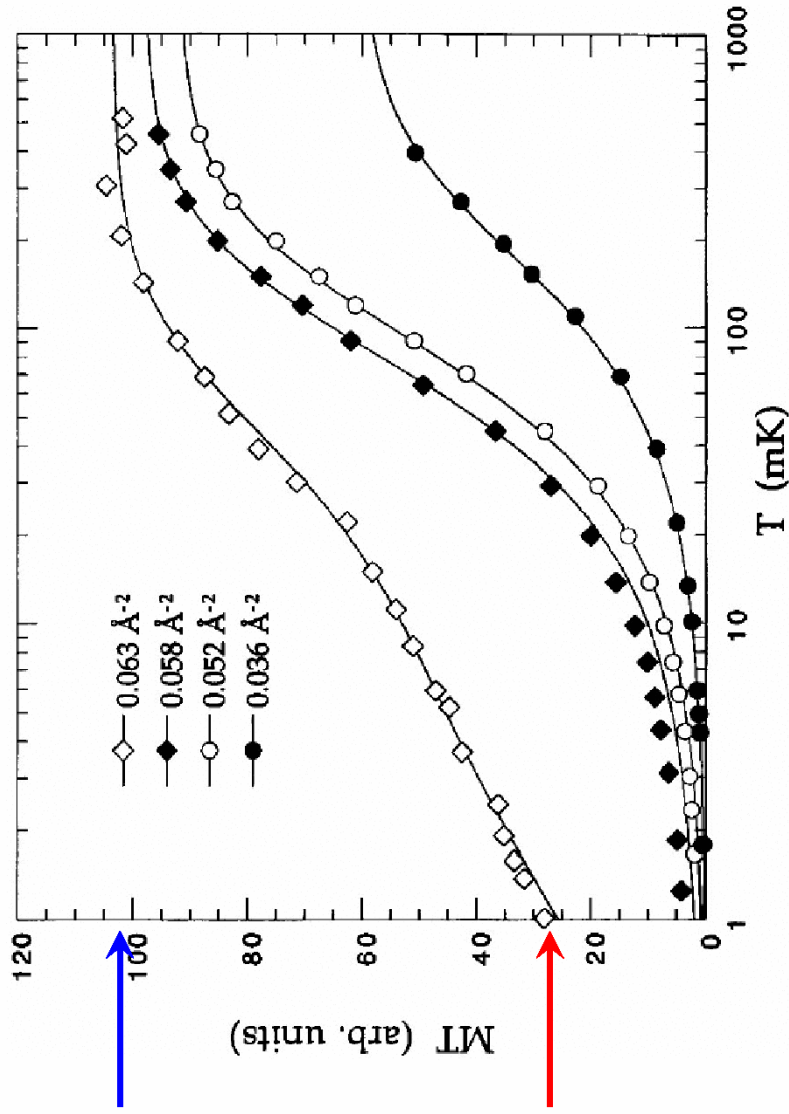
Specific heat in 2D He3



Casey, Patel,
Nyéki, Cowan,
Saunders, PRL **90**,
115301 (2003)

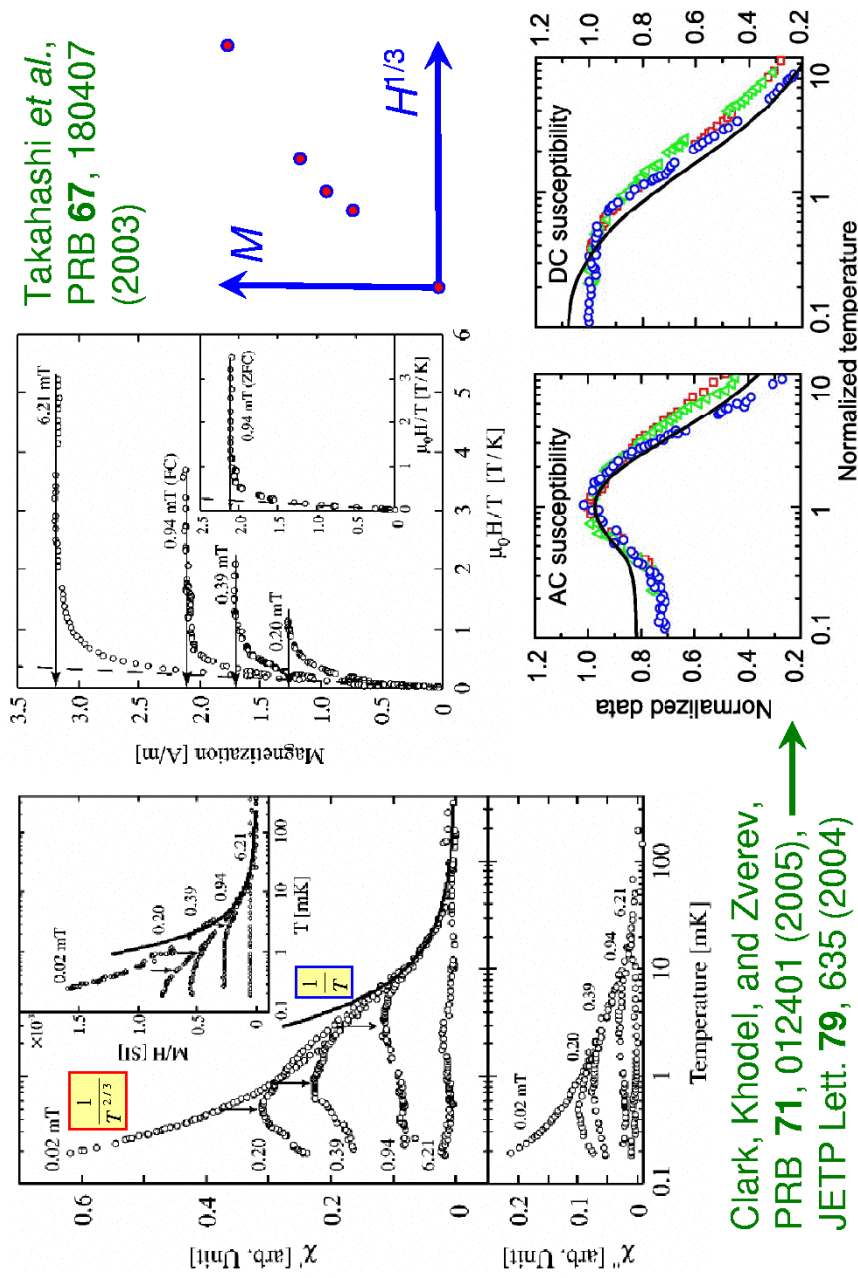
FIG. 1. Heat capacity at ³He coverages: 1.00 (●), 2.00 (○), 3.00 (■), 4.00 (□), 4.40 (▲), 4.70 (△), 4.80 (◆), 4.90 (◇), 4.95 (▼), and 5.00 nm⁻² (▽).

Nuclear spin susceptibility in 2D He3



Bäuerle, Bunkov, Chen, Fisher, Godfrin, JLTTP **110**, 333 (1998)

Quantum Critical Point in CeRu₂Si₂



Takahashi *et al.*,
PRB **67**, 180407
(2003)

Clark, Khodel, and Zverev,
PRB **71**, 012401 (2005),
JETP Lett. **79**, 635 (2004)

Transition from
 "localized spins"
 to super-
 conductivity in
PuCoGa₅: Sarrao
et al., Nature **420**,
 297 (2002)

Other examples:
CeCoIn₅:
 "localized spins"
 and super-
 conductivity
UCoGa₅: no
 "localized spins"
 and no super-
 conductivity

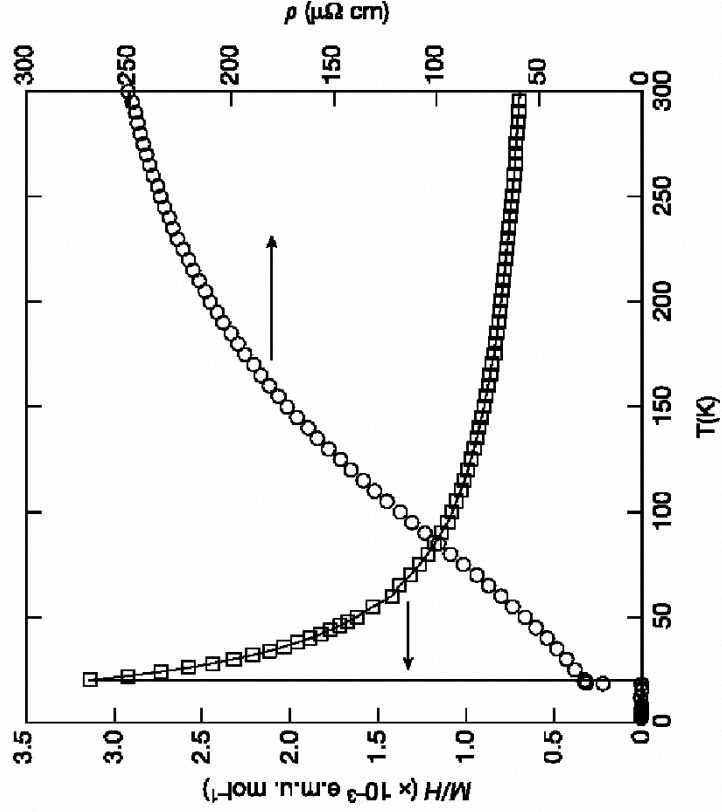


Figure 3 Normal-state properties of PuCoGa₅. The electrical resistivity ρ (circles) increases approximately as $T^{-1.35}$ from just above T_c to 50 K. The magnetic susceptibility $\chi \equiv M/H$ (squares) as a function of temperature follows $\chi = \chi_0 + C/(T - \theta)$ with an effective moment $\mu = (8C)^{1/2} = 0.68\mu_B$ and an interaction temperature $\theta \approx -2$ K.