

# 凝縮系物理学ゼミナール

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場所：理学部5号館 413号室

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## 「Ultracold gases of Ytterbium and $SU(n)$ Ferromagnetism」

We argue that ultracold quantum degenerate gas of ytterbium  $^{173}\text{Yb}$  atoms having nuclear spin  $I = 5/2$  exhibits an enlarged  $SU(6)$  symmetry. Within the Landau Fermi liquid theory, stability criteria against Fermi liquid (Pomeranchuk) instabilities in the spin channel are considered. Focusing on the  $SU(n > 2)$  generalizations of ferromagnetism, it is shown within mean-field theory that the transition from the paramagnet to the itinerant ferromagnet is generically first order. On symmetry grounds, general  $SU(n)$  itinerant ferromagnetic ground states and their topological excitations are also discussed. These  $SU(n > 2)$  ferromagnets can become stable by increasing the scattering length using optical methods or in an optical lattice. However, in an optical lattice at current experimental temperatures, Mott states with different filling are expected to coexist in the same trap, as obtained from a calculation based on the  $SU(6)$  Hubbard model.