

# 凝縮系物理学ゼミナール

## Condensed Matter Theory Seminar

Location: Room 413, School of Science Bldg. #5 (理学 5 号館 413 号室)

Date: 13:30-15:00, Wednesday, 5 November 2014

### “Photo-induced Kondo effect in a two-orbital optical lattice: a non-perturbative optical response”

Speaker: Mr. **Masaya Nakagawa** (Condensed Matter Theory Group)

Abstract:

Kondo effect is a ubiquitous phenomenon in condensed matter physics, in which hybridization between localized and itinerant degrees of freedom gives singular effects on the system. In this talk, we propose a novel route to realize the Kondo effect using light-matter interactions, which is described as a "singular" optical response. Motivated by recent progress in ultracold atomic physics using alkaline-earth species [1-4], we consider a two-orbital system consisting of a Mott insulator and itinerant free fermions, and apply an ac field which induces the optical transition between the orbitals. The ac field plays a role of hybridization, and thus dissolves the Mott insulator into the free fermionic "bath" degrees of freedom, which is nothing other than the emergence of the Kondo effect. We elucidate these behaviors and describe the resulting heavy-fermion state, using Keldysh field-theoretical formalism and slave-boson representation. Furthermore, we clarify that the photo-induced Kondo effect has a remarkable feature due to the form of the optical coupling, which results in a novel SU(N)-breaking Kondo effect and may induce a unique phase, dubbed "component-selective Kondo insulator".

References:

- [1] A. V. Gorshkov *et al.*, Nat. Phys. **6**, 289 (2010).
- [2] G. Cappellini *et al.*, Phys. Rev. Lett. **113**, 120402 (2014).
- [3] F. Scazza *et al.*, Nat. Phys. **10**, 779 (2014).
- [4] X. Zhang *et al.*, Science **345**, 1467 (2014).