

# 凝縮系物理学ゼミナール

## Condensed Matter Seminar

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

Date: **13:30-15:00**, Wednesday, 21 November 2018

## “Symmetry analysis of electrically-switchable antiferromagnets”

Speaker:

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Abstract:

Antiferromagnets are insensitive to electric or magnetic perturbations due to the absence of net electric or magnetic polarizations, and hence the control of the antiferromagnetic (AFM) domains is seemingly difficult. On the other hand, recent studies have been extensively enhanced the possibility to manipulate AFM domains [1]. Especially, the switching scheme using current-induced antiferroic magnetizations is attracting a lot of attention in a subfield of spintronics, that is, antiferromagnetic spintronics. The switching scheme was proposed by the theoretical works and subsequently confirmed in several antiferromagnetic conductors [2, 3]. In spite of those theoretical and experimental achievements, it remains unclear which antiferromagnets are switchable by electric currents. In fact, there are only a few candidate materials for the switchable antiferromagnets.

We present a general symmetry analysis of current-induced switching of antiferromagnetic states. By making the use of group-theoretical methods, we identify what “antiferromagnetic order” can be switched by applying the electric current. Following the obtained criterion for the switching, we show that there are a lot of potential candidates other than the existing candidates. We also discuss the relation with the ferro-toroidic order and the application to complete read-out of the AFM domains.

References:

- [1] For review, A. Baltz et al., Rev. Mod. Phys. 90, 015005 (2018).
- [2] Y. Yanase, J. Phys. Soc. Japan 83, 14703 (2013); J. Železný et al., Phys. Rev. Lett. 113, 157201 (2014).
- [3] P. Wadley et al., Science 351, 587 (2016); S. Y. Bodnar et al., Nat. Comm. 9, 348 (2018).