# 北京大学量子材料科学中心

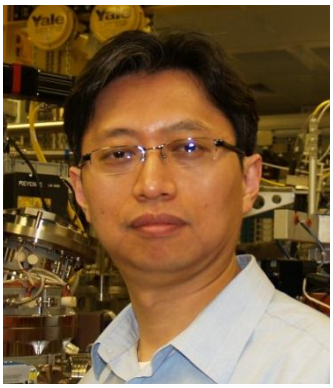
# International Center for Quantum Materials, PKU

## Weekly Seminar

# CHIRAL SPINTRONICS


## See-Hun Yang

*IBM Research – Almaden, San Jose, CA, USA*

**Time: 4:00pm, May. 30, 2018 (Wednesday)**

**时间：2018年5月30日 （周三）下午4:00**

**Venue: Room W563, Physics Building, Peking University**

**地点：北京大学物理楼 西563**

## Abstract


Chirality is one of the fundamental asymmetries in nature. Recently chiral nature of specific magnetic structures has been enormous attention and arisen to be very useful for potential application to spintronics since it has been realized that the combination with spin-orbit interaction such as spin Hall effect can be very efficient in manipulation of magnetic elements [1]. In this talk I will present a variety of novel emergent phenomena associated with chiral properties from emergent magnetic nanostructures: spin-orbit torques from perpendicularly magnetized ultrathin films [2], exchange coupling torque [3] and chiral exchange drag [4] from synthetic antiferromagnets, and chiral tunneling from chiral molecules [5]. In the end I will conclude my talk with promising outlooks from these new findings.



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[1] S. S. P. Parkin, and See-Hun Yang, “Memory on the racetrack”, Nature Nanotechnology (2015).

[2] K.-S. Ryu, L. Thomas, See-Hun Yang, and S. S. P. Parkin, “Chiral spin torque at magnetic domain walls”, Nature Nanotechnology 8, 527 (2013).

[3] See-Hun Yang, K.-S. Ryu, and S. S. P. Parkin, “Domain-wall velocities of up to 750 m/s driven by exchange-coupling torque in synthetic antiferromagnets”, Nature Nanotechnology 10, 221 (2015).

[4] See-Hun Yang, C. Garg, and S. S. P. Parkin, “Chiral Exchange Drag and Chirality Oscillations in synthetic antiferromagnets”, Nature Physics (2018) submitted.

[5] K. Banerjee-Ghosh, O.B. Dor, F. Tassinari, E. Capua, S. Yochelis, A. Capua, See-Hun Yang, S.S.P. Parkin, S. Sarkar, L. Kronik, L. T. Baczewski, R. Naaman, and Y. Paltiel, “Separation of Enantiomers by Enantio-Specific Interaction of Chiral Molecules with Magnetic Substrates”, Science (2018) in press.


## About the Speaker

Dr. See-Hun Yang is a Research Staff Member working for IBM Research – Almaden, San Jose, CA in the US. His research interests are spintronics and magnetoelectronics to understand the physics of current-induced manipulation of magnetic elements in nanostructures and to develop devices that are useful for emerging new types of memory and neuromorphic artificial intelligence technology. Before joining IBM, he obtained B.S, M.S, and Ph.D. from Department of Physics, Seoul National University with the theses on Heusler alloys and heavy fermion materials. After this, he worked for Advanced Light Source, Lawrence Berkeley National Laboratory as a postdoc research fellow, where he developed a novel technique to probe magnetic and electronic structure in the buried layers using x-ray standing waves. He received IBM Research Division Award for the Discovery of Giant Tunneling Magnetoresistance in MgO-based Magnetic Tunnel Junctions that is one of major impacts to modern spintronics. Recently, he has made a few breakthroughs by discovering entirely new powerful torques that can move magnetic domain walls much more efficiently by current than established conventional spin transfer torque. He has published more than 100 peer reviewed papers in Science, Nature Materials, Nature Nanotechnology, Nature Physics, Nature Communications, Science Advances, Nano Letters, Physical Review Letters, and Journal of Physics, etc.