



Graduate Program in Spintronics Seminar

# “Spin-orbit torque-based spintronic devices”

Time : 1pm-3pm

Date : Friday, **September 14, 2018**

Venue: **Seminar Room 407**, 4th floor

Education and Research Building, Materials Science and  
Materials Processing, Graduate School of Engineering

Dr. **BYONG-GUK PARK**

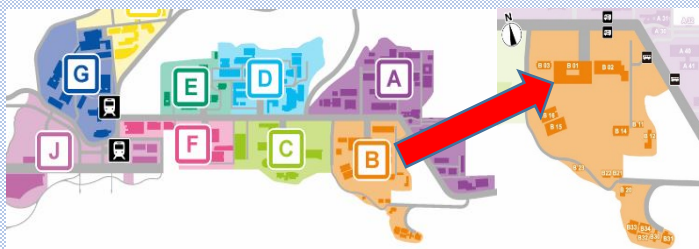
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# Spin-orbit torque-based spintronic devices

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Spin-orbit torque (SOT) arising from the spin-orbit coupling of non-magnetic heavy metal (HM)/ferromagnet (FM) structures has gained much attention because it allows for an efficient switching of perpendicular magnetization as well as high speed domain wall motion. In this talk, I will firstly present the SOTs in antiferromagnet (AFM)/FM CoFeB structures. We demonstrate that IrMn can generate a sizable SOT as well as effective magnetic field via exchange bias, which enables all-electrical deterministic switching of perpendicular magnetization without assistance from an external magnetic field [1]. Secondly, I report the development of a complementary spin logic device, which is achieved by the combination of voltage controlled magnetic anisotropy and SOT [2]. We showed the SOT-switching current can be effectively controlled by electric field in a non-volatile manner. Finally, I will present thermally-induced magnetoresistance in HM/FM bilayers, which evidences thermal generation of spin current or spin Nernst effect [3].

[1] Y.-W. Oh, et al. *Nature Nanotech.* **11**, 878 (2016)

[2] S.-C. Baek, et al. *Nature Electro.* **1**, 398 (2018)

[3] D.-J. Kim et al. *Nature Commun.* **8**, 1400 (2017)