**Graduate Program in Spintronics Seminar**

# TOPOLOGY OF MAGNETIC SKYRMIONS / AN INVESTIGATION OF MAGNETIC NANOSTRUCTURES USING SYNCHROTRON X-RAYS


Professor **Zi Qiang QIU**

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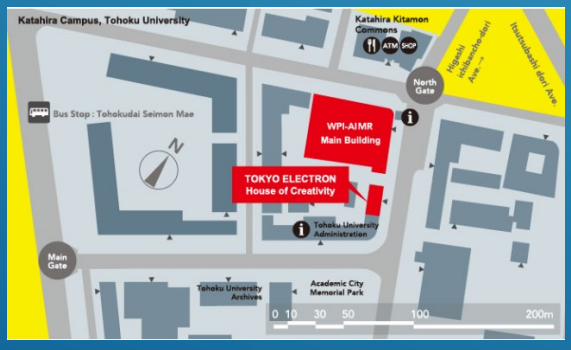
Date: **Wednesday**, December **12** 2018

Venue: **2:00**pm **3**rd Floor, **Lecture Theater,**

**Tokyo Electron House of Creativity,**

**Katahira Campus, Tohoku University**





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## Topology of magnetic skyrmions

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Skyrmion is a topologically stable field configuration which was originally proposed to describe nucleons by Tony Skyrme in 1962. In condensed matter physics, it was noticed in theory that a skyrmion could actually exist as a topological twist of two-dimensional spin texture. It was only recent that magnetic skyrmions were finally discovered in several class of materials and have soon become an emerging field in nanomagnetism research. As an alternative approach to the naturally formed skyrmions, we fabricated single crystalline Co disks on perpendicularly magnetized Ni/Cu(001) film to create artificial skyrmions. In this way, we can tailor the skyrmion topology by changing the relative orientation between the vortex core polarity and the surrounding perpendicular magnetization. Using Photoemission Electron Microscopy (PEEM) to image the spin textures after applying an in-plane magnetic field, we demonstrated clearly the topological effect in the skyrmion core annihilation process.

## An investigation of magnetic nanostructures using synchrotron x-rays

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X-ray Magnetic Circular Dichroism (XMCD) and X-ray Magnetic Linear Dichroism (XMLD) offer a unique technique for element-resolved investigation of ferromagnetic and antiferromagnetic nanostructures. Further development has combined XMCD/XMLD with spatial-resolved and time-resolved measurements to provide a powerful tool for the investigation of magnetic domains and spin dynamics. In this talk, I will discuss three projects we carried out at the Advanced Light Source of Lawrence Berkeley National Lab. First, I will discuss our study on exchange bias using XMCD/XMLD. Then I will present imaging study of magnetic vortices and Skyrmions using Photoemission Electron Spectroscopy (PEEM). Finally, recent development of x-ray pump-probe measurement will be discuss on the study of spin-current in magnetic nanostructures.