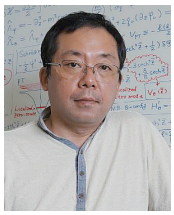
Visiting Professors



Visiting Professor
KISHINE, Jun-ichiro *(from The Open University of Japan)*

Theoretical Studies on Chiral Material Science

We focus on chirality-induced phenomena in solids. (1) Magnetic response of a highly nonlinear soliton lattice in a monoaxial chiral helimagnet: We presented a theory of nonlinear magnetic response of a chiral soliton lattice state in a monoaxial chiral helimagnet under an oscillating magnetic field. (2) Tensile deformations of the magnetic chiral soliton lattice probed by Lorentz transmission electron microscopy: We considered the case of a chiral soliton lattice subjected to uniaxial elastic strain. We found that the strain induced anisotropies give rise to three distinct non-trivial spin textures, depending on the nature of the strain, and we show how these states may be identified by their signatures in Lorentz transmission electron microscopy (TEM). (3) Chirality-Induced Spin-Polarized State of a Chiral Crystal: Chirality-induced spin transport phenomena are investigated at room temperature without magnetic fields in a monoaxial chiral dichalcogenide $CrNb_3S_6$. We found that spin polarization occurs in these chiral bulk crystals under a charge current flowing along the principal *c* axis.

Visiting Associate Professor
FURUKAWA, Ko *(from Niigata University)*

Advanced ESR Study of Molecule-Based Functional Materials

To develop the high-efficiency molecule-based device, it's vital to clarify the mechanism of the functional molecules/materials. We investigate the mechanism of the solid-state functional materials in terms of advanced electron spin resonance (ESR) spectroscopy such as high-field/high-frequency ESR, time-resolved ESR, pulsed-ESR and so on. Recently, our themes are following three (I) spin dynamics study of molecule-based materials with the complex function combined to photoconductivity and photo-induced magnetic properties, (II) operand ESR study of the alternative catalyst for oxygen reduction reaction (ORR) in fuel cell, and (III) The ESR study aimed to investigate the paddy soil environments and to identify the rice cultivar from the trace metal in the rice bran.

Visiting Associate Professor
OSHIMA, Yugo *(from RIKEN)*

Microscopic Studies of the Bilayer-Type Molecular Ferromagnet (Et-4BrT)$[Ni(dmit)_2]_2$ by ESR

Recently, a novel type of ferromagnet has been developed by Kusamoto Group and Yamamoto Group in IMS. The novel molecular ferromagnet (Et-4BrT)$[Ni(dmit)_2]_2$, where dmit is 1,3-dithiol-2-thiole-4,5-dithiolate and Et-4BrT is ethyl-4-bromothiazolium, takes a bilayer structure, and becomes ferromagnetic below 1 K. We are considering that this ferromagnet is the first realization of the Nagaoka-Penn ferromagnetism, where the ferromagnetism is achieved by the light hole-doping of the insulating $Ni(dmit)_2$ layer owing to the internal dipole moment of the monovalent cation Et-4BrT. In collaboration with Kusamoto Group and Yamamoto Group, we have investigated the microscopic electronic state of (Et-4BrT)$[Ni(dmit)_2]_2$ by high-frequency ESR. We have found that ESR lineshape largely changes below 30 K, which is probably due to the effect of doping from the cation site. We are now developing an ESR sample holder for field-effect transistors (FETs), so that we can control precisely the electrical doping of (Et-4BrT)$[Ni(dmit)_2]_2$ by means of FET structure, and investigate its change of magnetic properties by ESR spectroscopy.