

Notes on Basic Science Vol.19 No.1

Interview

P2 Integrating spin currents into physics of matter

Eiji Saitoh

An electron has spin which is analogous to rotation, besides electric charge. As there is electric current as a flow of electric charge, there is a flow of spin named spin current. Spin current related phenomena appears in the submicroscopic world, and it becomes possible to use the spin current by progress of nanotechnology. It may become possible, using the spin current, to process a lot of information with less power consumption and to generate electricity by using the heat and sound in environment. “However”, Saitoh Group Leader emphasizes “in the present framework of electromagnetism and mechanics, which are the bases for such applications, description of the spin current falls out. We incorporate a spin current into the framework, and are advancing the grand challenge of rewriting physics.”

Notes

P6 Correlation between anomalous quasiparticle scattering and superconductivity in URu₂Si₂

Naoyuki Tateiwa

The pressure dependent electrical resistivity of URu₂Si₂ has been studied at high pressure. The electric transport property deviates from Fermi liquid theory in the “hidden order” phase. We find a linearity between the coefficient of the T -linear resistivity and the superconducting transition temperature T_{sc} that indicates the strong correlation between the anomalous electric transport and superconductivity. The present study suggests a universality of the “hidden order” phase inherent in strongly correlated electron superconductors near quantum criticality.

P10 Approaching a mystery of doubly closed shell in nuclei

Yutaka Utsuno

We have studied the nuclear structure around a doubly closed-shell nucleus ¹⁶O with large-scale shell-model calculations, aiming at clarifying the mechanism of the appearance of excited states in the low excitation energy region. We have found that the excited states are lowered by the significant reduction of the shell gap from the so-believed “experimental gap,” on the assumption of the independent-particle model in fact, due to the correlation energy. This result leads to a renewed understanding of the closed-shell structure, and indicates that the excited states of closed-shell nuclei can be described with an extended independent-particle picture.

News & Views

P14 Study of immobilization of heavy elements on biological reaction environment – Perspective of bio-remediation of radioactive waste –

Toshihiko Ohnuki

P16 1st ASRC International workshop “New approach to the exotic phases of actinides compounds under unconventional experimental conditions”

Shinsaku Kambe

Essay

P17 Fukushima support

Shin-ichi Mitsuoka

Experience of a visitor during the earthquake

Timothy Ziman

My visit to Los Alamos National Laboratory this summer

Hiroyuki Chudo