

低温物質科学研究センター セミナー報告

日時：2002年9月26日（木） 午後3時30分～

場所：理学研究科5号館 物理学教室439号室

講師：Professor E. B. Sonin

所属：Hebrew University, Israel

題目：Tunneling into 1D quantum wire:Luttinger-liquid behavior vs.
Effects of environment

要項：

The talk addresses the problem whether and how it is possible to detect the Luttinger-liquid behavior from the $I-V$ curves for tunneling to 1D or quasi-1D conductors. The power-law non-ohmic $I-V$ curve, which is usually considered as a manifestation of the Luttinger-liquid behavior in nanotubes, can be also deduced from the theory of the Coulomb blockaded junction between 3D conductors affected by the environment effect. The two approaches predict different power-law exponents for conductance, but the difference becomes negligible for a large number of conductance channels.

日時：2002年11月15日（金） 午後3時30分～

場所：理学研究科5号館 物理学教室439号室

講師：Professor J. C. Seamus Davis

所属：Department of Physics, University of California, Berkeley, USA

題目：Imaging the Quantum Interference of Cuprate Quasiparticles

要項：

Since cuprate superconductivity develops out of electrons localized at the atomic scale in real space, and since it exhibits nanometer characteristic length scales, a pure momentum-space description of electronic structure is unlikely to suffice. I will describe new scanning tunneling microscopy techniques (atomic-resolution spectroscopic mapping and Fourier-transform scanning tunneling spectroscopy) which achieve these apparently contradictory aims. I will then discuss the new physics emerging from these experiments such as direct exploration of quasiparticle interactions with their real-space environment at the atomic-scale and quantum interference of cuprate quasiparticles.

(This research was carried out in collaboration with K. McElroy, J. Hoffman, & D.-H. Lee (Berkeley), H. Eisaki (AIST-Tsukuba) and S. Uchida (Tokyo University))

日時：2002年12月9日（木） 午後1時30分～

場所：理学研究科5号館 物理学教室第4講義室

講師：Dr. Oleg Vyaselev

所属：Institute for Solid State Physics, University of Tokyo

題目：Properties of a pyrochlore superconductor $\text{Cd}_2\text{Re}_2\text{O}_7$ from Re and Cd NMR/NQR

要項：

The pyrochlore lattice, which represents the network of corner-sharing tetrahedra, has become recently an object of special interest. Its geometry provides both frustrations and degeneracy, resulting in rich phase diagram.

The phase diagram of $\text{Cd}_2\text{Re}_2\text{O}_7$ includes, besides superconductivity, two structural phase transitions of unknown origin, one (second order) at $T_{s1}=200$ K and another (first order) at $T_{s2}=120$ K. The upper transition distorts the cubic $Fd\bar{3}m$ structure inherent at high temperature down to tetragonal $I\bar{4}m2$. It is associated also with strong changes in magnetic and transport properties and may probably be considered a kind of band Jahn-Teller effect. At T_{s2} , one tetragonal phase switches to another ($I4_122$) with minor effect on the electronic properties, so its driving force is not clear so far. The results of Cd and Re NMR/NQR on $\text{Cd}_2\text{Re}_2\text{O}_7$ will be presented, which include both magnetic and structural properties of the compound.

日時：2002年12月12日（木） 午後4時～

場所：理学研究科5号館 物理学教室439号室

講師：北岡 良雄 教授

所属：大阪大学 基礎工学研究科

題目：重い電子系の量子臨界点と新超伝導現象

要項：

固体物理学の長年の柱である磁性と華麗なる華である超伝導、この2つの現象が出会い融合した汲めども尽きない魅惑の世界について、進展の著しい「磁性と超伝導の共存」の問題に焦点を当てる。加圧によって誘起される磁気臨界点付傍は、特異な超伝導発現の新たな舞台である実験結果を紹介し、磁性と超伝導の新たな本流の行き着く先に関する1つのシナリオを提案する。

日時：2003年2月18日（火） 午前10時30分～12時

場所：宇治地区・化学研究所 新館1階 セミナー室

講師：Dr. Thibaut Devolder

所属：CNRS-Université Paris-Sud, Orsay, France

題目：Irradiation-Induced Magnetic Property Modifications:

Basic Phenomena, Nanostructure Fabrication and Potential Applications

要項：

We have developed an ion irradiation technique that can tune the magnetic properties of thin films without affecting their surface roughness. Firstly, we show that 30 keV He^+ ion irradiation of Co-Pt multilayers with perpendicular easy axis decreases their magnetic anisotropy. Ion-mixing at the Co/Pt interfaces gradually reduces the interfacial contribution to anisotropy, first reducing the coercive force in a controlled way, then triggering an in-plane reorientation of the magnetization easy axis. Irradiation-induced chemical ordering of FePt high anisotropy systems is also possible when the light ion irradiation is performed at moderate temperatures. Embedded 50 nm wide nanostructures can be produced if the irradiation is performed through a patterned mask. This opens the way to pattern new planar magnetic devices comprising locally sensitive regions and/or

neutralized areas. Promising applications to information storage are anticipated. In particular, such devices may allow the very fast switching of high anisotropy bits.

日時：2003年3月24日（月） 午前10時30分～11時30分

場所：低温物質科学研究センター会議室 （2F）

講師：石黒 亮輔 氏

所属：京都大学 理学研究科

題目：高速回転超低温冷凍機の建設と回転超流動 3He の量子流体力学

要項：

日本で最初の高速回転（毎秒1回転）するサブmK温度領域の超低温冷凍機を京大と東大物性研の共同研究で建設した。1回の核断熱消磁冷却の回転下で超流動 3He の実験を1ヶ月連続して行う事ができる。講演では回転超低温冷凍機と、同筒試料容器中の超流動 3He の量子力学「テスチャーの構造と量子渦生成・消滅機構」について述べる