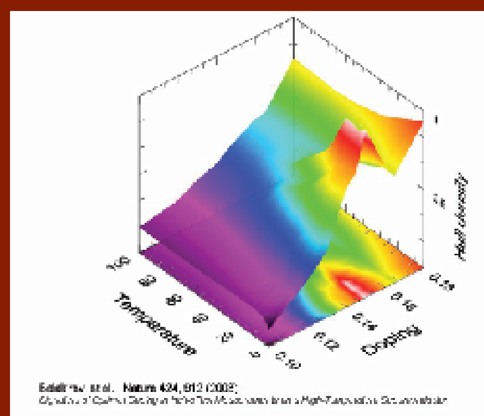
Greg Boebinger

“ The Abnormal Normal State of the High-T_c Superconductors... or Undressing Electrons with Nearly a Million Gauss ”

Since April Fool's Day 2004, Greg Boebinger has been the Director of the National High Magnetic Field Laboratory, the only laboratory of its kind in the United States and considered to be the world's pre-eminent center for research and technology using intense magnetic fields. A fellow of the American Physical Society since 1996, he spent 11 years at Bell Laboratories, where he established a unique pulsed magnetic field facility for research on semiconductors, f-electron compounds, and superconductors, including the high-temperature superconductors. Boebinger received his Ph.D. from MIT in 1986, working on the Fractional Quantum Hall Effect with Horst Stormer and Dan Tsui. When he's not writing quality memos, Greg's hobbies include traveling, history, and telling humorous stories that are mostly true.

The National High Magnetic Field Laboratory (NHMFL) operates an international users' program with the world's most powerful 65-tesla (650,000-gauss) pulsed electromagnets, more than a million times stronger than the Earth's magnetic field. The infrastructure includes a 1.4-billion-watt generator, the largest electrical generator in the United States, which delivers to the magnet during a magnet pulse the energy equivalent of 100 sticks of dynamite. High-tensile-strength nano-composite materials are used in the magnets, which are operated up to the point of explosive stress failure... and occasionally, inadvertently, beyond. In addition to revealing what happens beyond the point of magnet failure, this talk will report on successful pulsed-magnetic-field experiments that suppress the superconducting state in the high-temperature super-conductors, revealing the normal-state behavior in the zero temperature limit. This normal-state behavior is highly abnormal compared to conventional metals. Resistivity and Hall Effect data suggest the presence of a zero-temperature phase transition (a quantum phase transition) precisely at the same carrier concentration at which high-temperature superconductivity is most stable. This talk will be aimed at a general physics audience, both when discussing the magnet explosions and when discussing the condensed matter physics experiments that occur when the magnets don't explode.



3:00 p.m. • Wednesday, June 2, 2004

The APS Auditorium, Building 402

Argonne National Laboratory

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