Reviews of Modern Physics

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Articles for *Reviews of Modern Physics:* What our editors are looking for

Colloquium guidelines

1 **Nuclear magnetic ordering in simple metals at positive and negative nanokelvin temperatures** — A. S. Oja, O. V. Lounasmaa

The interaction between atomic nuclei in solids is extremely weak, and therefore the observation of the cooperative phenomena such as, for example, magnetic ordering among nuclear-spin moments requires attainment of extremely low temperatures. This review describes experimental work that has reached ultralow temperatures of nanokelvins or less and describes how nuclear magnetic ordering has been probed and verified in simple metals. It also explains how the nuclear subsystem can be brought to negative temperatures and shows that this anomalous situation has actually been realized experimentally.

137 **The discovery of the top quark** — Claudio Campagnari, Melissa Franklin

Particle physicists have been searching for the top quark for over 15 years, ever since the discovery of the tau lepton and the *b* quark in the late 1970s provided evidence for a third generation of fundamental particles. This article reviews the early searches for top and describes the discovery of the top quark in 1995 at Fermilab. The authors discuss the experimental signature to identify the top quark, as well as the measurement of its mass. They end with a look at future prospects for using top quarks to uncover new physics beyond the standard model.

213 **Gauge fields in the separation of rotations and internal motions in the *n*-body problem** — Robert G. Littlejohn, Matthias Reinsch

One of the oldest, knottiest problems in the dynamics of simple systems is identifying and separating rotational motions from all other motions. The problem is trivial for rigid bodies, but has been virtually intractable for nonrigid systems. A classic illustration is the ''falling cat'' problem. This review puts the traditional methods of handling

the problem, both classical and quantum-mechanical, into the context of gauge fields. A particular consequence of this formulation is a new expression of the kinetic energy consisting of two gauge-invariant parts, one containing all the angular momentum contributions and the other all the irrotational contributions.

277 **Phonon excitations in quasicrystals** — M. Quilichini, T. Janssen

The understanding of physical properties of quasicrystals, a new form of condensed matter with highly ordered but nonperiodic structures, is one of the new challenges in solid-state physics. Considering the nonperiodicity of the lattice, it seems quite likely that the excitations of these materials will also reveal some unexpected features. The authors discuss possible models for the lattice dynamics of quasicrystals and show the ways in which these differ from the common treatment of periodic crystals. On the experimental side, they review experiments to measure elastic properties and lattice excitations using ultrasound, light scattering, and neutron scattering.

RMP Colloquium:

315 **Continuous quantum phase transitions** — S. L. Sondhi, S. M. Girvin, J. P. Carini, D. Shahar

A quantum phase transition is a fundamental change in the quantum ground state of a system which takes place at the absolute zero of temperature as some parameter is varied. Recent understanding of these transitions has come about from a powerful analogy between the behavior of a d-dimensional quantum system and the statistical mechanics of a $(d+1)$-dimensional classical system (the order parameter variations in the extra dimension reflect the quantum fluctuations in the system). This analogy allows the application of ideas and intuition developed for classical critical phenomena to their quantum counterparts.

335 **Forthcoming articles**

Cumulative listing of reprints