Reviews of Modern Physics

Volume 70 **Number 4** **October 1998**

Part I

1039 **Metal-insulator transitions** — Masatoshi Imada, Atsushi Fujimori, Yoshinori Tokura

The metal-insulator transition is characterized by huge resistivity changes under the control of external parameters. This comprehensive review covers both the theory and experiment, developing the theories to describe the two phases and the strongly fluctuating region between them. The extensive data on the metal-insulator transition, particularly in *d*-electron materials, are presented and used to assess theories.

Part II

1265 **Solar fusion cross sections** — Eric G. Adelberger *et al.* Institute for Nuclear Theory Workshop on Solar Fusion Reactions

The solar neutrino puzzle, namely, the unexplained deficit of neutrinos detected from the sun, challenges the accepted theory in particle physics, solar modeling and the nuclear physics of neutrino-generating reactions. This review provides a critical assessment of the nuclear reaction rates. Besides offering recommended values for the significant cross sections, the article points out possibilities for further reducing their uncertainties.

1293 **Proton-antiproton annihilation and meson spectroscopy with the Crystal Barrel** — Claude Amsler

During seven years of operation the Crystal Barrel experiment at the Low-Energy Antiproton Ring (LEAR) at CERN has collected a very large sample of data in proton-antiproton annihilation. Meson spectroscopy in particular has greatly benefited from the data on final states having high neutral multiplicity. Among the new scalar mesons discovered is one, the f_0 (1500), that has the properties of the expected scalar glueball.

1341 **Precision measurements with high-energy neutrino beams** — Janet M. Conrad, Michael H. Shaevitz, Tim Bolton

High-energy neutrino scattering offers a unique means to probe the parton distributions in the nucleon and to test perturbative quantum chromodynamics as well as electroweak interactions. The authors review the experimental results in the last two decades and point out some of the open questions to be addressed by the present and future high-energy neutrino experiments.

1393 **Astrometry and geodesy with radio interferometry: experiments, models, results**
Ojars J. Sovers
John L. Fanselow
Christopher S. Jacobs

Very long baseline interferometry (VLBI) at radio wavelengths permits measurements of exquisite accuracy in both astrophysics and geophysics. The article discusses the modeling required to achieve this accuracy and describes the principle achievements of VLBI. These include nanoradian astrometry, determination of the earth's cosmic reference frame, and tests of relativity.

1455 **Topological analysis of chaotic dynamical systems**
Robert Gilmore

In many areas of physics one is faced with the challenge of analyzing chaotic data sets. One of the important developments in recent years has been the realization that chaotic dynamical systems may be characterized by a number of topological invariants. In this article the author describes the new developments in topological analysis and illustrates their use by applying them to some experimental data sets.

RMP Colloquia:

1531 **Polymer solutions: A geometric introduction**
T. A. Witten

This article presents a geometrical approach to the description of polymers in solution. The interaction of polymers with their surroundings is shown to be describable in terms of their fractal properties. This approach provides insight into both the thermodynamics and the hydrodynamics of polymer solutions, thereby indicating ways to modify and control the properties of these unique forms of condensed matter systems.

1545 **Quasinormal-mode expansion for waves in open systems**
E. S. C. Ching
P. T. Leung
A. Maassen van den Brink
W. M. Suen
S. S. Tong
K. Young

Open systems, from which energy can escape, may be treated in a way similar to the familiar normal mode expansion for a closed system. This article presents a description using quasinormal modes of complex frequency. Examples are given with applications to cavity QED and to gravitational radiation from black holes.

1555 **Forthcoming articles**

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