Reviews of Modern Physics

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783 **Feedback for physicists: A tutorial essay on control** John Bechhoefer

In systems as diverse as control circuits and biochemical networks, the concept of feedback plays a central role. This tutorial on control theory is aimed toward experimenters designing their equipment as well as theorists wishing to understand the broader intellectual aspects of control.

837 **Nobel Lecture: The discovery of asymptotic freedon and the emergence of QCD** David J. Gross

851 **Nobel Lecture: The dilemma of attribution** David Politzer

857 **Nobel Lecture: Asymptotic freedom: From paradox to paradigm** Frank Wilczek

The 2004 Nobel Prize for Physics was shared by David Gross, David Politzer, and Frank Wilczek. These papers are the text of the addresses given in conjunction with the award.

871 ***Colloquium*: Photons and electrons as emergent phenomena** Michael Levin, Xiao-Gang Wen

What are the fundamental natures of electrons, photons, and quarks? This colloquium examines the idea that they may be collective modes of some deeper underlying structure like the spin networks in condensed matter physics.

881 **Microscopic dynamics in liquid metals: The experimental point of view**

Tullio Scopigno
Giancarlo Ruocco
Francesco Sette

The understanding of the microscopic dynamics of liquid metals has been greatly enhanced by the recent development of third-generation x-ray sources, which have made possible inelastic x-ray scattering studies. These measurements have provided important new opportunities to understand the dynamics of liquid metal systems. This review concentrates on the experimental aspects of microscopic dynamics in liquid metals.

935 **Proximity effects in superconductor-ferromagnet heterostructures**

A. I. Buzdin

This article treats the interplay between superconductivity and magnetism at metallic interfaces, reviewing both the recent experimental progress and the underlying theory. Among the phenomena discussed is the capability to reverse the phase across a Josephson junction, which might open a way to make quantum logic devices.

977 **Microfluidics: Fluid physics at the nanoliter scale**

Todd M. Squires
Stephen R. Quake

With the advent of new technologies which allow the fabrication of micron-size channels, networks, and reaction systems, the field of microfluidics is emerging as a meeting ground for fluid dynamics, colloidal physics, biotechnology, and biological physics. This review summarizes the current state of the field, with emphasis on the characteristic dimensionless paramaters that quantify the competition between various physical processes.

1027 **Quantum cluster theories**

Thomas Maier
Mark Jarrell
Thomas Pruschke
Matthias H. Hettler

A great challenge for condensed matter physics is to find tractable theories for strongly interacting electronic systems. The quantum cluster approximation offers a promising approach, combining accurate solutions of a finite many-body system with a mean-field description of the longer range interactions. Progress on the Falicov-Kimball and the Hubbard models is reviewed and compared to other techniques.

1081 **Forthcoming articles**