

**361       $1/f$  noise: Implications for solid-state quantum information**

Decoherence is a crucial limitation to storing and processing quantum information. When other sources of decoherence are eliminated,  $1/f$  noise due to the coupling of microscopic degrees of freedom to the device remains. This review discusses the mechanisms behind decoherence induced by  $1/f$  noise and ways to minimize its effects.

E. Paladino  
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G. Falci  
B. L. Altshuler

**419      Bell nonlocality**

Bell's theorem answers quantitatively, and in the negative, the question posed by Einstein, Podolsky, and Rosen, of whether there could be a deterministic description of nature with degrees of freedom, local in space, whose values are generally hidden from view. This review gives a comprehensive survey of contemporary formulations of the Bell inequalities, and various characterizations of the degree of nonlocality that are present in quantum theory, or that could be present in any conceivable postquantum theory. Implications for experiments, and for the science of cryptography, are also reviewed.

Nicolas Brunner  
Daniel Cavalcanti  
Stefano Pironio  
Valerio Scarani  
Stephanie Wehner

**479      Standard model Higgs boson searches through the 125 GeV boson discovery**

For more than 40 years, particle physicists searched for the so-called Higgs boson as a manifestation of the Higgs field which was introduced to explain why some fundamental particles have mass. Except for its mass, the properties of the Higgs boson were predicted and scientists employed complex particle detectors to search for decays of this neutral, spinless scalar boson. This article describes searches performed by the CDF and D0 experiments at the Tevatron of Fermilab and the ATLAS and CMS experiments at the LHC of CERN with a 4 times higher collision energy than the Tevatron, until the discovery at the LHC of a new boson in July 2012. At that time ATLAS and CMS established independently with two decay modes the observation of a new particle with a mass of 125 GeV with properties that are compatible with those predicted for the Higgs boson.

Gregorio Bernardi  
Matthew Herndon

**509      Crystalline color superconductors**

At high densities and low temperatures the ground state of quantum chromodynamics is believed to involve Cooper pairs of quarks leading to color superconductivity, analogous to ordinary electromagnetic superconductivity. This article reviews the various possibilities, including two-flavor and three-flavor superconducting phases, especially spatially inhomogeneous ones. Theoretical and phenomenological issues, as well as applications to the cores of compact stars and their observational consequences, are discussed.

Roberto Anglani  
Roberto Casalbuoni  
Marco Ciminale  
Nicola Ippolito  
Raoul Gatto  
Massimo Mannarelli  
Marco Ruggieri

- 563 Bose-Einstein condensation in quantum magnets**
- Early work by Bose on the statistics of photons and by Einstein on the condensation of a noninteracting gas of bosons into a single-particle macroscopic ground state has influenced the understanding of coherent ground states in superfluids, superconductors, and laser-cooled atoms. This review focuses on the physics of antiferromagnetic phases in quantum magnets and their description with bosonic models. The advantage of using magnetic fields to tune the bosonic number and test thermodynamic scaling laws near Bose-Einstein condensation quantum critical points is emphasized. Experimental characterization of a variety of magnetic compounds is shown to validate the underlying concepts and also points to a future of novel exotic states induced by disorder, frustration, dimensionality, and fine tuning of chemical composition.
- Vivien Zapf  
Marcelo Jaime  
C. D. Batista
- 615 Insect flight dynamics: Stability and control**
- Flying insects maneuver like no other organisms: they can hover, fly forward, or backward in all three dimensions, and rapidly change direction. These behaviors lead us naturally to wonder about the interplay of aerodynamic forces and the flexible wings of the insect, and the flight control strategies necessary for stability. In this review, recent advances in the study of the stability and control of insect flight are reviewed. The review treats flapping kinematics, simple theoretical models for dynamic stability, and the stability and flight control properties of maneuvers that change the mode of flight.
- Mao Sun
- 647 Real-space renormalization in statistical mechanics**
- Real-space renormalization group methods have a long history. In recent years these ideas have seen a revival based on tensor network techniques. In this paper these approaches are reviewed and contrasted, with an emphasis on their comparative strengths and weaknesses.
- Efi Efrati  
Zhe Wang  
Amy Kolan  
Leo P. Kadanoff
- 669 Phonon-glass electron-crystal thermoelectric clathrates: Experiments and theory**
- Materials that hold promise for efficient thermoelectric conversion of heat into electricity must simultaneously possess a high electrical conductivity, a low phonon thermal conductivity, and a high Seebeck coefficient. Type-I clathrates, the subject of this review, are host-guest complexes that have the requisite phonon-glasslike thermal properties due to the random occupation of group 1 or 2 elements at off-center positions within voids of the material. Detailed characterizations including the dynamics of phonons, specific heat behavior, and scattering results of Raman, x-ray, and neutron diffraction studies provide a comprehensive understanding of the potential of these materials for efficient thermoelectric conversion.
- Toshiro Takabatake  
Koichiro Suekuni  
Tsuneyoshi Nakayama  
Eiji Kaneshita
- 779 Nonequilibrium dynamical mean-field theory and its applications**
- Advances in preparing and probing nonequilibrium systems, as exemplified by ultrafast spectroscopy and cold atoms in optical lattices, have enabled the systematic study of nonequilibrium phenomena in correlated lattice systems. This review provides a theoretical framework for describing these effects, with a focus on generalizations of dynamical mean-field methods to nonequilibrium situations and their applications.
- Hideo Aoki  
Naoto Tsuji  
Martin Eckstein  
Marcus Kollar  
Takashi Oka  
Philipp Werner

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| 839 | <b>Publisher's Note: Bell nonlocality [Rev. Mod. Phys. 86, 419 (2014)]</b>                                                                | Nicolas Brunner<br>Daniel Cavalcanti<br>Stefano Pironio<br>Valerio Scarani<br>Stephanie Wehner |
| 841 | <b>Publisher's Note: Phonon-glass electron-crystal thermoelectric clathrates: Experiments and theory [Rev. Mod. Phys. 86, 669 (2014)]</b> | Toshiro Takabatake<br>Koichiro Suekuni<br>Tsuneyoshi Nakayama<br>Eiji Kaneshita                |