

REVIEWS of MODERN PHYSICS

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| 1119 | Nobel Lecture: Fascinated journeys into blue light | Isamu Akasaki |
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| 1133 | Nobel Lecture: Growth of GaN on sapphire via low-temperature deposited buffer layer and realization of <i>p</i>-type GaN by Mg doping followed by low-energy electron beam irradiation | Hiroshi Amano |
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| 1139 | Nobel Lecture: Background story of the invention of efficient blue InGaN light emitting diodes | Shuji Nakamura |
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| <p>The 2014 Nobel Prize for Physics was shared by Isamu Akasaki, Hiroshi Amano, and Shuji Nakamura. These papers are the text of the address given in conjunction with the award.</p> | | |
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| 1153 | Nobel Lecture: Single molecules, cells, and super-resolution optics | Eric Betzig |
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| 1169 | Nobel Lecture: Nanoscopy with freely propagating light | Stefan W. Hell |
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| 1183 | Nobel Lecture: Single-molecule spectroscopy, imaging, and photocontrol: Foundations for super-resolution microscopy | W. E. (William E.) Moerner |
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| <p>The 2014 Nobel Prize for Chemistry was shared by Eric Betzig, Stefan W. Hell, and William E. Moerner. These papers are the text of the address given in conjunction with the award.</p> | | |
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| 1213 | Spin Hall effects | Jairo Sinova
Sergio O. Valenzuela
J. Wunderlich
C. H. Back
T. Jungwirth |
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| <p>In solid-state materials with strong relativistic spin-orbit coupling, charge currents generate transverse spin currents. The associated spin Hall and inverse spin Hall effects distinguish between charge and spin current where electron charge is a conserved quantity but its spin direction is not. This review provides a theoretical and experimental treatment of this subfield of spintronics, beginning with distinct microscopic mechanisms seen in ferromagnets and concluding with a discussion of optical-, transport-, and magnetization-dynamics-based experiments closely linked to the microscopic and phenomenological theories presented.</p> | | |

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| 1261 | Google matrix analysis of directed networks | Leonardo Ermann
Klaus M. Frahm
Dima L. Shepelyansky |
| <p>How can information from communication and social networks in modern societies be processed, classified, and retrieved? For this new mathematical methods have to be invented for a precise characterization of the existing networks and their search engines. This article describes the properties of the Google matrix and its efficiency in analyzing directed networks by way of several examples like the World Wide Web, Wikipedia, world trade, social and citation networks, DNA sequences and Ulam networks, and others. The underlying analytical and numerical tools used thereby originate from fields like quantum chaos and random matrix theory.</p> | | |
| 1311 | Spinodal nanodecomposition in semiconductors doped with transition metals | T. Dietl
K. Sato
T. Fukushima
A. Bonanni
M. Jamet
A. Barski
S. Kuroda
M. Tanaka
Pham Nam Hai
H. Katayama-Yoshida |
| <p>The occurrence of high-temperature ferromagnetism in transition metal semiconductors holds promise for devices with spintronic functionalities. This review focuses on the transition metal aggregation process, which leads to random patterns of high-temperature material doped beyond the solubility limit. A computational description of nanodecomposition and the relevant experimental results are presented for a range of semiconductor compounds. The correlation of high-temperature ferromagnetism with spinodal nanodecomposition points to promising nanotechnology utilizing materials with transition metal rich nanoclusters coherently embedded within semiconducting hosts.</p> | | |
| 1379 | Cavity-based quantum networks with single atoms and optical photons | Andreas Reiserer
Gerhard Rempe |
| <p>A vision has formed in recent years of the components necessary for a large-scale quantum network. Single trapped atoms can serve as the nodes of this network, with the links established by flying photons that are coupled to the atoms using optical resonators. This review describes progress toward the goal of multinode networks using the current generation of experiments, which have achieved unprecedented levels of atomic qubit control and light-matter coupling efficiencies.</p> | | |
| 1419 | Ion-trap measurements of electric-field noise near surfaces | M. Brownnutt
M. Kumph
P. Rabl
R. Blatt |
| <p>How can the electric noise in the vicinity of a metallic body be measured and understood? Trapped ions, known as unique tools for metrology and quantum information processing, also constitute very sensitive probes of this electric noise for distances from micrometers to millimeters. This paper presents various models for the origin of the electric noise, provides a critical review of the experimental findings, and summarizes the important questions that are still open in this active research area.</p> | | |

Experimental searches for new physics beyond the standard model of particle physics are not constrained to the high-energy sector alone. This article shows examples on symmetry violations, possible breaking of time reversal and Lorentz invariance, from nuclear and neutron beta decay experiments and discusses how the accuracy of standard model parameters could be improved in the search for new physics.