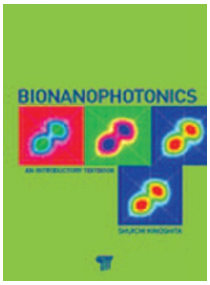
New titles at a glance

Bionanophotonics: An Introductory Textbook

By Shuichi Kinoshita
PAN STANFORD. 400PP. US$150



This text describes the optical mechanisms responsible for the generation of structural colour in living creatures. Various beetles, butterflies and birds, for example, have striking visual patterns and bright, iridescent colours that are used to attract mates and warn predators. It is now known that such colours often originate not from pigments but from the manipulation of light at the microscale and nanoscale by complex optical structures. This book describes how phenomena and structures such as thin-layer interference, diffraction gratings and photonic crystals are used to generate beautiful visual effects. Also included is a section on how the finite-difference time-domain technique can be used to model such effects and how bio-inspired designs of optical devices can be put to good use in the modern world.

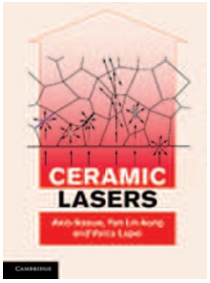
Laser–Plasma Interactions and Applications

Edited by Paul McKenna, David Neely, Bob Bingham and Dino Jaroszynski
SPRINGER. 471PP. £117

Compiled by an internationally renowned team of authors, this book provides a comprehensive discussion of the interaction of laser light with plasmas, with emphasis on laser-plasma accelerators and inertial confinement fusion. The text covers a wide range of topics: the theoretical foundations of the area; high-energy-density physics; applications of the field, such as inertial confinement fusion, charged particle acceleration and plasma-based radiation sources; and the role of diagnostics, targets and computational approaches. The driving schemes at the Omega laser and the National Ignition Facility in the USA are also discussed.

Ceramic Lasers

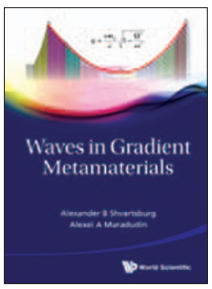
By Akio Ikesue, Yan Lin Aung and Voicu Lupei
CAMBRIDGE UNIVERSITY PRESS. 458PP. £70



Historically, ceramic materials have been considered unsuitable for applications in optics because of the detrimental light scattering that occurs at their grain boundaries and pores. However, in the 1990s, fabrication techniques for creating low-scatter doped ceramics allowed the realization of highly efficient ceramic lasers. This book describes the manufacturing technologies used to synthesize optical-grade ceramics, polycrystalline cubic sesquioxide ceramics and yttrium aluminium garnet ceramics heavily doped with rare-earth elements, such as neodymium. The use of sintering methods to create composite, fibre and single-crystal forms of ceramic is also discussed. The current status of ceramic lasers is reviewed, including a discussion of their thermal, mechanical and optical properties.

Waves in Gradient Metamaterials

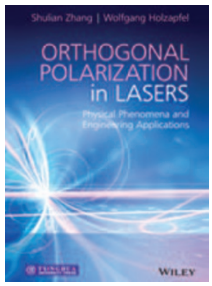
By Alexander B. Shvartsburg and Alexei A. Maradudin
WORLD SCIENTIFIC. 340PP. £55



Metamaterials — materials whose subwavelength properties are engineered to achieve properties not usually found in nature — have become a popular topic of research in recent years. Indeed, devices such as invisibility cloaks and superlenses have only been possible due to advances in this field. In this text, the authors consider what happens when heterogeneous dielectrics are used to create metamaterials with graded properties, and explore how such structures interact with electromagnetic and acoustic waves. In particular, they describe curious phenomena such as non-local dispersion, gradient photonic barriers and the behaviour of shear acoustic waves in elastic solids. They also show that the resonant tunnelling of light — the reflectionless propagation of visible and infrared waves through gradient nanolayers — is a useful tool for analysing the flow of light through a photonic crystal. A series of exact solutions to Maxwell's equations that are helpful when designing and optimizing the subwavelength parameters of such materials is also included.

Orthogonal Polarization in Lasers: Physical Phenomena and Engineering Applications

By Shulian Zhang and Wolfgang Holzapfel
WILEY. 400PP. £110



Orthogonally polarized lasers — light sources that simultaneously emit two stable modes whose polarizations differ by 90° and offer distinct oscillation frequencies — are potentially important tools for applications in metrology. These lasers can be realized by placing a birefringent element, such as a quartz crystal plate, into the cavity of a conventional He–Ne or Nd:YAG laser, for example. The difference between the frequencies of the modes, which can range from a few megahertz to several gigahertz, is dictated by the strength of the birefringence. This book summarizes the latest research results and applications of both orthogonally polarized lasers and birefringence laser cavities. Coverage includes basic principles and technologies, the characteristics of different cavities and lasers, and various measurement techniques. Several figures, experimental designs and measurement curves are included, which together help to indicate the wide range of engineering applications offered by such devices.