In this reviewers’ opinion, the volume will be a valuable addition to the armoury of all those engineers and scientists involved in designing and using solid-state lasers for a range of practical applications, not limited to materials processing. A major strength is in the area of practical optical design. The original German language edition was first published in 1990.

Clive L.M. Ireland
Advanced Optical Technology Ltd.,
18, Repton Court, Repton Close,
Burntmills, Basildon, Essex SS13 1LN, UK
Email address: info@AOTLasers.com

Electromagnetic fields in unconventional materials and structures

This is an edited volume of 10 chapters, the majority of which are highly theoretical. The title accurately reflects the contents. The book looks at electromagnetic propagation phenomena in unusual structures and material configurations.

The book starts with a paper from J.C. Bose, published over a century ago, in the Proceedings of the Royal Society of London which, without a single equation, ingeniously argues for polarisation rotation in a range of structures from jute ropes to dextrose. It is an interesting introduction, since what follows are effectively more rigorous presentations on essentially the same theme.

The book is written primarily by theoretical physicists and mathematicians, whilst I am viewing this through the rather more pragmatic eyes of an engineer with an interest in applying electromagnetics to practical problems. The links to practical situations are—with the exception of a couple of chapters—rarely made overtly. Bishnu Pal’s contribution on “All Fibre guided wave components” is the one with the most applications focus. This is an account of optical fibre couplers and optical fibre gratings from a very practical perspective and provides an excellent physical insight into the operation of these very important elements. Waveguiding also feature in Choudhury and Singh’s project on multilayer light guides. This—perhaps surprisingly—examines a range of general situations without venturing into the very important emerging domain of photonic crystal waveguides and fibres, which have recently been creating considerable practical and theoretical interests. These certainly fall within the “unconventional” remit and whilst they can be extrapolated from the chapter, it would have certainly been useful to include them.

The remainder of the book concentrates essentially on the impacts of material symmetry at various levels on electromagnetic propagation. A chapter on propagation on helical structures examines helical coupling in structures such as travelling wave tubes and is essentially about metallic twisted structures implicitly operating in the microwave domain. At the microscopic level, the
introductory review of chiral media is an extensive treatment of an important material category. It links molecular symmetry and microscale dielectric symmetry. This leads to two related chapters. The account of sculptured thin films combines an overview of the physical appearance and preparation of a variety of such device configurations with a comprehensive theoretical analysis of their properties. There are also some useful hints towards applications in optical filtering and gas sensing, which highlights the potential, which this technique may offer. Fabrication methods pioneered through, for example, laser assisting micromachining, promise to bring some of these concepts into reality. Carbon nanotubes have excited curiosity for the past decade and the chapter on the electrodynamic properties of these fascinating structures provide some insight into their potential as electromagnetic components, sitting alongside the multiplicity of other prospects in mechanics, electrochemistry and semiconductor physics. At present, the carbon nanotube retains the status of the universal panacea which will undoubtedly emerge as an important contributor to something, though at present, describing this “something”, remains elusive.

Bianisotropic materials feature strongly in the remaining three chapters. Whilst bianisotropy has been with us for some time, it is only recently that the fabrication techniques at the thin film level have begun to make such media possible, combining chirality with normal anisotropy, typically as composite media. Some important potential implications of these media are highlighted including controllable microwave conductivity, polarisation sensitivity and potential non-reciprocal operation through controlled Faraday rotation.

The book is potentially useful, though predominately, to the electromagnetic theorist intent in pursuing research into interesting material symmetries and their electromagnetic properties. It is about the influence of geometrical symmetry on electromagnetic propagation—an old topic but one, which is increasingly important as the practical potential of nano and microstructural machining, becomes more apparent. The theoretical treatments are sometimes difficult to interpret for the non-specialists (like this reviewer). However, I believe that the effort would be justified by those circling around the edge of optical devices and micromachining, who would like to bring together the exotic electromagnetism described in the book with a real device, which will at least provide a demonstration and could well lead to something really useful. Research students and postdoctoral workers with interest in this area could very usefully spend the time.

The book is expensive and heavy going but it would be a useful addition, not only to the libraries of those in mainstream electromagnetism and materials analysis, but also at the emerging community of thin film engineers and micromechanical designers. I am sure that thorough study and interpretation of its contents targeted towards a specific activity could be valuable.

Brian B. Culshaw

Electronic & Electrical Engineering Department, Royal College Building, 204 George Street, Glasgow G1 1 XW, UK
Email address: b.culshaw@eee.strath.ac.uk

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The image contains a page from a book titled "Electromagnetic Fields in Unconventional Materials and Structures" by Onkar N. Singh (Editor) and Akhlesh Lakhtakia (Editor). The book is published by J. Wiley in New York in 2000. It consists of 520 pages.

The page contains some text snippets that mention reviews of the book. One review states: "In summary, Electromagnetic Fields in Unconventional Materials and Structures is an advanced book, written by experts, that is bound to be useful to serious researchers." (Int. Jnl. of Electronics and Communications, Vol.55, No.5, 2001) Another review says: "Congratulations! The book is a pearl. It is like a treasury." (Optik - Int.

The text is written in English and is formatted with paragraphs and quotations. It appears to be a review or a summary of the book's content and reception. The page also includes some bibliographic information and classifications, such as "Wiley series in microwave and optical engineering."