Energy Harvesting Materials

David L. Andrews (ed.)
World Scientific (2005), 400 pp.
ISBN 981-256-412-8
$78 / £45

This book covers all aspects of state-of-the-art energy harvesting materials, from natural plant and bacterial photosystems, through their biologically inspired synthetic analogs, to other photoactive molecular materials such as dendrimers. It also establishes the theory and underlying principles. Authoritative, comprehensive, and well referenced, it will appeal to those in solar energy, photobiology, and photoactive materials science.

Metal Oxides: Chemistry and Applications

J. L. G. Fierro
CRC Press (2005), 808 pp.
ISBN: 0824723716
$179.95

This book offers a timely account of transition-metal oxides (TMO) for catalysis. Part one examines crystal and electronic structure, stoichiometry and composition, redox properties, acid-base character, cation valence states, and new approaches to preparing ordered TMOs with the extended structure of texturally defined systems. Part two covers applications. It examines many reaction types to show how chemical composition and optical, magnetic, and structural properties affect surface reactivity.

Biofunctionalization of Nanomaterials

Challa S. S. R. Kumar (ed.)
Wiley-VCH (2005), 386 pp.
ISBN: 3-527-31381-8
$195 / £100 / €150

The ten-volume series *Nanotechnologies for the Life Sciences* overviews underlying nanotechnologies for the design, creation, and characterization of biomedical uses, collating many articles found in the relevant specialist journals. This first volume covers synthetic and materials aspects of making nanomaterials biocompatible with properties desirable for advanced medical applications.

Expert
Graduate
Undergraduate

Making your mark

A book on how to make your mark in science includes advice that might be good for young scientists in industry but, for research scientists, should be more thoughtful

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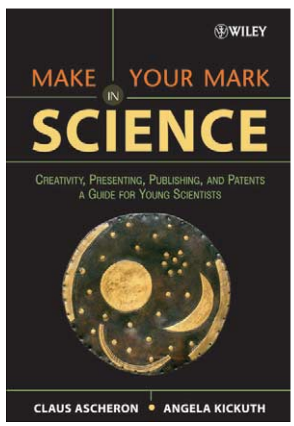
Why is science like sex? Well, in the 1950s, both sex and some of the varied activities of being a professional scientist were, shall we say, left to extracurricular activities. Fifty years on, high schools teach sex education and, as Ascheron and Kickuth's book indicates, universities take broader views of their formal science education.

Their volume follows books such as Peter Medawar's splendid *Advice to a Young Scientist* (Harper and Row, 1979). But, whereas Medawar's book is about research, asking key questions like "How can I tell if I am cut out to be a scientific research worker?", Ascheron and Kickuth's book is largely about the presentation of research, either as talks, in printed journals, on the Internet, or as patents. Having two points of view is valuable: Medawar was an incredibly gifted and perceptive Nobel Prize winner, whereas Ascheron and Kickuth are research-trained scientists now primarily involved in scientific publishing.



Given their involvement in publishing, let me first get some minor gripes out of the way. There is no index. Key reference books, such as the works by Fowler or Gowers on how to write clearly, are not cited. Spellchecking has not been used (e.g. on page 184 in that famous, possibly mythical, referee report). Young scientists should not be encouraged to distract readers with invented words (e.g. 'mostpart', on page 158, is not in my copy of Webster's dictionary).

What is good in this book is the fact that it addresses some practical issues about patents, posters, print versus Internet publication, and even electronic paper. Where it is weak is in areas that active research scientists know too well, because of the authors' tendency to give anecdotes, rather than to address issues. There are comprehensive examples of how not to ask questions at a conference (page 103), with only a hint of what to do (for the record, only ask a question if you actually want to know the answer, and usually if there's a respectable chance that the person presenting might be able to give it). When discussing ethics, one hopes that few young scientists will be tempted into fraud as bad as the examples given, such as Jan Hendrik Schön's faking of data, and it is good that the American Physical Society guidelines are described. However, there are more immediate questions. For example, is it ethical to ignore papers that are not available electronically? Can one really pretend that everything pre-Internet is not for citing?

It is a rare young scientist that has to worry about the Nobel Prize, yet most will start to supervise students. They may start with a vacation student from high school, then help to supervise students of a senior scientist. Later, they will need management skills. Communication is a key part of such skills, but it is not addressed here. It may involve helping an even younger worker to tease out what is significant in what they have done, and supporting their creativity. More important – and far, far harder – are those presentations to senior managers that explain just why his or her pet idea will not work. Looking ahead, having a strategy to cope with scientific upsets is part of a mature approach to research. The young scientist will find little, if any, guidance to help with these issues, nor even the awareness that the nature of the job changes throughout a career. Nor will the young scientist find help with common social problems, like finding research jobs that do not separate partners by hundreds of miles.

Claus Ascheron and Angela Kickuth
Make Your Mark in Science: Creativity, Presenting, Publishing, and Patents: A Guide for Young Scientists
Wiley • 2005 • 256pp • ISBN: 0-471-65733-6
$29.95 / £17.50 / €25

Only ask a question if you actually want to know the answer

I was also concerned about some of the advice given. For instance, consider the checklist on page 98 for evaluating presentations. Of the 16 explicit items, only one item relates to content, and it (the 'Take home message') doesn't hint at the need for anything substantial. The context and novel ideas that underlie a piece of research work should be central and clear, even when detail must be left out. Later, regarding the structure of papers, I found myself contrasting what is quite a helpful discussion on page 159 with Peter Medawar's talk *Is the scientific paper a fraud?* (page 228 of his book *The Threat and the Glory*, Oxford University Press, 1991). How science is done can be hidden, rather than demonstrated, by an imposed structure. One of Medawar's points is that most papers give little idea of the thought processes by which the conclusions of the printed version were reached. In a routine paper, of course, little is lost. But, in a seminal paper, indications of wrong turnings and half-right ideas are important. It is not necessary to go as far as James Watson in *The Double Helix* (Atheneum, 1968), but it is of value to know that those scientists reasoned and fumbled their way to a discovery that changed biology. The best invited conference talks can give the same impression, as I know from talks by senior scientists that impressed and enlightened me as I began my career in research. Most papers, Medawar suggests, give only the clean 'final' version. The clarity is worthy – good journalism, one could say – but it is incomplete science.

How science is done can be hidden, rather than demonstrated, by an imposed structure

Moving on again, I felt that key questions were not tackled in the book. What do you do when your paper is rejected? This happens even to Nobel Prize winners (including Albert Einstein in his prime). After initial shock and dismay, you need to try to decide whether there has been a misunderstanding and how it might be remedied, or whether there is a fundamental flaw and what can be learned.

The book does describe some of the issues in choosing which journal to send your paper to, but it rather misses the point. Ideally, you will choose a journal that puts your papers alongside other really good papers (so that it might be seen by readers browsing). Ideally, you will choose a journal that is efficient, with good referees and minimal delays. But do you publish a letter then a full paper, or only a full paper, or only a letter? There is strong perceived pressure to publish letters in certain prestigious journals (journals *A* and *B*, let's say). Ascheron and Kickuth do not analyze this perception, but merely overstate it, quoting a comment by respected science journalist Roger Highfield that scientists will do almost anything to publish in certain journals (page 126). Certainly, anyone publishing in journals *A* and *B* should feel proud, for their Letter will be alongside really good material. However, much of the pressure comes from the wish of science administrators to assess scientists without understanding (or even examining) the science content. Such judgement-free judgements are

irresponsible. Happily, others do try to value content. In all the years that I was on Royal Society Sectional Committees (which do most of the work in deciding who will be elected to a fellowship), I never once heard a view of the sort "Candidate *X* has published more papers than candidate *Y* in journals *A* and *B*". The issue always concerned the content of their papers. The medium is by no means the whole message. Furthermore, any responsible scientist must publish their work as fully as is appropriate. It cannot be in the interests of science when no full account follows a short letter.

Do you publish a letter then a full paper, or only a full paper, or only a letter?

Clearly, I have mixed feelings about this book. It is well organized, it makes some good points, and tries to address the needs of a young career research scientist. Some of the advice might be good for young scientists in industry, or commerce, or journalism. However, Ascheron and Kickuth themselves do not seem to be career research scientists, and advice to research scientists should surely be more thoughtful. Anecdotes have value, yet asking why they have value (as Medawar does) is better still. Also, they might have benefited from more input from those young scientists whose worries the authors would like to allay.

Materials Science in Microelectronics

Eugene Machlin
Elsevier (2005), 270 pp. (I) & 280 pp. (II)
ISBN: 0-08-044640-X; 0-08-044639-6
$165 / £105 / €150 (each volume)

Volume I, *The Relationships Between Thin Film Processing & Structure*, focuses on the close connection between processing and the structure of thin films for microelectronics. Influences considered include: crystal defects, void structure, grain structure, interface structure in epitaxial films, amorphous film structure, and reaction-induced structure. Volume II examines *The Effects of Structure on Properties in Thin Films*, covering electrical, magnetic, optical, mechanical, and mass transport properties.

Half-metallic Alloys

Iosif Galanakis and Peter H. Dederichs (eds.)
Springer (2005), 313 pp.
ISBN: 3-540-27719-6
$99.95 / £69 / €89.95

Half-metals are ferromagnetic materials that are hybrids between metals and semiconductors. Fermi-level electrons show complete spin polarization, making them prime targets for spintronic devices. Subtitled *Fundamentals and Applications*, this book is both an introduction and a survey of the latest advances in the understanding and applications of Heusler alloys and related compounds.

Physical Principles of Electron Microscopy

Ray Egerton
Springer (2005), 202 pp.
ISBN: 0-387-25800-0
$69.95 / £42.50 / €58.80

Subtitled *An Introduction to TEM, SEM, and AEM*, this book covers the theory and current practice for undergraduates wanting an appreciation of how basic principles of physics are used in an important area of applied science, and for graduate students and technologists using electron microscopes. It will also be valuable for university teachers and researchers needing a concise supplemental text on basic principles.

Expert
Graduate
Undergraduate