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Writing is magical, mysterious, aggressive, dangerous, not to be trifled with

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ABSTRACT

Recent books and conference proceedings are examined.

1. Microscopy

> [*My readers*] *will, I may safely aver, not form the bulk of the nation. However high may be my estimate of my own powers of narration, however amply Providence may have gifted me with self-appreciation, I may be sure of that, seeing that the only books I know of which enjoy so wide a circulation are the Prayer-book and Bradshaw. I am not going to instruct anyone in religion or trains, so I may as well make up my mind to a more limited audience, while I pipe my simple lay* (*rather squeakily and out of tune, perhaps*), *and may think myself very lucky if that same, kind limited audience do not hiss me down before I have got through half a dozen staves of the dull old ditty.*
>
> Rhoda Broughton

I have never warmed to chemistry and have managed to avoid it since the age of 16: mathematics and physics at A-level, physics, mathematics, crystallography and geology at Cambridge. I am therefore not on the mailing list of the Royal Society of Chemistry and was unaware that a book on *Nanocharacterisation*, edited by our editor A.I. Kirkland and J.L. Hutchison was published by the RSC in 2007 [1]. By way of atonement, I am placing it in pole position, even at this late date, for the seven chapters, form an excellent snapshot of the subject. First is a description of 'Characterisation of nanomaterials using transmission electron microscopy' by D.J. Smith, which is too short (27 pp.) to do more than skim over the subject. The following chapter, on 'Scanning transmission electron microscopy', by A.R. Lupini and 11 co-authors is much more informative. Most of their space is given to the instrument, with the aberration-corrected STEM especially prominent. Next is an account of 'Scanning tunneling [sic; UK spelling is used (almost) everywhere else] microscopy of surfaces and nanostructures by M.R. Castell, which gives a good idea of what could be done with a STM 6 years ago. In a slightly longer chapter, R. Brydson provides a clear introduction to 'Electron energy-loss spectroscopy and energy dispersive X-ray analysis', with descriptions of the necessary instrumentation and a few applications. In chapter 5, R.E. Dunin-Borkowski, T. Kasama and R.J. Harrison discuss 'Electron holography of nanostructured materials', which has the great merit of presenting in detail a number of applications of real interest. M. Weyland and P.A. Midgley then contribute a long chapter on 'Electron tomography', a compact monograph on a subject that they introduced into materials science. Finally, P.L. Gai surveys 'In-situ environmental transmission electron microscopy', with a good range of applications. At the very last minute, I learned that a revised edition will appear early in 2014, now edited by A.I. Kirkland and S. Haigh. There are some changes in the chapter titles (all include "nano") and authors and no doubt everything will have been updated. The chapter by P.L. Gai has vanished; in its stead we find 'Scanning electron and ion microscopy at the nanoscale' by D. Bell and N. Erdman (see [6]) and 'In situ microscopy of nanomaterials' by E. Stach.

This belated encounter with *Nanocharacterisation* led me to consult the RSC website, where I found three other highly relevant titles. First, a tribute to the life and work of Sir John Thomas, edited by K.D.M. Harris and P.P. Edwards, entitled *Turning points in Solid-state, Materials and Surface Science* with 48 chapters and 14 appendices filling nearly 900 pages [2]. This too is not recent but the tone of the contributions is such that much remains relevant today. It is divided into four long sections, embellished with a

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hagiographical chapter by A.H. Zewail, a list of 'awards and honours of Sir John Meurig Thomas' and John Thomas's own thoughts about 'Design and chance in my scientific research': "Over and above the tools and techniques that one chooses to deploy, there are other vital determinants that govern progress in one's scientific research. These include the books and articles that one reads, the lectures that one hears and, above all, perhaps, the intellectual energy, manipulative dexterity and determination of one's students, collaborators and colleagues. All these factors can make the difference between success and failure.

I have always tried to pursue my research with passion and commitment. When it progresses well, my spirits can be raised to the brink of ecstasy. When it goes badly, I can become enveloped in saturnine gloom. And chance – that 'divine creator' as Pushkin called it – can play an extremely important role in one's scientific life. Whilst I console myself with Pasteur's dictum that 'chance favours the prepared mind', I nevertheless feel that, on many occasions, I was unprepared to reap the benefits of chance conversations or encounters with scientists in contiguous or distant disciplines". The themes of the four sections are Inorganic solid state chemistry, Organic solid state chemistry, Solid catalysts, surface and materials science and Electron microscopy and its contribution to chemistry and materials science. The last of these contains essays on 'Electron microscopy studies of structural modulation in micro- and nano-porous crystals' (O. Terasaki and 7 co-authors), 'Extrapolating from fifty years of dislocation imaging – reaching into the core' (A. Howie), 'Turning points in understanding the emission of brilliant light from highly defective GaN-based materials and devices' (C.J. Humphreys), 'Electron tomography: a 3D view of catalysts and nanoscale structures' (P.A. Midgley), 'Nano and mesoporous materials: a study by HREM' (J.M. González-Calbet et al.), 'In situ direct observation of atomic scale twinning transformations and the formation of carbon nanostructures in WC' (P.L. Gai et al.), 'A survey of the Bi_2O_3–MoO_3 binary system' (D.J. Buttrey) and 'An investigation of the surface structure of nanoparticulate systems using analytical electron microscopes corrected for spherical aberration' (R. Brydson and A. Brown). The 14 appendices are all 'Tributes to Sir John Meurig Thomas' and include many memories and anecdotes that will be recycled when the time comes to write a biography (or, inevitably, obituary). Among the memorialists is our editor, who attended Thomas's lectures on Surface Chemistry as a Cambridge undergraduate and was introduced to the TEM by him as his third-year project. I can add one tiny detail for that future biographer: John Thomas was among several participants who have subsequently become famous at a workshop on radiation damage in the electron microscope funded by the Cambridge Philosophical Society more than 40 years ago and held in the Old Cavendish Laboratory.

Nanoscience, edited by P. O'Brien and sub-titled *A review of recent literature*, is a new publication and is the first of the RSC Specialist Periodical Reports on the subject [3]. The theme of this volume, appropriately enough, is *Nanostructures through Chemistry*. "This SPR will try each year to feature different and topical issues. It would frankly be impossible to cover this enormous area each year without excessive length or condensation of the content. I hope some articles will appear on an annual basis where there is sufficient activity and interest. A new idea is to provide regional perspectives as in the chapter on India this year. I am keen to commission an initial report on nanoscience in China as well as other regional perspectives reflecting growth areas in contemporary science and engineering". This first member contains 10 chapters, certainly aimed at a chemical audience but not confined to it: Recent advances in mesocrystals and their related structures (Y. Oaki and H. Imai), Nanomaterials for solar energy (M.A. Malik et al.), Magnetic hyperthermia (D. Ortega and Q.A. Pankhurst), Recent developments in transmission electron microscopy and their application for nanoparticle characterisation (S. Haigh), Extracellular bacterial production of doped magnetite nanoparticles (R.A.D. Patrick and 5 co-authors), Atom-technology and beyond: manipulating matter using scanning probes (P. Moriarty), Graphene and graphene-based nanocomposites (R.J. Young and I.A. Kinloch), Metal oxide nanoparticles (S.A. Corr), Recent advances in quantum dot synthesis (A. Panneerselvam and M. Green) and Nanoscience in India (A. Som and 3 co-authors). I do not doubt that the material collected here will be appreciated but I must just comment on the price (£299.95). Before noticing this, I assumed that the book had been produced as inexpensively as possible to keep the price down: the margins are very narrow, there is no colour and some of the black-and-white illustrations are rather sooty; there is no index. The price seems very steep for 286 pages.

In 2012, a summer school on nanotechnology was held in Bukova (in the Ukraine). *Nanomaterials Imaging Techniques*, *Surface studies*, *and Applications*, edited by O. Fesenko, L. Yatsenko and M. Brodin [4], is a collection of articles written by the participants, the vast majority from the Ukraine, with a sprinkling from Austria, Belarus, Belgium, Estonia, France, Holland, Italy, Russia and the USA. Although the editors do not mention this, the omnipresence of Kiev and to a lesser extent Tartu in the affiliations will awaken memories in anyone interested in the history of electron optics for one of O.I. Seman's most important articles appeared in an Estonian journal in 1961. V.E. Dyachenko and I. Sakharov were publishing papers on electrostatic lenses in Ukrainian journals from 1935 onwards and N.G. Sushkin's first work was published in Ukrainian (though his later textbook on the electron microscope, 1949, was published in Russian). The book is divided into three broad parts: Imaging techniques: microscopy, spectroscopy and lasers, Interface studies and techniques and Nanocomposites and applications of nanotechnologies. There is, however, little instrumentation. In Part I for instance we meet 'Nano-bio architectures: combining chemistry and biology in nanotechnology', 'Comparative analysis of the IR signal enhancement of biomolecules adsorbed on graphene and graphene oxide nanosheets', 'Infrared spectroscopy in studying biofunctionalised gold nanoparticles', and six similar titles. This book is therefore aimed at users of the techniques and students of modern applications of nanomaterials.

I have already drawn attention to the new edition of Harald Rose's *Geometrical Charged-particle Optics* ([36] in [63]) but had not then seen the book [5]. Springer have produced a very handsome volume, with colour in place in the text – this is very effective; in Fig. 13.3 for example which shows four in-column imaging filters and various rays passing through them. Several new topics have been included. There is a section on the Aharonov–Bohm effect. Chapter 3 includes an account of the charge simulation method of computing field distributions. Calculations based on Glaser's bell-shaped field model are now present, caustics are accorded a section and the fifth-order aberrations of multipoles are also included. The latter are very welcome as this is a subject that is not often treated fully. Finally, there is new material on particle confinement and on relativistic electron motion and spin procession. Like the first edition, the great merit of the book is that aberrations are treated in a uniform notation for all the various optical elements considered. This is very much a textbook, not a source book, for although there are 175 references, the choice is very selective: in the section on the A–B effect, for example, Ehrenberg and Siday are not mentioned, nor is the book by Peshkin and Tonomura on the subject. The modern theory of mirrors is set out at length but with no mention of the abundant Russian work. One small objection: in his introduction, Rose tells us that "It had been these two important discoveries [by Busch and de Broglie] which led Ernst Ruska to the