In the words of the authors of this new book ‘in the 25 years since the first, highly successful, edition of Microfossils was published there have been significant advances in all the areas of understanding of microscopic life and their fossil counterparts’. This is certainly true and, over much of that 25 years, Microfossils (Brasier, 1980, with reprints in 1983, 1988, 1992) has been the standard reference for most UK students of micropalaeontology. Throughout most of that time, however, Microfossils was (almost) the only viable text available as other volumes (Haq & Boersma, 1978; Tappan, 1980; Haynes, 1981; Bignot, 1982 (and 1985 reprint); Traverse, 1988; Murray, 1991; Lipps, 1993; Jenkins, 1993; Jones, 1996; Sen Gupta, 1999; Martin, 2000; Haslett, 2002) were either too expensive for the average student, were not readily available or were too limited in scope for the ‘general’ student reader looking for a book that covered as many aspects of the subject as possible at the lowest affordable price.

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Since 1980, however, the numbers of students reading geology in Europe (and elsewhere) has reduced, as have the fortunes of the hydrocarbons industry have fluctuated over time and, while I do not have the figures to hand, I would guess that the number of micropalaeontologists in industry has fallen markedly. Over the same time, however, the use of microfossils as (palaeo)geochronographic proxies has greatly increased and this is – in part – recognized in this new version of Microfossils by the inclusion of a small chapter on this subject.

When the original 1980 version of Microfossils was reprinted (in 1983, 1988 and 1992) it was precisely that: an identical reprint with no updating. The new book is quite significantly updated and that is most welcome. Many chapters have additional information, almost all of which is of value to readers. In some of these chapters the degree of ‘reworking’ is quite significant but in others (Chitinozoa [Chapter 11], Spores and Pollen [13], Radiolarians [16], Diatoms [17], Silicoflagellates and Chrysophytes [18] and Ciliophora [19]) the changes are relatively minor. While some scanning electron micrographs are included in this edition, the bulk of the book remains illustrated by line drawings. I have absolutely no problem with this although, in the case of the larger foraminifera, I am sure that some thin section micrographs could have been used to augment the drawings. Unfortunately some of the line drawings appear rather dark (if not black) and, if one compares back to the earlier versions, they appear to have been clearer when less densely printed.

To my mind there are three problem areas that should be dealt with if another edition should ever be contemplated. As in the earlier editions there is a section on preparation methods (most welcome) but almost nothing on sampling methods. A small section on field sampling techniques should have been included as many students, undertaking field work, have little idea of how to collect good, fresh samples that will yield good assemblages. I would also have included sections on marine sampling as well as some information on commercial sampling of cores and cuttings. In the chapter on preparation methods there is due acknowledgement to the hazards of using acids and solvents but this should have gone further. Health & Safety issues are now so important, with masses of legislation, that there should have been something more than a cautionary ‘be careful’. In our laboratories every student must have a risk assessment form signed off before working with acids or solvents and I am sure that this is quite common across the rest of Europe and the World. My final concern is for the fossil groups not included (otoliths, charophytes, ichthyoliths, etc.) as well as those groups that were in the earlier edition and which have now been removed (Chlorophyta and Rhodophyta being the most obvious). As these green and red algae are a major constituent of the warm-water limestones that students see on fieldwork in southern Europe (and elsewhere) I cannot see a valid reason for leaving them out of the book.

Faults and omissions aside this book remains a very good introduction to micropalaeontology and will, no doubt, still remain one of the preferred texts in many university departments. The other texts, good though they individually may be, remain expensive, are often difficult to obtain, may be out-of-print, and fail to cover the range of fossil groups that those in training are required to study. The price (£32.99) of this second edition of Microfossils is also a bonus, as many of the other texts (some costing £100+) cannot be considered for purchase by the average student.

Malcolm Hart

References


However biased I may be as a geochronologist, it can safely be said that dating is crucial to our understanding of the geological record and underpins all our research. For the Quaternary in particular, there is a wide range of techniques available, all with their advocates and detractors, and with the complexity of the methodologies it is sometimes difficult for the non-chronologist to get to the root of the data and interpret their results in light of the chronological information. *Quaternary Dating Methods* is the perfect ally, building on previous dating texts with the inclusion of the new developments within the field.

The book comprises eight chapters, beginning with an overview of the Quaternary and the development of dating. This is followed by six chapters on specific types of techniques, all with a similar format. Starting off with a description of the technique, the strengths and weaknesses are then outlined, followed by some practical applications illustrated by a selection of published research papers from a wide range of international sites.

Following the introduction there are three chapters devoted to radiometric techniques, with radiocarbon covered in the greatest detail with its own dedicated chapter. Chapter 3 includes Ar-isotope, U-series, cosmogenic nuclide and short-lived isotope dating. The chapter entitled ‘Radiation Exposure Dating’ covers luminescence, ESR and fission track techniques.

The suite of ‘absolute’ (the use of this term being frowned upon in the book) dating techniques is completed by the annually banded records, including dendrochronology, varved sediments, lichenometry, and ice-core chronologies along with speleothems, corals and mollusc shells. The last two method chapters focus on relative dating methods, such as surface weathering, pedogenesis and amino acids, and then techniques for establishing age-equivalence, including oxygen isotope stratigraphy, tephrochronology and palaeomagnetism. A short final chapter on the future of dating rounds the book off nicely.

The need for an updated book on Quaternary chronology results from major advances in the field, often encompassing extremely complex refinements. Despite this, the techniques are all presented clearly and successfully simplified so as not to alienate the wide audience, from students to professionals. Whilst the scope of this book is only as an introduction to the methods available, with a lack of detailed technical information (equations, etc.), the follow-up references are good and as up-to-date as can be expected in such a fast-moving field. I particularly like the use of figures adapted from the original papers, including the details from examples of specific pieces of research will make the transference from theoretical to practical use a smaller jump for the reader, having a familiarity with the way in which results are presented being extremely useful. The use of both archaeological and geological applications means that there is a broad range of interests represented. The balanced overview of the advantages and limitations of each of the techniques should help the reader critically to evaluate the results from the field.

Although a good explanation of precision and accuracy is given in the introductory chapter, one criticism is that it would have been useful to have an assessment of the practical resolution of each of the techniques, an idea of their ‘believability’ over their various ranges.

For a topic area that to many might seem quite dry, and the type of book one perhaps would expect to just dip into to find specific pieces of information, surprisingly this is an enjoyable and easy read – good news for the students in the target audience of Geography, Archaeology, Earth and Environmental Sciences. An excellent introduction to the world of Quaternary dating, it is an essential part of any Quaternary scientist’s bookshelf.

Kirsty Penkman


Petroleum kitchens, migration routes and traps evolve independently within a PVT-depth framework that is constantly changing. There is thus time-variant compositional variation in what is generated at source and retained in the trap; moreover sources may be multiple and phase separation during migration may result in differing fractions moving at different speeds and, where pore-water moves laterally, different directions. To what extent hydrocarbons in the trap mix and/or reach thermodynamic equilibrium under gravitational and thermal forces is a critical quantitative consideration for reservoir engineers who want to constrain modelling scenarios for PVT behaviour and flow properties during production and their impact on the economics of ultimate recovery. Related mass-balance considerations increasingly interest basin modellers for the improved risking of closures and production geologists who wish to use compositional data in the evaluation of reservoir compartmentalization.

Organic geochemistry is at the cutting edge of all these disciplines and a special publication covering its usage and pitfalls might reasonably be expected to focus on broad messages for future application by mixing overviews of relevant technologies, discursive reviews of first principles and case histories aimed at the general petroleum geologist/reservoir engineer, not just specialist geochemists. The book follows this three-fold aim with variable success. The editors provide only a summary introduction and omit a glossary of terms which might have broadened the appeal to general readers.

The first major section of the book includes papers on the use of PVT data for charge assessment and detection of allochthonous gas, the impact of charge mixing on abundance and interpretation of geochemical markers, anaerobic biodegradation and a short introduction to the EOS open-source phase equilibria programmes.

The second section concentrates on modelling, beginning with a useful summary of rates of compositional equilibration within reservoirs, setting useful guidelines for rapid screening of the mixing possible in the time since charge. A masterly paper, by John Stainforth, argues that hydrocarbons stack into traps in the density sequences in which they arrive and convincingly explains the wide variation in GOR.
for oils of similar API gravity: for clarity and insight it is likely to become required reading for course work and for some may swing the decision to purchase the book. The section concludes with two somewhat lengthy basin modelling exercises around the Snorre Field, Norway, usefully indicative of currently increasing ability to match predicted and actual petroleum compositions.

The third section, case histories, deals with compositional variations of petroleum fluids and formation waters. Particularly instructive examples include the giant Val D’Agri fields of Italy which have suffered major uplift after, at least early, charge and the Magnolia Field in the Gulf of Mexico which is still receiving charge. The paper detailing a mass-balance approach towards modelling of ‘deep basin’ gas plays is a welcome link with both reservoir engineering and prospect evaluation methodology, but two papers dealing with diagenesis are only marginally relevant to the book’s objectives. The fascinating story of charge, breach, fault-zone diagenesis and recharge in the west of the Haltenbanken province of Norway occupies nine authors for 67 laborious pages and might have had greatly improved audience impact if rewritten at half this length.

The book is a very desirable library purchase and at discounted price should appeal to many petroleum geologists. Despite unevenness it is a significant pointer to the future.

David James


This Geological Society Special Publication aims to address how and why deformation appears in narrow high strain zones – faults and shear zones – that cut the Earth’s crust and lithosphere. These are fundamental questions which should be of interest to geodynamicists, solid earth geophysicists and structural geologists. The inspiration for this volume was a session entitled ‘High-Strain Zones’ at the 2003 EGS–AGU–EUG meeting held in Nice, although not all the papers published here were presented at that meeting. The production standards are good, with high quality graphics including one fold-out and four colour figures.

To cover such a broad topic in a single volume is ambitious. However, in their introductory paper, Burlini & Bruhn make it clear that their interest lies primarily in the structure and rheological evolution of viscous (‘ductile’) shear zones within the mid to lower crust. They touch briefly on the role of brittle faulting as a mechanism of grain size reduction (which in turn promotes strain softening and a switch from frictional to viscous deformation), but otherwise focus on the mechanisms, processes and conditions that give rise to strain localization in the viscous regime. The Editors’ preference is clearly reflected in the subjects addressed by the remaining 21 papers: of these, only four deal specifically with strain localization and deformation in the brittle or ‘brittle–ductile’ fields.

The papers are arranged according to six themes: (1) case studies of exhumed high strain zones; (2) physical properties of high strain zones; (3) rheology of high strain zones; (4) interactions between deformation and metamorphism; (5) new approaches to studying high strain zones; and (6) numerical and analytical modelling of flow and strain localization. Taken together, these papers provide an excellent overview of current research and illustrate the multidisciplinary approach required to study both active and fossil high strain zones. My only concern is that some of these papers could become ‘lost’ in a volume with such a general title and apparently broad scope. The majority are standard research papers (i.e. they present new data and interpretations) although, as befits a volume of this nature, one of the contributions (by Brian Evans) is a review and synthesis of previous work, which then goes on to propose a new conceptual framework for future research into quantifying the creep behaviour of rocks in high strain zones.

If this volume has a scientific shortcoming, I think it is that the Editors have missed an opportunity to discuss the way in which strain localization in the viscous regime might affect upper crustal deformation patterns, and vice versa. In particular, how can we reconcile our understanding of strain localization in the viscous regime (which requires strain softening) with recent numerical models that suggest strain localization in the upper crust is controlled by elastic interactions between seismogenic faults and does not require strain softening (e.g. Cowie, 1998)? Despite these minor criticisms, this volume contains many excellent and varied contributions. In summary, I believe it will be of particular use to researchers wishing to gain an insight into the wide range of techniques currently used to investigate high strain zones in the mid to lower crust. It also provides a source of interesting material for advanced level undergraduate courses in rheology, tectonics and structural geology.

Jonathan Imber

Reference


This book (although it seems to be getting a little ahead of itself by claiming, as it does, to be published in 2007 – yes, honestly, see the copyright page) is intended primarily for undergraduate students in the American University teaching system: those taking ‘liberal-arts’ (non-major science) type courses, but electing to take the occasional (but not too scientific) science-orientated course. It comes as a package along with a web-based password-controlled “instructor’s manual” for supplementary teaching information and test question items. The veracity of the cover illustration might generate some interesting discussion – but, no doubt, that would be the author’s point?

The book is divided into an early section (three chapters) on the history and how to study/discover dinosaurs, a middle section (five chapters) outlining the various well-known dinosaur groups, and an end section (seven chapters) on thought-provoking topics: extinction, physiology, biogeography, and
even one on the public’s perception of dinosaurs. As a general introductory text on the topic of dinosaurs the book does pretty much as well as any other in the field, the main ‘opposition’ being represented by Fastovsky & Weishampel’s *Evolution and Extinction of the Dinosaurs* (2005). I did find the illustrative material a little inconsistent in style, and the subject choice and treatment just a little bit stilted and perhaps out of date in places. However, the pedagogical structure that has been implemented means that it can be used in relatively practical ways as a teaching aid and is thus extremely accessible – which is no doubt an important intention of this book.

While I am sure that this book is well-targeted at the undergraduate audience in the US, I am slightly less convinced of its applicability to the British (European) teaching systems. It may for example merit a place on a reference list as background reading (though I would tend to favour Fastovsky & Weishampel if given a straight choice), but it could not justify a place as essential reading. The courses in this part of the world tend to be not at all orientated toward those intended as ‘science-made-easy’ for arts and humanities students. Perhaps we (Europeans) are missing a trick, or perhaps have the wrong end of the educational stick, but for the time being there is a reasonably clear educational divide between Europe and America across this post-18-years-old educational sector. The audience for this book in Europe would tend to be perhaps younger teenagers who are mad-keen on dinosaurs, or the genuine dino-enthusiasts of any age.

David Norman


Every four years since 1977 there has been an international conference on fluvial sedimentology, and from each a collection of papers has been produced in a volume, this being the seventh in that series. The meeting itself took place in August 2001, and the process of publishing the volume seems to have been a little longer than most of the previous collections in the series, and it was published just a few months before the eighth international fluvial meeting in the summer of 2005. However, it is a substantial collection, with 29 papers covering a wide range of topics. An interesting development is that the balance of the contributions has shifted towards studies on modern processes and case studies from the Quaternary, with relatively fewer focusing on rocks from older parts of the stratigraphic record. It is also noteworthy that many of the papers adopt a more quantitative approach than was usual in past fluvial sedimentology volumes: the science has apparently moved on from its more descriptive phase.

The scope of the papers also reflects the more advanced techniques which are now used in studies, from particle imaging velocimetry and laser distance measurements in flume experiments, laser diffraction granulometry, digital elevation models and satellite imagery in studies of modern rivers, to the use of high resolution seismic techniques and borehole imaging systems for Quaternary and older deposits. However, there are still plenty of studies which use more traditional field observation and sedimentary logging techniques which stress the need for, and use of, data collected in the field. The case studies come from a wide variety of locations around the world, and a broad selection of river types, both ancient and modern. Rivers on all scales, including a review of the Amazon, are covered within the volume, and the temporal scale also ranges from processes related to individual dune bedforms to the consideration of the architecture of fluvial deposits in a sequence stratigraphic context. Different climatic settings are covered, from temperate rivers to ephemeral systems where there is interaction with aeolian processes in Namibia. If there is any aspect of fluvial sedimentology which is less well represented it is the study of the overbank environment, although some of the works on the pre-Quaternary successions do consider this setting.

Whilst the studies are worldwide, the authorship reflects the concentration of research in fluvial sedimentology in a relatively small number of countries. The predominance of authors from North America is not surprising, given the location of the conference in Nebraska: most of the other contributions are from the UK, Italy, Holland, India and Australia, a pattern which has been the case throughout the history of research in the subject. Perhaps the location of the next fluvial congress (in Argentina in 2009) will help broaden interest in this field.

The editors have maintained high standards with the papers in this collection and the production is up to the usual high quality that the IAS Special Publications maintain, with clear layout and high-resolution diagrams and photographs: the inclusion of some colour images is a welcome addition, although some of the plates are largely blank, containing just one small colour image. Fluvial sedimentology is one of the few sub-disciplines of earth and environmental science that has such regular international conferences and consequent collections of papers. For scientists involved in anything related to this field of research, these volumes are essential reference material which more-or-less provide a ‘state of the art’ snapshot of the science at four-yearly intervals. By continuing this series, this volume is an important addition to the sedimentological literature.

Gary Nichols