

### The deformation of some soft (and not so soft) sediments

Jones, M. E. & Preston, R. M. F. (editors) 1987. *Deformation of Sediments and Sedimentary Rocks*. Geological Society of London Special Publication No. 29. Blackwell, London. 350 pp. Price £52.50.

This book contains a selection of papers covering various aspects of the deformation of sediments and sedimentary rocks. Much emphasis is placed on the deformation of unlithified sediments, a subject somewhat neglected by many structural geologists. The book contains 25 of the papers given at a conference held at University College, London, in April 1985. As such, it is typical of the Geological Society of London Special Publication Series and contains papers of varying quality, ranging from new innovative studies, often with some imaginative attempts to address the central theme of the meeting, to others which are largely the re-working of previously published material. The editing of such material into a coherent volume is a difficult, if not impossible, task.

In reviewing such a book, it is tempting to simply catalogue the contents and make brief comments on individual papers, but this simply duplicates the 'contents' page of the book and provides the reader with an insight into the interests and prejudices of the reviewer. Instead I will try to provide a broader overview of the book, pointing out some of its more general strengths and weaknesses, as I see them.

The book starts with a short, but very useful, introduction in which the editors define some basic terms and concepts introduced mainly from soil mechanics. From this introduction it is clear that the original aim of the conference was to bring together structural geologists, sedimentologists and engineers with an interest in the deformation of sediments. This is a very laudable aim; if it was achieved at the conference, however, it is rarely obvious from the papers in this volume.

The individual papers are arranged into three parts, covering (1) *theory and experiment*, (2) *processes* and (3) *descriptive* aspects of the subject. The last two sections contain papers based on field studies, the main distinction being into papers which discuss the field observations in terms of deformational and sedimentological processes and those which merely describe the rocks (or sediments) and their structures.

The *Theory and Experiment* section (Part 1) includes some very useful papers, on topics which may not be too familiar to many structural geologists, such as the reviews of deformation in unconsolidated sands (G. Owen) and hydrocarbon migration by hydraulic fracturing (G. Mandl and R. M. Harkness). Other papers on pressure solution (J. P. Gratier) and the deformation of muds (A. Maltman) cover topics which may be more familiar to readers of this journal, whereas others on the physical properties of chalk are of more specialized interest. Overall this part of the book, although somewhat 'patchy' in its coverage, should be of widespread interest and provides some useful information and ideas of the deformation of sediments. It made me want to find out more about some topics and I only wish that more of the book had been devoted to this type of paper.

The second part contains eight papers which attempt to analyse field examples in terms of processes which take account of the mechanisms which operate in sediments. The papers include some interesting work on gravity slides and slumps, and on microfaulting in unconsolidated sediments. Two papers by J.-P. Petit and E. Laville, and M. Guiraud and M. Séguret discuss the recognition of hydroplastic faults in pre-lithified rocks and provide some criteria by which they may be distinguished from faulting in lithified rocks. Most of the papers in this section are characterized by their attempt to apply structural principles and methods to 'soft sediment' deformation and, thus, they provide useful sources of ideas for others working in similar rocks. One short paper by M. Leeder makes a preliminary attempt to link sediment deformation structures with palaeotectonics in the Carboniferous of northern England. I draw attention to this paper, not because it provides definitive methods, but because it is a real attempt to bring together ideas in tectonics, sedimentology and engineering soil mechanics to address a fundamental problem in basin analysis, that of recognizing the tectonic input from the sedimentary record. Although the conclusions are tentative I only wish more of the papers in this volume had been so stimulating.

The final part (3), which occupies some 40% of the book, contains a very 'mixed bag' of papers, generally of limited and local interest. Whilst some papers give a careful description and analysis of specific field examples of structures and outcrops, others say little more than where the outcrops are and provide a few photographs. Of the nine papers in this section, no less than five are by Brodzikowski and his

colleagues, describing various aspects of 'soft sediment' deformation in the Kleszczów Graben in central Poland. They mostly consist of location maps (often the same map in different papers) and some photographs of structures (several of poor quality of reproduction), with little critical discussion of the processes involved in their formation. The field examples look very interesting, but could have been presented in one or two papers instead of occupying some 16% of the book; surely the editors and/or referees should have suggested this?

So much for what the book contains, but what is omitted? Two major fields of current research into the deformation of unlithified sediment are conspicuously absent from this book; these are work on recent marine and oceanic sediments and the wider field of engineering soil mechanics and geotechniques. These areas are well covered elsewhere in the literature, hence their omission in this volume may have been intentional. The paucity of input of ideas from these fields in the papers presented (with one or two exceptions) is, however, less easily justified.

Taking this book for what it is, a collection of papers submitted to a conference, it is a useful addition to the geological literature. As a "well-balanced composition of theoretical and field studies" which is "authoritative and challenging" and "of great interest to sedimentologists and structural geologists in academic institutions, in the field and in the oil industry" I am not so certain. The claims of publishers are almost as amazing as those of estate agents!

After reading the book I felt I had made some tentative steps into the interesting field of deformation of unlithified sediments, but that I had not been presented with a comprehensive overview of the subject, nor gained much insight into the link between the disparate research areas in this inter-disciplinary field. At a price of about £52.50 (more than a years personal subscription to *Journal of Structural Geology*!) this is a book for the institution library rather than the personal bookshelf.

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### The lithosphere–asthenosphere system

Fuchs, K. and Froidevaux, C. (editors) 1987. *Composition, Structure and Dynamics of the Lithosphere–Asthenosphere System*. Geodynamics Series, Vol. 16. American Geophysical Union, Washington, D.C. and Geological Society of America, Boulder, Colorado. Price \$33.

Although the title of this book implies an organized assault on the problems of the structure and dynamics of the lithosphere and asthenosphere, the papers it contains are mainly the reports of work completed—or quite often in progress—on topics that range from shear wave tomography to ocean floor geology. The groups reporting are from a diverse range of nations and disciplines and have little in common save that their efforts are cheered on by the International Lithosphere Program. Inevitably, therefore, this compilation represents a set of point-like penetrations (sometimes deep, sometimes shallow) into the subject rather than a balanced presentation of current knowledge. This makes the volume a difficult one to review and the only sensible course to follow is to ask what benefits a reader of the *Journal of Structural Geology* would derive from the book.

Three themes occur in more than one paper: there is a set of papers on various aspects of the seismic velocity structure of the crust and upper mantle; these are interleaved with theoretical studies of the mechanics of the lithosphere and the convecting mantle, and with papers on the petrology and geochemistry of the upper mantle. There are also papers on the geology of the ocean floor, electromagnetic soundings, and isostasy in the U.S.S.R.

Most of the recent advances in our knowledge of the structure of the crust and upper mantle have come from seismic studies and it is natural that results of such studies should occupy about one third of the book. Unfortunately, these data do not grow on trees; their acquisition costs a lot of money and this money has been won through powerful and prolonged advocacy by the seismological community. Anyone wishing to get a flavour of the oratory involved need look no further than some of the papers in this volume. The financial pressures, and necessity of producing results, provide the sub-text to most of the seismological papers. I don't know whether a course in subliminal advertising is now obligatory for high-flying seismologists, but I suspect it may be: in reading the progress report of the European Geotraverse I noticed