The Geological Deformation of Sediments

*edited by **Alex Maltman**, published by Chapman & Hall, 2-6, Boundary Row, London SE1 8HN, UK in 1995, ISBN 0-412-40590.*

Review by **Christopher G. Kendall**

This book has been written for structural geologists and other earth scientists who need to know more about sediment deformation in terms of terminology, principles, and processes, so they may be used to interpret sedimentary sections on the basis of the deformational structures. The editor of this book has been strongly influenced by the controversy which has existed between structural geologists and sedimentologists on the origin of deformation in the sedimentary section; whether it represents deformation formed at or shortly after deposition or is a product of later burial and tectonic deformation. To a large extent, this has probably become a largely academic debate since most, particularly those of us who have some association with the oil industry, have come to recognize the wide ranging origins of deformation in the sedimentary section. This realization has developed in the last 30 years as geologists have become exposed to the very diverse disciplines involved in interpreting the subsurface with seismic or wells or matching these interpretations to the outcrops. How far we have come in the evolution of our thought can be seen in this book when we read of the acrimonious quarrel between P.G.H. Boswell and O.T. Jones. Boswell supported the contention that many of the structures that occur in central Wales were the product of tectonic movement and thrusting, whereas Jones believe that they were related to penecontermpraneous sediment deformation. Much of Jones' work is now accepted, though some of Boswell's ideas were correct. This contentious argument was the driving force behind many studies of soft sediment deformation and explain why in the United Kingdom geologists step around this topic with great care. Much of the information provided in this book can be found scattered through many different papers on totally different topics, but as far as I know, no one has assembled a book of this kind focused entirely on emphasizing early sediment deformation over the later tectonic movement. Since the book is multi authored, there is some repetition in the text, but essentially the book is laid out in a very logical and complete way.

It begins with an introduction and overview by Maltman which discusses terminology, mechanical aspects, and causes of deformation. He focuses the themes of the papers of the book with his bias on volume changes due to burial, sediment strength, mechanical role of pore fluids, and results of deformation experiments. He then describes the causes of deformation by ice, in place disturbance, gravitational mass movement, fluid-sediment movement, the role of tectonism, and igneous activity. His paper ends with a case history on mélanges.

The papers that follow, also discuss the mechanical principles of sediment deformation, glacial deformation, sedimentary deformational structures, mass movements, tectonic deformation, fluids in deforming sediments, and the result of sedimentary dewatering and diagenesis with illustrations from mélange zones, largely from Alaska. Finally there is a paper on deformation structures preserved in rocks by the editor.

The book is abundantly illustrated by very clear sharp photographs, many clear diagrams, and cross sections, and graphical maps, etc. This book cannot exactly be used as a handbook on sediment deformation, but it is an extremely fine source book. The reader can use the text to conduct research into subjects that they may have specific interest in. For instance, permeability changes in sands and sand stones, or equivalent permeability or gross

permeability anisotropy. There are recent references, pertinent historical reviews and a good index. This book should be of great interest to professionals, explorationists, production geologists, engineers and graduate students pursuing studies of sediments and structure, particularly those who need information on the deformation of sedimentary sections during their deposition. Geoscientists working in any of the many hydrocarbon producing areas in the world that have sections in sediments that have been deformed shortly after their deposition may find the book helpful. This is particularly true for person working in the Gulf of Mexico, the Niger Delta, or portions of the Canadian and US Arctic.

The book is well written and it is easy to read. I like the combination of both historical and direct descriptive review of the various features described in this book and the emphasis on explanations of their origin. If anything the book is conservative when trying to present a balanced picture for the origins of sediment deformation, but for this reason it makes this book a likely text for graduate classes. This book is clearly written and well put together. It will have a much wider audience than the editor anticipated from his introductory remarks and should be used by those who have some considerable experience in working with sedimentary sections, but are puzzled by the deformational features that they may have no explanation for. The book is worth having in your library and if you are a sedimentologist it should probably be on your personal shelves. The book is packed with facts and you won't be disappointed to own it, even if you consider yourself to be an expert in sedimentary deformation.