

AAPG Memoir 52, "Active Margins"

edited by **Kevin Biddle**, published by the American Association of Petroleum Geologists, ISBN

Review by Christopher G. Kendall

This is one of a series of memoirs put together by AAPG to provide a detailed description of different kinds of basins in different tectonic settings; the theme being to emphasize what combined geological factors might make a basin productive, and how these would assist in evaluating the geological risks for new ventures in similar basins, or in the same basin. There are 11 papers in the book, eight of which are focused on the Los Angeles Basin, with the final three on the Taranaki Basin of New Zealand, the Middle and Upper Magdalena basins of Colombia, and the Falcon Basin of northwestern Venezuela. This book is essentially the state-of-the-art for the Los Angeles Basin, and the last three papers are almost as an afterthought, though each of them is quite good in itself.

Biddle begins with a paper which provides an overview to the general setting of the Los Angeles Basin, listing field size, structural setting, the fields, their discovery date, major fault trends, the importance of the preservation of organic material, etc. He explains how the Los Angeles Basin is one of a number of strike slip basins that may form at a transform margin and have a polyphase history common to this type of setting. He explains that hydrocarbon production is associated with all the phases of the tectonic history of this area, with an intimate relationship between the source and reservoir rocks, and the thermal history and the structural events that occurred in the basin. He explains how, by chance, the rapidly subsiding deep Los Angeles Basin formed at the right time and the right place with the right geometries to serve as a significant container for hydrocarbons. The paper sets the stage for the theme that follows in the later papers.

Rintoul then has a paper on the exploration history of the Los Angeles Basin, with a strong slant on the human interest of the early exploration of the basin. It has some splendid photographs from the early 1900s oil boom of derricks, gushers and beach scenes of the Los Angeles area with the oil patch in the background.

Next is a paper by Wright on the structural geology and tectonic evolution of the Los Angeles Basin. This very long paper traces the tectonic setting of the basin, with numerous maps showing plate positions, oil field locations, major fault and structural trends, a number of regional cross sections across the Los Angeles Basin, and structural contour maps, followed by descriptions of the major fault trends in terms of major production. It also looks at the evolution of structures throughout the basin, providing an extremely complete and well written description of the basin history and the kinds of traps that are associated with a particular structural style of this area. The references at the end of this paper are numerous, and all inclusive. This probably is the most useful paper in the text for the oil explorationist. Next is a review of the Neogene biostratigraphy and stratigraphy of the Los Angeles Basin, by Blake. This paper lists the major benthic foraminiferal assemblages for this region, and shows how they can be used to separate and correlate the four major structural blocks within the basin. This paper will be extremely helpful to explorationists who are studying the Los Angeles Basin, and need biostratigraphic data to support or help interpretations.

Next is a paper by Mayer. This paper is rather short and to the point, describing why the author believes the Los Angeles Basin has the thermal history that it does. It enters into a short description of how basin modeling and thermal modeling is carried out by different people, and then shows how backstripping and geohistory analysis can be used to determine the burial path of the sediments, and how one can predict thermal history from stretching

models, and relate this to timing of maturation.

Next is a paper by Jeffrey, Alimi and Jenden on the geochemistry of the Los Angeles Basin oil and gas systems. This relatively short paper suggests that the Los Angeles Basin is rich in source rocks, but that the source rocks seem to have rather low maturity. The authors feel that the sapropel-rich kerogen is generating the oil at these lower maturities. This paper has a number of illustrations, including gas chromatograms, phase diagrams for organics, Rock-Eval diagrams, etc.

This is followed by a paper on the stratigraphic controls on the oil fields in the Los Angeles Basins, by Yates and Beal. This paper has a number of cross sections of the Los Angeles Basins, which show the basic stratigraphy and lithology of the basin, and are based on well data. It also figures a number of isopach maps for the tops of the different formations. The paper notes that the current thermal isostatic models of Los Angeles Basin don't account for its stratigraphic complexity.

Finally, there is a paper by Tom Reddin on the oil and gas production from submarine fans in the Los Angeles Basin. This sedimentological paper shows the distribution of oil and its relationship to a series of submarine fans in the basin, and their probably depositional history. This paper contrasts with the previous papers, which had more of an emphasis on the structural history of the basin. This informative paper shows how oil production comes from the middle and upper portions of channelized fans of the late Mohinian to Reptian aged rocks, and how the paleobathymetry of the basin was undoubtedly a response to tectonics.

Finally, the last three papers of this book begin with the Taranaki basin, which is described by Palmer and Bult. This paper is a classic description of the basin stratigraphy and the relationship of oil and gas fields to basin stratigraphy. There are numerous cross sections, interpreted seismic lines, structural maps, even some SEM photographs of some of the lithologies associated with the McKee oil field.

Next is a professional paper by Schamel on the Middle and Upper Magdalena basins of Colombia has numerous cross sections, nice maps of the general structure of the basin, and its stratigraphy.

Finally, there is a paper by Bosi and Goddard on the Falcon Basin of Venezuela, where there are several small fields in the onshore and offshore areas of Venezuela. Again, this paper has maps, cross sections, seismic, and well logs, showing the evolution of the basin, and its relationship to the structural evolution of the area to the east of Lake Maracaibo. This report is based on some 70 years of petroleum activity, numerous seismic lines, and over 1,000 wells. This memoir meets the usual AAPG standards. The papers are well written and well illustrated. The text really would be helpful to people working in active margins, and actually within the Los Angeles Basin, the Magdalena Basin, the Taranaki Basin, or the Falcon Basin. All are quite scholarly, and have numerous references. I'd say that the book is of greatest value to those who are playing the Los Angeles Basin, since the descriptions for this basin are the most complete. The papers for the Falcon, Upper Magdalena and the Taranaki basins are not as complete or as long, but are good starting points to track down the geological history of the basins, if one needs to go beyond the overview presented in this book. Unless you have a specific interest in active margin geology, this book probably better in your local library, but if you are actively exploring in the regions described by this book or exploring in active margin areas, then the text will be helpful to you. As is usual with the AAPG volumes, I am pleased to have this volume on my shelf. I enjoyed reviewing it.