Foreland Basins and Fold Belts

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Review by **Christopher G. Kendall**

This book is composed of some 16 chapters, each of which is a separate paper. The first ten are focused on the geology of western Canada. Five of the last chapters are focused on the geology of the Zagros Basin, the Eastern Venezuelan Basin, the Northern slope of Alaska, the Rocky Mountain Basin, and the Ouachita Basin, and finally there is a summary of the conclusions of the whole book.

Essentially, this text is one of a series of volumes put together by the AAPG to describe the major hydrocarbon producing basins of the world. The AAPG has recognized that in the evaluation of hydrocarbon potential of new venture areas, properly documented analogs provide a means to understanding their geology better. So with this in mind, this series of volumes treat basins on the basis of their different tectonic settings, namely divergent/passive margin basins, cratonic basins, active margin basins, foreland basins and interior rift basins. Each basin is described in terms of its stratigraphy, structural style, hydrocarbon potential, etc.

The striking thing about this book is that the portion on Western Canada is so elegantly complete and it is for this reason that I recommend the book to you. These ten chapters on western Canada cover almost everything one needs to know geologically about a basin and this basin, in particular. The book starts with a chapter on the paleogeographic relationships of the sedimentary fill from the Middle Jurassic to the Tertiary. This paper is illustrated for beautiful paleogeographic maps of the sedimentary facies, cross-sections, and isopach maps.

It is followed by an article by Macomb Jervey, which focuses on an analysis based on computer-generated, graphic simulations of the sedimentary basin fill. This fill is in the form of siliclastic sequences developed from the Jurassic through the Tertiary and the simulation is used to explain their distribution in terms of the sedimentary history of the basin. Jervey shows how the interaction of tectonic subsidence, sediment supply, and sea level change are responsible for the geometries of the sediments through space and time.

Jervey's paper is followed by one on the tectonic structures of western Canada illustrated with a series of really excellent cross-sections, which track the palinspastic reconstruction of the area and the relationship of the structure to the local sedimentary history.

Next is a paper on the relationships of the stratigraphy to geodynamic models, and there's even a paper on the early hydrocarbon exploration in western Canada. This is illustrated with some "old-time" photographs of the exploration of the area with a particularly revealing one of the Imperial Oil base camp on the McKenzie River.

Further, there are papers on the conventional hydrocarbon reserves of western Canada, and on the oil and gas plays associated with the late Mesozoic and Tertiary stratigraphy. Then, there's a paper on the lithology and diagenesis of the sandstones and a paper on the thermal history of the basin. All of these papers are well illustrated with cross-sections, diagrams, and burial history diagrams as appropriate. Finally, there's discussion of the petroleum systems of

western Canada in terms of the nature of source rocks and their potential.

After reading the papers on the Canadian foreland basin, the articles that followed were a letdown. In fact the first part of the book was so complete, it could have been a separate volume.

The last part of the book began with a paper on petroleum geology of the Zagros basin, which disappointed me particularly, since I know that there's far more information available on the area. It surprised me that the authors didn't call on this data to make a more complete paper. I had the feeling of a cursory overview, which could have been supplemented by more paleogeographic maps of the sort that were published by Murris, etc. The stratigraphic cross-sections that were included were also cursory and could have been expanded on. The information on the regional stratigraphy, particularly across geographic and political boundaries, could have been greater. There could have been maps showing the maturation potential at different horizons rather than the odd well and burial history diagram and so on.

In other words, with use of the Canadian example, the authors could have expanded and made a much better stab at the Middle Eastern petroleum geology rather than providing a brief overview, which might be useful to the beginning graduate student, but for someone who was hoping to use the volume as a source of analogs for exploring this basin or another, this information was limited. Possibly, the authors were inhibited for geopolitical reasons from publishing more information, but I think that the editors and the authors of the volume should have shown more courage and published more information - much of which is already in the public domain.

The incredible thing to me is that this is the premier oil province of the world (though it may now be eclipsed by some of the Russian basins) and yet, many geologists seem to be afraid to make adequate scientific and professional presentations on the area. Negative criticism is easy to offer, but my intent is not to be destructive, but spur the editors of future volumes to remember the intent of their volumes in their entirety.

The paper on the Venezuelan Foreland Basin was more complete than that on the Zagros, but I felt that the use of computer-generated maps and the brief overview, denegrated this area when a more indepth examination of the area would have peaked our interest. There was information here that had not been published before; but again, I felt as if the paper had been put into the volume as a need to fill a niche, rather than provide information. Thus, if the authors had been given more time and thought to the area, they would have produced a more extensive description of this basin.

The paper on the Alaskan example was more complete, though again, I would have liked to have had more information. However, the cross-sections and seismic lines were excellent, as were the maps on the petroleum potential. I felt that this was a much more professional paper than the earlier two. As with the earlier three papers, the paper on the Rocky Mountain Foreland was a little too much of a summary. I would have liked more information on the area, instead of listings of the dominant lithology and known recoverable reserves, etc. I'd have liked some descriptions of the fields in the basin and the same goes for the Ouachita Foreland Basins.

All of these papers were professional, but in the light of the intention of the volume and a comparison to those for the Canadian area, they looked like "ho-hum" papers that the AAPG bulletin tends to focus on these days.

Overall, the volume is excellent and though the last papers were obviously pedestrian, they will all help the geologists who need information and wants to build from a beginning. Overall, this text had a nice feel to it and though flawed, it is a great masterpiece that I am really glad to have the opportunity to review and have on my shelves.