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Reefs and Evaporites - Concepts and Depositional Models

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Reefs and Evaporites — Concepts and Depositional Models

Edited by J.H. Fisher
Studies in Geology No. 5, American Association of Petroleum Geologists, 196 p., 1977.
AAPG and SEPM members U.S. $15.00, others U.S. $18.00

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The Michigan basin is a classic region in which to study basinal evaporite deposits and their relationships with basin-margin barrier and pinnacle reef complexes. How and when did the basin-centre evaporites form in relation to the basin-margin carbonates? Are the basinal evaporites of sabkha origin and did sea level fall catastrophically to fully expose encircling pinnacle and barrier reefs? Why is the marginal barrier reef composed of dolomite while the basinal facies are limestone? When and how did dolomitization occur?

These are some of the problems discussed, but not finally resolved, in this compendium of ten papers most of which were presented at a 1975 regional meeting of the American Association of Petroleum Geologists.

The Silurian of the Michigan basin is the subject of five papers and four others concern the Devonian of the Michigan basin, the Silurian of West Virginia, the Carboniferous of the Canadian Arctic and the Miocene of Sicily. All of these describe, with differing emphasis, the relationships between carbonates and evaporites and their respective environments of deposition. A final paper records base-metal concentrations in a density-stratified evaporite pan.

The danger is that, with so many fragments, a satisfying integrated picture would not be achieved. However, several of the papers are sufficiently comprehensive that this is not the problem. The problem is the lack of agreement among the authors concerning the relationships of carbonates and evaporites, specifically in the Silurian of the Michigan basin. In a short summary by Sloss, the essence of the controversy is well defined.

Two schools of thought are about evenly represented. One school considers that basinal evaporites are entirely younger than enclosing basin-margin carbonates while the other proposes that basin-interior evaporites and basin-margin carbonates are nearly synchronous. A third variation, not treated here, would be rapid alternation in many stages of carbonate deposition marginally and evaporite deposition basinally.

A fundamental cause of these different interpretations is the lack of sufficiently refined time control in the rocks studied and the consequent inability to date depositional events in different geographic regions. The stratigraphic conclusions have suffered because of inadequate paleontological information. In only one of the papers are fossils used as indicators of time in reconstructing regional facies relationships. Fossil remains may be scarce in sequences containing evaporites but how much effort went into searching for them?

Differing interpretations also arise because of lack of agreement concerning criteria for the reconstruction of water depths. For example, the nodular anhydrites of the basinal salina are attributed, by Huh, Briggs and Gill, to a sabkha environment with attendant catastrophic fall of sea level and complete exposure of basin-margin reefs. In contrast, Droste and Shaver demonstrate that major volumes of carbonate were deposited at the basin margin while evaporites were deposited in submarine environments within the basin interior, an interpretation which does not require catastrophic changes of sea level or extensive exposure of the reefs. Davies provides evidence from the Carboniferous of the Canadian Arctic that nodular anhydrites may form in submarine as well as sabkha environments.

The book is a useful one for all interested in carbonate-evaporite relationships and points to the need for more work and new ideas. As Sloss says "surely, a scientific community that survived decades of belief in fixed continents can develop new thought on the origin of table salt."

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River Channel Changes

Edited by K.J. Gregory
John Wiley and Sons, 448 p., 1977.
$39.50

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According to the editor, the objectives of this volume are "to demonstrate the various approaches available for the study of river change, to illustrate the results that have been obtained during the last decade, and hopefully to point the way forward for future work". The book is a collection of 27 original papers grouped into four categories: mechanics and sedimentology, channel geometry changes, river channel pattern, and network change and theory.

Results in the papers come from a number of countries: three from Poland and Hungary, two from Australia and New Guinea, three from the U.S. and Canada, and 19 from the U.K. From North America, G. Dury contributed two papers and one by E. Hicken, discussing aspects of geomorphic dominance, underfit streams, and river planform analysis. The overwhelming number of papers from the U.K. demonstrates their degree of research activity in the fluvial sciences.

The total absence of photographs in the book is a major disappointment for a text on such a visual subject. The lack of photos is probably due to a constraint imposed by the editor or publisher in order to reduce publishing costs. Though a wealth of equations, graphs, and illustrations is provided, visual synthesis is lacking.

Another major shortcoming of the book is the near absence of imaginative interpretation of results. Most of the contributors appear unwilling to speculate on the temporal aspects of channel changes, the stated title of the book. However, Dury's paper on Underfit Streams: Retrospect, Perspect, and Prospect, is one of several refreshing contrasts.

A third but relatively minor criticism (from a North American point of view)