
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.*
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\$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, Prospect, and Prospect, is one of several refreshing contrasts.

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

is the disproportionate number of papers (70%) from the U.K., which implies that most of the contemporary work on fluvial geomorphology is centered there. The fact is that much of the pioneering work has been and currently is being carried out in North America, most of which is cited in the references. With this criticism and those in the previous paragraphs, the reviewer feels that this book, in general, does not represent the present state of the science of fluvial geomorphology.

The book has several positive aspects which make it a valuable addition to library collections. The bibliographies are comprehensive (especially for European literature). Several of the papers are real contributions to geomorphology and are worth reading for their ideas. Nearly all of the papers have good sections on methodology and analysis, a great benefit for students anticipating field work. While many of the papers are either repetitive literature reviews or field studies adding supportive results to existing theory, they do provide data for a region outside of North America. The book provides a good cross-section of fluvial research being carried out, particularly in the U.K. Overall, the book has many positive points; however, several negative aspects have detracted from the overall quality.

Although overpriced for its content, I would recommend that the book be ordered for university libraries.

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Pédologie 1. Pédogenèse et Classification

P. Duchaufour
Masson, 477 p., 1977.

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P. Duchaufour nous présente le premier des deux volumes destinés à remplacer l'ancien "Précis de Pédologie" actuellement épuisé.

Ce volume traite de l'aspect proprement "pédologique" de la science du sol, c.à.d. la dynamique des sols en fonction du milieu.

L'ouvrage est divisé en deux parties. La première partie (ch. 1 à 4) étudie les trois processus fondamentaux de la pédogenèse. La deuxième partie (ch. 5 à 13) définit les horizons fondamentaux, discute les classifications modernes et propose une classification écologique.

Le premier chapitre se consacre à l'évolution de la fraction minérale, l'altération et la genèse des argiles, dont il étudie les mécanismes physico-chimiques. Il met l'accent sur les influences du climat général et sur les conditions locales: station et végétation.

Le deuxième chapitre décrit la dynamique de la matière organique, définit les termes classiques *mull*, *moder*, *mor*, qui traduisent la rapidité de la décomposition des litières. Les processus biochimiques de l'humification y sont largement détaillés ainsi que les facteurs écologiques qui influencent l'humification. Il décrit ensuite l'évolution lente des composés humiques c.à.d. la maturation influencée par le climat et par le milieu minéral. L'auteur critique les anciens critères de la classification des humus et propose de nouveaux critères basés sur la nature et la proportion des différentes fractions de l'humus.

Le troisième chapitre concerne les transports de matière dans les sols. Il définit et discute en détail la lixiviation, la chéluviation et le lessivage, trois

processus d'entraînement ou éluviation, ainsi que les processus de remontées physico-chimiques et biologiques. L'influence des facteurs écologiques sur les transports de matière est largement exposée.

Le quatrième chapitre, genèse et évolution des sols, est une synthèse générale des précédents, mais il aborde le facteur temps. C'est sans doute le chapitre qui intéresse le plus les géologues, géomorphologues et quaternaristes. Il explique les évolutions progressives et régressives, les cycles courts et les cycles longs, les façons de déterminer l'âge des sols, les actions des facteurs écologiques sur les cycles d'évolution y compris celles de l'homme. Dans l'étude des cycles longs, il décrit les paléosols, les sols fossiles, les sols polycycliques, les sols anciens, les sols composés et complexes et expose les problèmes de l'interprétation de ces cycles en évolutions prolongées ou évolutions successives.

La deuxième partie de l'ouvrage consacrée à la systématique des sols, est introduite par le chapitre 5 qui expose les critères utilisés par les classifications modernes et définit les horizons. L'auteur analyse et critique la classification américaine, celle de la F.A.O., et présente une classification nouvelle basée sur les processus écologiques d'évolution des sols. Cette classification est décrite en détail dans les chapitres 6 à 13. Ces chapitres sont clairement exposés, riches en schémas topographiques et pédologiques, ainsi qu'en diagrammes analytiques. Ils mettent l'accent sur les propriétés morphologiques et écologiques, et sur les processus biochimiques et souligne régulièrement les propriétés agronomiques des sols.

Enfin l'ouvrage se termine par un bon index alphabétique des termes utilisés.

Ce livre, qui fait appel à des notions déjà approfondies de chimie, semble destiner aux lecteurs avertis. Malgré son coût élevé, il manque d'illustration et fait, sans doute, trop souvent appel à un ouvrage du même auteur, publié dans la même collection.