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# Belize Shelf - Carbonate Sediments, Clastic Sedimentology, and Ecology

Noel P. James

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Possibly the most interesting and original paper (also the longest . . . 30 pages) was that by G. M. Kaufman *et al.*, "A Probabilistic Model of Oil and Gas Discovery". The authors present a statistical model based upon Alberta's oil and gas pools, and utilize Monte Carlo simulations to predict the size of pools discovered as the resource base is depleted.

Other papers including those by such authors as H. D. Hedberg, M. T. Halbouty, K. O. Emery and L. G. Weeks deal with a diversity of concepts relating to basin evaluation, entrapment factors, computer simulation studies and deep ocean sediments. Editor J. D. Haun has provided a good introductory summary paper.

The volume is suitably indexed under author, subject, and keyword, and is attractively bound in soft cover.

Conferences, especially of this type, have may inherent limitations which make the original objectives difficult to achieve. It is therefore understandable that expediency and confidentiality result in only minor input from the major oil companies and little originality in many of the papers. Many of the authors have merely reiterated old ideas and some touch only on the peripheral aspects of the conference theme.

However, despite such shortcomings, this volume is definitely a good buy, and recommended reading for any geologist who is concerned about the state of the art/science for which geologists as a group are receiving much justifiable criticism. Mineral geologists may find some of the concepts adaptable. In addition, this book should be recommended reading for the layman, government official and politician or anyone concerned about today's or tomorrow's energy supplies.

MS received February 10, 1976.

## Belize Shelf - Carbonate Sediments, Clastic Sedimentology, and Ecology

Edited by K. F. Wantland and W. C. Pusey III
*American Association of Petroleum Geologists, Studies in Geology No. 2. 599 p., soft cover, 1975.*
SEPM and AAPG members $15.00, Others $19.00.

Reviewed by Noel P. James
*Department of Geology*
*Memorial University of Newfoundland*
*St. John's, Newfoundland*

In 1960, having completed the herculean task of describing the modern carbonate sediments on the Great Bahama Bank, E. G. Purdy turned his attention to the Belize (British Honduras) continental shelf, a contrasting, reef-dominated area of both terrigenous-clastic and carbonate sedimentation. Over the next six years he, and a team of graduate students from Rice University, studied the sedimentology of this complex. The result was nine Ph.D. dissertations focused on various aspects of sedimentation, carbonate diagenesis and benthic organism ecology. Time and circumstance have mitigated against publication of all but two of these studies, and now, at last, the rest are combined between the pages of this volume.

The book contains nine papers; a succinct, well-written overview of the regional shelf attributes by Purdy and the two editors, seven papers on the Belize shelf proper and one paper on the aeolianites of the northeastern Yucatan Peninsula.

Sedimentation on different parts of the Belize shelf are detailed in three papers. The shallow northern shelf studied by Pusey, although reminiscent of Florida Bay, Shark Bay and parts of the Great Bahama Bank, is veneered with fine grained terrigenous clastic as well as carbonate sediments. Of particular interest are the two large mud banks at the entrance to Chetumal Bay, thought to result from the interplay of tidal currents and waves as opposed to binding and trapping by sea grasses. The documentation of carbonate sediments in lagoons, on beaches and on tidal flats around the large island Ambergris Cay by Ebanks is another addition to the growing literature on this topic. An important, and at the same time disturbing conclusion resulting from analysis of coastal mangrove swamps along the landward margin of the shelf by High, is that the sediments in this zone have no consistent relationship to environment of deposition. Perhaps the most significant contribution does not come from any one of these papers alone, but rather from the consistent picture of sedimentation during the Holocene transgression, obtained by all three workers from analysis of many soft-sediment cores.

Clay minerals, which comprise a significant part of lagoon sediments throughout, are thought by Scott to be detrital in origin and to reflect drainage from intensively leached, geologically varied terrane versus karsted carbonate terrane. Interestingly, she also feels that dispersal patterns of the clay minerals reflect, in part, the different settling tendencies of the various clays.

Pleistocene carbonates are treated in two studies, one on the reef to shelf to mudbank transition on Ambergris Cay (Tebbutt) and one on the aeolianites of the Northeast Yucatan platform north of Belize (Ward). These studies confirm the now well-documented diagenetic processes that occur in the subaerial vadose zone and contain interesting information on recrystallization of aragonite skeletons (to aragonite) and diagenesis related to plant roots, paleoexposure horizons and calcrete.

Microfauna in the Holocene shelf sediments are described in two solid studies, one on the ecology of benthic foraminifera (Wantland) and the other on the taxonomy of ostracods (Teeter) and both convincingly illustrate the value of examining microfauna together with sediments.

This volume, along with earlier published studies on the shelf interior lime muds (Matthews, Jour. Sed. Petrology, 1969; Scholle and Kling, Jour. Sed. Petrology, 1972); the morphology and fauna of some shallow reefs (Stoddart; Atoll. Res. Bull., 1962, 1963) and the role of inherited topography in reef distribution and sedimentation (Purdy, SEPM Spec. Publ. 18, 1974) combine to yield one of the most complete analyses of a modern reef

complex, with the exception of the reefs. The fact that most studies were completed some eight years before publication is glaringly obvious both from the text and the references quoted, few of which are later than 1967.

Eight years ago this would have been a major publication in the field of carbonate sedimentology, today it is a solid addition to the literature; for the serious worker on carbonate sedimentology and paleoecology this book should be handy as a reference; for the worker on carbonate diagenesis it can easily be reached in the nearby library.

MS received March 1, 1976.

## Neue Möglichkeiten erdgeschichtlicher Forschung mit Hilfe des Paläogeruches

By W. A. Schnitzer and R. G. Schwab
*Erlanger Geol. Abh., Helf 101, 20 Seiten, 1975.*
DM 8.00 (approx. $3.25).

Reviewed by Anna-Stina Edhorn
*582 Davenport Road*
*Toronto, Ontario M5R 1K9*

**New Possibilities in Stratigraphic Research with the help of Paleosmell**

Paleosmell is the term used by Schnitzer and Schwab in their publication. Considered is the sensorial perception of smell from clays and its usefulness and importance in stratigraphic geology.

It is known that burnt clay is able to adsorb odorous substances from the atmosphere. During fieldwork in India, Schnitzer came in contact with the manufacturer of an "earth parfum" "Matti-ka-attar" and he could follow the process of retrieving that odorous substance from its source. The substance is produced in the clay burnt by the sun in the hot summer months from April to June.

I. J. Bear and R. G. Thomas, Melbourne, Australia have made detailed studies of the complex composition of that "Matti-ka-attar". They introduced the term "petrichor" to describe the smell of clay and also the smell displayed by outcropping rocks on earth.

Schnitzer and Schwab speculated that shale and even other rocks from the past must have had the same ability to adsorb odorous substances. Hence, the goal was to make use of this assumption and to find methods to identify these odorous substances, which are of great variety and discernible in moistened shales and marls.

The two researchers established a joint program, in which Schnitzer used thin-layer chromatography to graphically explain paleosmell. He gives a detailed description of the procedures in his method as well as illustrations of the chromatograms received from the shales used in the experiments. He found that shales of different age and facies could be distinguished because of remarkable differences in smell ranging from musty to earthy and aromatic to burnt. This thin-layer chromatographic method has been successfully applied to the Upper Triassic shales of southern Germany. From vertical sections without noticeable changes in facies, there is evidence that isochronous strata are identical, whereas heterochronous sediments differ as far as their paleosmell is concerned. Over a studied area with a distance of approximately 50 km, these observations proved to be correct. Many other shale samples have been investigated, such as Precambrian shales from India, Devonian ones from Spain and Plio/Pleistocene shales from western Germany.

Chromatograms in this project are not interpreted in terms of the nature of the easily volatilized organic compounds, but are made for visual comparison only, to record which chromatograms are identical and which have a different configuration.

A series of chromatographic identity cards have been compiled for the Upper Triassic stratigraphic units, representing 200 collected samples. Hopefully, these cards will serve as a comparative standard in the future.

Information regarding the nature of those organic compounds, which are volatile in water vapour and are the essence of paleosmell, is given by Schwab in part II of the reviewed publication. He uses pulse-polarography to investigate various clay-stones and gives a description of his method. Most of the samples investigated contained polarographically active compounds giving characteristic polarograms. These compounds being the source of the paleosmell apparently are aldehyds, ketones, terpene-aldehyds and terpen-ketones, possibly also aromates and heterocyclic compounds.

The polarograms received proved to be identical within the same stratum. A valuable point is that Precambrian samples, as expected, do give characteristic polarograms, which are quite different from the Mesozoic ones. This may reveal what type of compounds existed in the Precambrian biology and in the primeval atmosphere. It may bring out such important information as when and where the first animals appeared and started to compete with the all dominating algae.