tures because of flexibility and concessions on the part of management. Companies with stereotyped exploration policies regarding fixed ROI formulas, minimum size of land holdings, exploration procedures, and partnership arrangements, find it difficult to compete.

Examples of exploration geologists' influence on corporate decisions show how the merits of a prospect can change. They illustrate the disadvantages of restricting the geologist prematurely with economic limitations and suggest that the premonitions and innermost thoughts of the explorer should be included in geologic reports. There seems to be no substitute for exploration experience in dealing with important but intangible parameters.

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REEF FACIES AND STRATIFIED MINERALIZATION

The rhythmic reef-type sedimentation of the Givetian synclinorium of Dianant (Belgium) has been the subject of a detailed facies study including faunal and physical chemical characteristics.

The more recent reefal phenomena dating from the upper Aptian in the vicinity of Reocin (west of Santander, Spain) have been compared lithologically and paleontologically.

The stratified mineralization is related closely to the Reocin reef facies. This is not an isolated case; other examples throughout the world illustrate such associations.

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RECENT INTERTIDAL CEMENTS—THEIR MINERALOGY, TEXTURE, AND SIGNIFICANCE, GRAND CAYMAN, BRITISH WEST INDIES

Recent intertidal rocks of Grand Cayman are cemented by metastable carbonates. Both aragonite and high magnesium calcite are present in various morphologic forms, as shown by X-ray, stains, and chemical analysis. Aragonite is present either as clear acicular crusts or as a fine-grained ($<5\mu$) "micrite" crust. These 2 modes of aragonite are present in the same specimen and within the same pore as alternating layers. High magnesium calcite cement is present only as a fine-grained ($<5\mu$) "micrite" crust. Both the acicular and "micrite" aragonite cements appear to be a chemical precipitate from normal-marine water. Chemical analysis of a sample of the "micrite" aragonite cement shows a high sodium content (4,580 ppm) which would support the hypothesis of marine origin of this cement. The magnesium calcite cement data are incomplete and its origin is more uncertain. Both the aragonite and magnesium calcite "micrite" cements contain trapped detritus such as tiny foraminifers and silt-size shell debris and many areas appear to be distinctly pelleted. Once the pore is completely filled, the "micrite" cement mimics the fine-grained carbonate-mud matrix characteristic of quiet water conditions. The presence of significant amounts of fine-grained metastable cements as described from Holocene high-energy environments raises the question of whether these cements can survive in ancient rock sequences, and be confused with carbonate-mud matrix material characteristic of much lower energy situations. The presence of high magnesium "micrite" cement in this situation and its known propensity for stabilization without significant change in form leads me to believe that such cements can be preserved and incorporated into the rock record, and could be confused with true micrite matrix.

[1] Paper will be presented by G. P. BROGNON, Canadian Fina Oil Ltd., Calgary, Alta.

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CONSOLIDATION OF MARINE CARBONATE MUD

Although there has been considerable interest in the consolidation of marine carbonate sediments, there has been little actual testing of carbonates. For our study, 34 sediment samples from the Gulf of Mexico, Florida Bay, and the Bahama Banks were tested in an Anteus back-pressure consolidometer to determine their consolidation characteristics. Eleven of the sediment samples were less than 50% calcium carbonate. Of the samples containing more than 70% carbonate, 12 samples were of Holocene age, deposited since Wisconsin glaciation, and 11 samples from the continental slope west of Florida were of Pleistocene-Pliocene age.

The samples were overconsolidated; that is, there was more structural strength than would be expected from the effect of the present overburden. There was a definite relation between the percentage of fine material present and the resulting consolidation.

In general, the results of consolidation tests were similar to those found by testing noncarbonate silty clay. The main differences observed were between the older carbonate sediments and the noncarbonate or partly carbonate sediments. Under a similar final load, the carbonate sediments did not compact to as low a porosity as the noncarbonates. This could be caused by differences in particle shape and strength of the individual particles. Age and incipient cementation must play a part because the Holocene carbonate sediments did not show this characteristic. This conclusion is supported by the results reported by several other workers —that the strength of carbonate sediments increases with age.

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ARCHITECTURE OF WESTERN PART OF ALBERTA BASIN AND UPPER DEVONIAN REEF TRENDS

A paleogeology map with datum below the Devonian unconformity based on data from previous investigations, a revised Devonian palinspastic map, and maps of Devonian units in the Main Ranges west of the Banff-Jasper highway between 51°30′ and 52°00′, provide new data for assessing structural control of reef-bank margins and the western edge of the Fairholme carbonate shelf.

Although recent erosion has removed most of the Devonian strata of the Main Ranges, sufficient outcrops are preserved to indicate definite trends. Two distinct NW-SE trends are evident in the underlying Ordovician and Cambrian strata: (1) a prominent broad positive ridge paralleling the eastern Front Ranges and adjoining Foothills (Alberta ridge), and (2) a prominent negative trough or depression (North Saskatchewan trough) paralleling the eastern Main Ranges and marked by the thickest and youngest Ordovician sediments preserved.

The margins of the Southesk complex and the north margin of the Fairholme complex trend NNE or NE

almost at right angles to the Alberta ridge and the North Saskatchewan trough. These trends parallel those of the Rimbey-Leduc and Sundance-Windfall subsurface trends and are the most prominent features of this basin. The development of a later Devonian trend is documented by the presence of the southern part of the Southesk complex and the northwest part of the Fairholme complex above the thickest (most negative?) parts of the North Saskatchewan trough.

The positive Alberta ridge exerted a secondary control on the distribution of the Miette, Southesk, and Fairholme complexes. The thickest sections of the Fairholme Group (about 2,000 ft) are at the westernmost outcrops and appear to mark the western shelf margin of the Alberta basin.

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COMPARISON OF SOME ALBERTA UPPER DEVONIAN REEF COMPLEXES WITH MODERN CARIBBEAN REEFS

Reefs on the eastern coast of Carriacou (southern Grenadines) are considered to be representative of this part of the Caribbean. The upper Southesk stage of the Upper Devonian reefs closely resembles these modern reefs. Similarities are (1) narrow reef crest zone a few 10s of feet wide, (2) a slightly broader rubble zone just inside the reef, (3) lagoonal sediments consisting of fine- to coarse-grained coral-algal particles, making up about 80% by area of the reef complexes, (4) interior parts of the lagoon are progressively finer grained and poorly sorted, (5) sediment filling of the lagoon occurs from the reef inward, depending on lagoon topography and rates of sediment supply, (6) active reef growth was established at suitable depths (40–100 ft) during a rise in sea level and progresses from a submerged to a nearly emergent reef bank, and (7) stromatoporoids fulfilled the same role as modern corals, and algae-like *Renalcis* acted as encrusting framebuilders.

Differences include (1) the lack of abundant terrigenous sediments, forereef talus, and carbonate mud in Carriacou reefs, (2) lack of ripples and cross-stratification, but the presence of prominent planar bedding in the Devonian lagoonal deposits, and (3) the less diverse fauna with less marked differentiation of growth forms in Devonian reefs. These are not significant differences and can be explained in terms of different basin sedimentation, organisms, preservation, diagenesis, *etc.* Modern reefs provide useful prototypes for testing concepts and models of Devonian reefs and banks. The Miette and Ancient Wall reef complexes (and others) are comparable to modern offreef drape types.

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DOLOMITIZATION, DOLOMITE DISTRIBUTION, RESERVOIR ROCKS

Approximately 80% of the hydrocarbon reserves in carbonate rocks in North America are found in rock that is essentially pure dolomite. In many reservoirs the field limits are determined by the distribution of dolomite, because the dolomitization process is conducive to the production of a favorable reservoir rock. The distribution of dolomite may be determined by (1) those rocks that were within the flow path of a dolomitizing fluid (water-controlled dolomitization) and (2) the susceptibility of a rock within the flow path of a dolomitizing fluid to dolomitization (rock-controlled dolomitization). The second factor may be controlled by permeability at the time of dolomitization, particle size, or solubility of the original particles. The identification of the cause of the location of an individual dolomite body is significant to understanding its size and distribution.

Paleozoic carbonate rocks containing abundant crinoids commonly illustrate the idea of rock-control dolomitization. The significant parameter appears to be the original fabric of the sediment and is related to the ratio of carbonate mud to carbonate sand-size grains. The hydrology of hypersaline brine on Bonaire in the Netherlands Antilles provides a model from the Holocene that illustrates water-controlled dolomitization. In this model, access to hypersaline brine determines whether a sediment or rock will have the opportunity for dolomitization.

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CACHE CREEK FUSULINIDS FROM SOUTHERN BRITISH COLUMBIA

Permian fusulinids in the Cache Creek Group in southern British Columbia have been reported from several localities in the region between Vernon and Clinton. However, the only faunas described are from Marble Canyon and northeast of Kamloops. These faunas range in age from late Wolfcampian to Guadalupian.

Over the past few years, systematic search of the limestone beds of this area has resulted in the discovery of several important fusulinid faunas. For example, the distinctive genus, *Pseudoschwagerina,* has never been described from this area, but it occurs at several localities between Vernon and Clinton.

A new fusulinid fauna from a series of limestone bodies northwest of Meadow Lake, about 25 mi northwest of Clinton contains many Lower Permian species and 2 species of Middle Pennsylvanian (Missourian) *Triticites.* Species referred to the Permian indicate a late Wolfcampian or early Leonardian age and include 2 species of *Schubertella,* several species of *Triticites* and *Schwagerina,* a *Paraschwagerina,* 3 species of *Pseudoschwagerina,* and 2 species of *Quasifusulina.* The species of *Quasifusulina* occur with *Pseudoschwagerina* and represent the second reported occurrence of this genus in North America. A similar fauna containing *Quasifusulina* has been described from the Fort St. James area of central British Columbia.

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EVALUATION OF PETROLEUM PROSPECTS UNDER CONDITIONS OF UNCERTAINTY

Recent advances in computer technology have made practical the use of well-established methods for evaluating the consequences of uncertainty. Because of the complex and intricate process of translating exploration data into economic terms, these methods promise to be of great benefit to the managements of companies in the minerals industry. In addition to providing a means for evaluating risk or probability of financial loss, the methods provide information to aid in evaluating the importance of specific variables with respect to desired answers. As a means of communication they provide the mechanism whereby the qualifications