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Current Research

MEETINGS

The Atlantic Universities Geological Conference was held at Fredericton, New Brunswick from October 28-30, 1976. This year the geology students of the University of New Brunswick were hosts to this all-student affair. Aside from the field trips, a day was set aside for the technical session in which 5 universities presented papers on behalf of their geological departments and societies. Abstracts of these papers are given.

THE GAYS RIVER CARBONATE COMPLEX DEVELOPED AS A MUD MOUND, NOT AN 'ECOLOGIC REEF'

B. OSBORNE. Dalhousie University, Halifax, Nova Scotia.

The lead-zinc deposit at Gays River, Nova Scotia has been interpeted as a Mississippi Valley type deposit hosted by an ecologic reef complex. Evidence now indicates that the carbonate complex developed as a lime-mud dominated mound. This paper represents a preliminary report of work done on the origin and growth of a section of the complex. Hopefully the recognition of parameters controlling the origin and growth of the complex will make location of potentially similar build-ups possible.

Through detailed study of polished slabs and thin sections a stratigraphic succession of four distinct lithic units occurs. A thin, basal, carbonate-cemented, oligomictic conglomerate overlies an erosional unconformity which provides about 35 m of relief. Overlying the conglomerate is a basal wackestone which contains solitary corals and fills paleotopographic depressions. Gradationally overlying the wackestone is a thick bryozoan bafflestone. Associated with this unit are scattered thin-shelled brachiopods, gastropods and ostracods embedded in carbonate mud. A thick algal mudstone gradationally overlies the bafflestone and is truncated by erosion at the top.

This succession has little in common with a clastic ecologic reef (as it was originally interpreted); however, it compares favorably with an idealized mud-mound sequence. At this point nothing definite can be said about the origin of the carbonate mound, however the paleotopography clearly plays a major role. Water depth is interpreted to be less than 50 m in an overall shoaling upward succession. Aside from indigenous corals, the basal wackestone represents redistribution of initial transgressive deposits. Bryozoans act as baffles causing the bulk of the mound mud particles to accumulate. Late stage domination by algal material indicates probable environmental stresses such as shallowing water and rising salinity.

THE MODE OF EMPLACEMENT OF THE CREIGHTON POINT RHYOLITE SHEET

L. MACLELLAN. University of New Brunswick, Fredericton, New Brunswick.

The Creighton Point rhyolite occurs in a sequence of rocks correlative with the Lower Devonian Eastport Formation of Maine. These rocks are located in southwestern New Brunswick in the Passamaquoddy Bay area and consist dominantly of rhyolitic and basaltic flows and pyroclastics. Their intrusive equivalents occur as well. Sediments are minor but become increasingly abundant moving up through the stratigraphic sequence. Evidence in the volcanics and sediments indicates that the depositional environment changes progressively from shallow marine to terrestrial with time.

Some of the basalt flows contain sediment in their tops, or mixed uniformly throughout their thickness indicating that they flowed under the thixotropic sediments.

The intrusive or extrusive character of the rhyolites is reflected in the degree of development of flow layering. Flow layering in the intrusives is faint, at best, and limited to within a few inches of the contact. Conversely, the extrusives exhibit well developed flow layering which is found throughout the rock unit.

The Creighton Point rhyolite sheet shows intrusive, cross-cutting contacts with the surrounding rock units. That the rocks into which it was injected were still thixotropic or plastic is evidenced by the sedimentary dikes and sediment-rhyolite interaction found within the rhyolite unit itself. However, the interior of this sheet exhibits very well developed flow layering which is a characteristic of the extensive rhyolite flows. The flow layering has two forms which can be shown to have been formed by two different mechanisms. This is not a feature of either the intrusive or extrusive types. Thus, the Creighton Point rhyolite does not fit into either of these modes of occurrence. Rather, the rock is intermediate between these two, and a new terminology, subtrusion, is proposed to adequately describe its mode of occurrence. The characteristics of the sediment-interacted basalts are such that they may also be as subtrusions.

RECENT DEVELOPMENTS IN CAMBRIAN STRATIGRAPHY ON THE WEST COAST OF NEWFOUNDLAND

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Work on the Cambro-Ordovician carbonate sequence by Memorial University, the Newfoundland Department of Mines, and others in the last ten years has shown that the Cambrian is more extensively developed on the Great Northern Peninsula than had previously been thought. This has been shown independently both on Port au Port Peninsula in the south, and along the St. Barbe coast in the north, using faunal data in conjunction with lithofacies data.

In the north three new mappable formations have been recognized overlying the lower Cambrian Bradore and Forteau Formations. The lowest, the Hawke Bay quartzite, is a trough and planar cross-bedded beach quartzite which overlies Forteau beds containing *Olenellus brevoculus*, and is best exposed on the south shore of Hawke Bay. A thin unit of sandstone and shale within the quartzite yielded *Fremontia*

fremonti indicating an upper Lower Cambrian age. This formation is overlain by burrowed, knobbly-bedded dolomitic micrites containing locally abundant brachiopods and trilobites. The trilobites *Ehmania* sp., *Elrathia* sp., and *Solenopleurella* sp., which are present indicate an upper Middle Cambrian age for these beds. The top formation consists of extensive dolostone and contains restricted occurrences of brachiopods and, in one horizon, the lower Upper Cambrian trilobite *Araphoia* sp. has been identified. This formation has been divided into 3 members: (1) a lower member consisting of dolostone and interbedded micrite with isolated stromatolite horizons, some places red and green fossiliferous shales being present; (2) a middle member which is intensely stromatolitic; and (3) a poorly exposed upper member consisting of dolostone and more crystalline micrite, becoming more burrowed near the top. The two upper formations are best exposed along the St. Barbe coast. A gradational contact upwards with the St. George Group is probable on the St. Barbe coast. The lowest St. George here consists of dolostones and micrites containing abundant chert nodules and, locally, chert beds.

PETROLEUM-GENERATING POTENTIAL OF SEDIMENTS IN MOBIL OIL INTREPID L-80

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Approximately two years ago Mobil Oil drilled the wildcat oil well Intrepid L-80, roughly 10 miles southeast of Sable Island, to a depth of 13,655 feet.

The organic geochemistry of the sediments was used to draw conclusions on their oil-generating potential, and this was correlated with actual oil production shown by drill-stem tests.

The work consisted of (a) logging the lithologies and correlating them with the regional stratigraphy, (b) C_{15}+ extraction and interpretation, (c) a C to C_4 analysis and (d) a microscope study of the kerogen (organic material). These studies were used to rate the "source-rock potential" and to indicate the degree of maturation of the sediments at various levels.

The well encountered seven major rock formations ranging in age from Lower Cretaceous to Tertiary and reflecting various depositional environments. Marine organic material is the only kind which can easily produce petroleum. Shales occurring between 11,500 feet and 13,655 feet which represents an outer shelf marine environment, appear to offer the best chances for petroleum production in the well.

The "source rock potential" of the well as a whole was rated "poor" except at 13,500 feet where the sediments can be rated "good" for hydrocarbon generation. However, maturation studies indicate there are no levels in the well where the rocks are matured enough for good oil generation.

Oil was found in the well between 9,540 feet and 12,616 feet in four intervals. Since none of the sediments in the well are mature enough to generate oil, the petroleum must have migrated from rocks of higher maturity.

STRUCTURAL ANALYSIS OF DEEP COVE SHORE CAPE BRETON ISLAND

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The Deep Cove area is situated on the southeast shore of Cape Breton Island, Nova Scotia, about 40 miles south of Sydney, and lies within the area of exposure of Precambrian to Cambrian volcanics of the Fourchu Group.

Principal lithologies comprise andesitic volcanics and cross-cutting, fine to medium-grained dikes of monzonitic composition. A phase of these dikes is porphyritic. Quartz veining is widespread and is frequently associated with molybdenite and other minerals.

Quartz-vein orientations fall into two main sets, striking northeast and east, and dipping northwest and south respectively. Stereographic analysis of vein patterns suggests that their orientations are controlled by shear joints resulting from compressional or tensional stress. The principal axis of the associated strain ellipsoid would plunge steeply towards the northeast.

Accessory minerals in the quartz veins show a zonal distribution that strongly correlates with the mineral zonation patterns of molybdenite deposits elsewhere. Such a correlation would imply the involvement of a hydrothermal mineralization halo surrounding a postulated intrusion.

Cross-cutting relationships indicate a sequence of events that include the formation of volcanics, dike emplacement, mineralization and shearing. Cross-cutting relationships within the vein system indicate a multiple vein formation sequence.

The presence of an observable mineral zonation within the vein system itself, as distinct to zonal alteration of the wall rocks, might be of significance to the economic exploration of hydrothermal deposits.