high-velocity zones, marine sand is not available for transport. There bedrock sand and dust, largely a product of intensive marine-desert chemical weathering, are wind transported, resulting in either sand sheets or deflation areas.

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TRANSITION FROM FLUVIATILE TO MARINE SEDIMENTS IN COOMHOLA GROUP (UPPER DEVONIAN-LOWER CARBONIFEROUS) OF WEST CORK, IRELAND

At the head of Bantry Bay, southwest Ireland, the conformable transition between the nonmarine Old Red Sandstone facies and the marine Carboniferous clastic sequence occurs in the Coomhola Group. Within its 4 formations, 4 important partly repetitive facies are distinguished: (1) cyclic facies that become finer toward the top, interpreted to be stream deposits; (2) fine facies of rippled siltstone and mudstone, either separate or complexly interleaved, considered to be alluvial flood plain or interdistributary deposits; (3) burrowed facies, having variable proportions of wave-rippled siltstone interlaminated with mudstone, usually burrowed, thought to represent interdistributary bay deposits; and (4) parallel-bedded sandstone facies of parallel or cross-bedded sandstone units, in places having scoured surfaces, interpreted to be submarine-bar deposits.

The basal Yellow Rocks Formation (450 m) consists of the cyclic facies variably interleaved with the fine facies, its base being the highest redbed. Paleocurrents indicate a northerly provenance, and the general environment is interpreted to be an alluvial plain. In contrast, the lowest part (40 m) of the overlying Ardaturrish Formation consists of the fine facies and the burrowed facies in equal proportions. The latter is interleaved with the cyclic facies in the upper part (560 m). This facies association indicates a transgression over the alluvial plain, the environment changing to a coastal plain and then to an interdistributary area partly affected by south-flowing distributaries. The cyclic facies persists into the overlying Reenagough Formation (160 m) before giving way to the parallel-bedded sandstone facies indicative of an offshore bar deposit. The burrowed facies then dominates, and within the overlying Ardnamanagh Formation (80 m) shows cycles that become coarser at the top, suggestive of an advancing shoreline, before being succeeded by fine-grained marine sediments (Tournaisian). This facies sequence implies a deltaic advance before the marine transgression was established.

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DEPOSIT FEEDERS LIMIT DEVELOPMENT OF STROMATOLITES

Filamentous sediment-binding blue-green algae, principally *Scizothrix*, are present throughout the tide flats of the west coast of Andros Island, Bahamas, from storm-tide levels to below low tide, a range in excess of 3 m. However, extensive flat-laminated stromatolitic deposits are restricted to about ½ m in the upper intertidal and supratidal zones. A similar restriction is known from other areas, notably Florida Bay and the Persian Gulf.

Two small gastropods which feed on algae-coated surface-sediment particles are the principal cause of this restriction, but deposit-feeding polychaetes are also responsible. The gastropods, *Cerithidea costata* and *Batillaria minima*, in concentrations of 500–2,000/sq m, intermittently are exposed on the margins of shallow subtidal ponds. When flooded they feed so voraciously that about 100 fecal pellets are excreted per individual per hour. On the basis of the size of pellets (0.026 mm^3), rate of feeding (almost equivalent to the rate of excretion), number of individuals (1,000/sq m), and the percentage of time spent feeding (50%), I calculate that the topmost millimeter of sediment is reworked over the entire surface in 1 month.

If the gastropods and other deposit feeders were absent from Bahamian environments, the vertical range of stromatolitic deposits could be extended there from ½ m to several meters. Restriction or absence of deposit feeders could be caused by extreme salinity or temperature in other Holocene or Phanerozoic environments. Complete absence of deposit feeders in Precambrian time should have allowed stromatolites to develop to their maximum vertical range.

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SILURIAN REEF IN MICHIGAN BASIN—STRATIGRAPHIC-, FACIAL-, AND RESERVOIR-PROPERTIES ANALYSIS

The Belle River Mills gas field (China Twp., St. Clair Co.), discovered in 1961 and since 1965 utilized as an underground gas-storage reservoir, is one of 42 known reefs of Niagaran (Middle Silurian) age in southeastern Michigan, 36 of which are oil or gas producers. The reef is an elongate pinnacle structure, about 2 mi long and 0.75 mi wide. It attains a maximum relief of 420 ft with slopes ranging from 10 to 30°.

Three major growth phases are recognized: (1) biohermal, consisting of skeletal (crinoid, bryozoan, coral, and tabular stromatoporoid) wackestone and packstone rudites and arenites; (2) organic reef, consisting of a reef core (massive stromatoporoids, corals, and algae?) and associated interbedded and interfingering lithofacies of "backreef" skeletal wackestone rudite, burrowed mudstone and laminite, and coarse skeletal forereef talus; and (3) supratidal cover complex, composed of stratified algal stromatolites, flat pebble conglomerates, oncolites, and burrowed pelletal mud.

The mound developed to a height of 150 ft in quiet, relatively deep water. The reef grew in turbulent water, attaining a height of 300 ft above the surrounding sea floor. Reef growth stopped as a result of shallowing and increased salinity, which led to the deposition of the supratidal complex.

A conglomerate composed of algal stromatolite pebbles and boulders derived from the supratidal complex phase is present 400 ft below the reef crest at the base of the offreef Salina Group. It is covered by the A-1 anhydrite (15 ft) and the A-1 carbonate (120 ft) which both wedge out toward the reef walls.

The A-1 carbonate is finely laminated, finely crystalline dolomite devoid of fossils, in places pelletal with algal mats, birdseye, and desiccation features and having an abundance of various textural forms of anhydrite. It is indicative of a very shallow-marine, partly supratidal environment. The conglomerate and the environmental interpretation of the A-1 carbonate demonstrate that the offreef sequence is post-reef in age and that the reef was subaerially exposed during the deposition of the overlying units. Dolomitization and diagenetic processes of leaching and reprecipitation associated with this exposure period destroyed much of the original depositional texture.

A statistical data-reduction method was developed and used to construct a representative picture of the spatial distribution of reservoir properties. There is a correlation between stratigraphic and reservoir facies, markedly modified by diagenesis.

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TECHNIQUE OF OBSERVATION OF ORGANIZED ORGANIC REMAINS IN CARBONATES

Conversion of carbonate grains to fluorite gives a microporous pseudomorph in which the contained organic material may be dyed and observed. Photographs illustrate the application of this technique to *in-situ* observation of perforating algae and other organisms in modern Bahama ooids and skeletal grains. A similar group of organisms, that demonstrates the preservation of detailed cellular structure at least from Pleistocene time, has been found in Miami Oolite ooids. Other possible applications are to ancient carbonates and to carbonates trapped by blue-green algae.

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FOREREEF SLOPE ECOLOGY AND DEPOSITIONAL PROCESSES IN JAMAICA

The forereef slope is a well-defined zone of the reef biotope. In Jamaica, its maximum limits lie between about −20 m and −120 m, roughly from wave base to the depth of compensation for photosynthesis of green algae and zooxanthellae. In practice, the upper and lower limits of the forereef slope habitat appear to be defined by the 15 and 0.3% isophotes respectively.

Morphologically, the Jamaican forereef slope is divided horizontally by rimmed terraces at about the −18-m, −35-m, −65-m, and −120-m levels. Each terrace is set back from the one below by a steep coral-covered drop-off which may be vertical or even overhanging. These levels are related to eustatic sea level changes during the late Pleistocene and Holocene marine transgressions.

Biologically, the forereef slope has a rich and diverse benthos whose biomass may in some places exceed that of all other reef zones combined. From −20 m to −60 m, hermatypic corals are dominant, below that Porifera prevail. The algal flora is dominated by immense populations of various species of *Halimeda*, the chief sand builders of this zone. Frame cementation is mainly by encrusting coralline red algae and the colonial foraminifer, *Gypsina*. A common attribute of many groups in this habitat is gigantism, notably among the sponges, corals, *Gorgonia*, Antipatharia, and *Halimeda*. There is a high degree of endemism; *i.e.*, the forereef slope harbors many species not found elsewhere in the reef. Among these are the recently discovered sclerosponges which are important frame cementers of the twilight zone in caves, crevices, and subreef tunnels. Many of the endemic forms are precise habitat indicators, and thus may be of considerable paleoecologic significance.

Sedimentologically, the forereef slope is a region of accelerated deposition and erosion. There, transient sediment of shallow-water origin mingles with locally produced skeletal detritus, resulting in a poorly sorted mixture with a high proportion of fines. The rimmed terraces usually dam large pools of talus through which project nunataklike isolated pinnacles and outcrops of the substrate. The drop-offs in front of the terraces are steep, and dissected by gullies through which drainage of sediment into deep water takes place. Few organisms grow in these chutes, the richest organic communities are on the precipitous rocky promontories between the chutes. Mass transport of sediment downslope is by creep, turbidity currents, and slides. Sporadic fallout of corals results in an imbricated scree piled against the source area. Avalanches spread large amounts of coral detritus in disordered heaps far downslope. Slumping displaces very large blocks of reef framework into deep water. Extensive submarine organic and inorganic lithification tends to stabilize quickly the masses of detritus, even on very steep slopes and in spite of the structural weakening due to boring sponges.

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GEOLOGIC RECONNAISSANCE OF CHUKCHI SEA, BASED ON ACOUSTICAL PROFILING AND MAGNETIC DATA

(No abstract submitted)

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BIOSTRATIGRAPHY OF CARBONIFEROUS ROCKS, SAN SABA COUNTY, CENTRAL TEXAS

Increased understanding of complex carbonate facies patterns in Carboniferous rocks of central Texas permits systematic investigations of macropaleontology and biostratigraphy. Fossils studied were collected from exposures of Chappel, Barnett, Marble Falls, and Smithwick formations in the north-central part of the Llano uplift.

The first purpose of this investigation was to identify and describe the macrofauna as completely as possible. Brachiopods, particularly productids and chonetids, dominate the fossil assemblages. However, colonial and solitary corals, bryozoans, gastropods, pelecypods, goniatites, nautiloids, crinoids, and a few trilobites are also present.

A second purpose of the investigation was to assess relations among faunas and the several different carbonate and shale facies. For example, the fauna preserved in Chappel beach sediment is completely different from that fauna preserved in conformably overlying Barnett Shale. Most of the taxa from the Barnett range upward into the Marble Falls Limestone, where initiation of carbonate sedimentation resulted in greatly increased fossil abundance and species diversity. This population explosion was halted by the rapid influx of prodeltaic Smithwick mud.

An examination of the faunas across the Mississippian-Pennsylvanian and Morrowan-Atokan boundaries determined that changes within specific groups were adaptations to different ecologic conditions.

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LATEST DEVONIAN CONCHOSTRACANS ALONG CORDILLERAN MIOGEOSYNCLINE, ALBERTA, MONTANA, UTAH, AND NEVADA

Lioestheriid conchostracans are numerous in thin