occur at or a short distance below the sediment-water interface; post-depositional effects result largely from solution alteration accompanying subaerial exposure and (or) increasing lithostatic pressure. The thinness of Recent carbonate accumulations precludes solution alteration due to lithostatic pressure; consequently the present discussion is confined to the remaining diagenetic processes.

Within the marine environment pene-depositional diagenesis affects both sedimentary structures and grain textures. The most obvious, and perhaps most important, structural change is the destruction of stratification in carbonate mud deposits by a vagile infauna. Indeed, this absence of stratification is so commonplace that the occasional occurrence of laminated carbonate mud deposits heralds unusual environmental conditions.

The most important change in grain texture results from the recrystallization of various grain types, both skeletal and non-skeletal, to cryptocrystalline carbonate. Recrystallization is effected by the replacement of aragonite by aragonite or by the replacement of high magnesium calcite by high magnesium calcite. The only obvious change accompanying this replacement is the obliteration of the pre-existing crystal fabric of the affected grain. In fact, there seems to be no decrease in solubility accompanying the replacement. These data coupled with the observed replacement of organic matter by cryptocrystalline carbonate suggest that decomposition of the contained organic matter in certain carbonate grain types may indirectly effect recrystallization to cryptocrystalline carbonate.

Subaerial exposure of unconsolidated carbonate deposits results in carbonate solution, replacement, and precipitation in that order. High magnesium calcite and aragonite are dissolved preferentially by meteoric water until the percolating solutions become saturated with respect to low magnesium calcite. At this point the more soluble high magnesium calcite and aragonite constituents are replaced by less soluble low magnesium calcite. Pore space precipitation of low magnesium calcite occurs when calcite saturated solutions lose water or carbon dioxide. Precipitation and (or) replacement transform the unconsolidated carbonate deposit into a limestone.

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DIAGENESIS IN JURASSIC-CRETACEOUS CLASTIC ROCKS IN SOUTHWESTERN ALBERTA AND THE INTERPRETATION OF SEDIMENTARY ENVIRONMENTS

Coarse-grained clastic rocks at the top of the Kootenay formation and the base of the Blairmore group are transitional between the Jurassic and Cretaceous systems in the westerly regions of the area.

The subsurface equivalents in the easterly regions of the area occur at the base of the Blairmore or Mannville groups and are known locally as the Basal quartz, Ellerslie, Sunburst, Cutbank and Dina sands, respectively; all are generally considered Cretaceous in age and overlay either the Paleozoic surface or members of the Jurassic Ellis group. Where the Cretaceous overlies the Paleozoic, a residual or detrital bed commonly occurs and is known as the Deville member of the Mannville group.

Petrographic examination of the transitional or basal Cretaceous clastic rocks indicates that there are three main authigenic mineral facies developed largely irrespective of rock type in "residual beds," shales, siltstones, sandstones, and (or) conglomerates.

The three diagnostic authigenic minerals are hematite, siderite, and pyrite; other significant authigenic minerals present are magnetite, iron-rich dolomite, calcite, kaolinite, silica chlorite, and glauconite.

The presence of these authigenic minerals, together with various physical features of the sedimentary rocks, assists in elucidating the intricate paleographic pattern of estuaries, rivers, lakes, and land surfaces.

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INTRUSIVE CARBONATE IN THE ICE RIVER COMPLEX, BRITISH COLUMBIA

The Ice River valley is situated in Yoho National Park in the westerly ranges of the southern Rocky Mountains, British Columbia. The region is the site of a nepheline syenite-ijolite-jacupirangite complex which is intruded into Cambro-Ordovician sediments and is dated (potassium-argon method with biotite) as Devonian in age.

Associated with the ijolite-jacupirangite differentiates is a mass of brown-weathering carbonate (dominantly iron carbonate with calcite and iron oxide) at least 2 miles long and 900 feet across. This mass was originally described as a "stoped block or roof pendant" but recent field observation indicates that the carbonate is intrusive. Two traverses are described.

The carbonate is succeeded by an intensely fractured and brecciated ferruginous zone, which merges into carbonatized aegirine-feldspar gneisses which in turn merge into and alternate with ijolite or the aegirine-feldspar pegmatite dykes that cut the ijolite. Augen of unaltered to partly altered pegmatite occur commonly in the gneiss. Pods and lenses of carbonate (similar in composition to that of the main mass and as much as 500 feet from it) are associated with the gneiss.

A 10-foot zenolith of aegirine-feldspar pegmatite occurs in the main mass of carbonate. Toward the periphery of the zenolith the pegmatite merges into gneiss, then gneiss with carbonate and finally carbonate.

The carbonate mass may be termed carbonatite.

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SILURIAN CONODONTS FROM CENTRAL KENTUCKY AND THEIR RELATION TO EUROPEAN ZONES*

The Brassfield limestone and the overlying Crab Orchard formation of Madison and Estill Counties, central Kentucky, represent a nearly continuous sequence of strata of Llandovery and early Wenlock age. The conodont sequence very closely parallels that of Europe, and zones I and II (Llandovery in age) and zone III (early Wenlock(?) in age), as recognized by Otto Walliser, are found here.

The Brassfield limestone and the Plum Creek clay, Oldham limestone, Lulbegrud clay, and Waco limestone members of the Crab Orchard contain conodonts of zone I for which *Icriodina* is the most important guide. Zone II conodonts are found in a thin zone transitional between the Waco and the Estill clay member, and the lower part of the Estill contains new genus A and *Bryantodus?* sp., which are characteristic of European zone III. Zone III conodonts have been considered to be early Wenlock in age, but exact correspondence with the graptolite zones is uncertain.

Northward in Ohio and west of the Cincinnati arch in Indiana and Kentucky, the Brassfield also contains a zone I fauna. As the Crab Orchard formation is traced

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