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SECONDARY AND POSTDEPOSITIONAL REDBEDS OF DUCHESNE RIVER FORMATION (EOCENE-OLIGOCENE?), UINTA BASIN, UTAH

Clastic sedimentary rocks of the Duchesne River Formation are largely red or reddish brown. Red pigment (hematite) is present as very fine-grained iron oxide, as staining on grain surfaces, and in cement. Apparently most of the pigment was derived originally from red sedimentary source rocks of the Uinta Mountains. Fine-grained red material and red-stained grains survived erosion and transportation from the source area and deposition over large areas of the Uinta basin, but much of the red pigment has been mobilized subsequently and removed from some of the deposits.

The types and colors of cements are related to the color of sandstones. Red, reddish-brown, and brown sandstones contain predominantly silica cement. Sandstones of orange or yellowish brown color are cemented with both silica and carbonate cements, and most of the carbonate cement is stained. Green, yellow, and gray sandstones contain mainly carbonate cement, most of which is not stained. Petrographic relations indicate that the earliest cement was silica. Later carbonate cementation in many sandstones mobilized some of the red pigment derived from the source area. Additional red pigment was derived from the partial oxidation of iron-bearing detrital grains. In some sandstones another stage of carbonate cementation again mobilized pigment, reducing or removing most of it. As a result, most of the rocks retain the reddish color inherited from red sedimentary source material, either in its original form or redistributed in cement. Postdepositional red pigment has further stained many of the rocks, but red pigment has been removed from some after deposition.

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TRANSPORT AND DEPOSITION OF SUSPENDED SEDIMENTS ON ESTUARINE TIDAL FLATS

The suspended sediments in water flushing on and off an estuarine tidal flat have been examined for relative changes in concentration as a function of wind speed, local wave conditions, salinity, temperature, and tidal currents. The shallow water was sampled by "plumbing" the upper 20 cm of the sediment surface with buried plastic pipes and pumping water samples from an orthogonally spaced matrix of intake valves positioned across the tidal flat to permit observation of "natural" sedimentary processes. The sediment interface has been modified over parts of the matrix by introducing roughness elements in the form of small closely spaced stakes and stabilizers, such as eel grass.

The data show a decrease in sediment concentration as the water floods over the tidal flat primarily as a function of dilution by more marine waters. As high slack tide is reached, sediment deposition occurs when wave heights are at a minimum. This deposition appears to continue even on the ebbing tide until water depths are extremely shallow, at which time a minor resuspension usually is noted. In contrast, if a slight "surface chop" develops, the falling water maintains the sediment in suspension and flushes it out on the ebbing tide.

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STRATIGRAPHIC TRAP POTENTIAL, PERMIAN PHOSPHORIA FORMATION OF CENTRAL WYOMING

There are good opportunities for finding stratigraphic traps in the Permian Phosphoria Formation of central Wyoming. Ideally, hydrocarbons may be trapped in an updip reentrant of porous carbonate rock extending into redbed-anhydrite facies or in a porous algal leaf and oocastic mound enclosed in impermeable carbonate rock.

Three facies are found as bands of dolomitized carbonate rocks on the Wyoming shelf between the marine limestones of the Phosphoria Formation and redbeds of the Goose Egg Formation. Westward, the shelf deposits grade into basinal phosphatic and cherty beds.

Two transgressive-regressive marine cycles are present in which limestone grades through dolomite into a redbed-anhydrite facies. Stratigraphic work on the carbonate members (Ervay, Franson, and Grandeur) has defined three mappable facies exhibiting porosity and permeability due to secondary dolomitization. These facies consist of (1) algal oolitic-pellet mounds, (2) algal pellet mounds, and (3) oocastic carbonate rocks.

Traps formed where the algal oolitic-pellet mounds of the Ervay Member grade into impermeable redbed-anhydrite and dense carbonate rocks have proved the most important economically. Cottonwood Creek field, containing 45 million bbl of reserves, is an excellent example. This facies relation can be traced from outcrops in the northwestern Big Horn Mountains, through the Big Horn basin, to wells drilled on the south flank of the Wind River basin, where drilling so far has failed to find a productive trap. The Laramide orogeny further complicated the conditions of entrapment.

The oocastic facies, best developed in the Ervay and Franson Members, is directly west of the algal oolitic-pelletal facies and trends as a band across central Wyoming. This facies has excellent porosity but poor permeability, and has produced mainly from fractured reservoir rock on structures such as Winkleman dome, Circle ridge, and Beaver Creek.

The algal-leaf facies, found as lenses in fine-grained nonporous carbonate rock, parallels the depositional trends of the other facies; it also is interbedded with the algal oolitic and oocastic facies of the Ervay and Franson Members. The algal-leaf facies has excellent capacity and, if oil-saturated, constitutes an excellent reservoir. This facies is the primary pay zone in No Water Creek field in the Big Horn basin. Identification of this facies is difficult in wells, so cores and thin sections are needed.

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ESPÍRITO SANTO—PATTERN OF BRAZILIAN MARGINAL BASINS

The Espírito Santo basin lies in the eastern continental margin of Brazil, as a member of an assemblage of Cretaceous/Tertiary basins correlatable by close stratigraphic and structural analogies. It is considered as the most complete model of this group of basins, and can serve as a pattern for a study of their origin and evolution.

The basin originated by Early Cretaceous tectonism that fractured the original cratonic mass into elongated grabens bounded by normal faults. Immature fluviolacustrine sediments were deposited in this tectonically active rift valley.