

in 10 cores, 3–10 m. thick, from the floor of the Puerto Rico trench form the basis for correlation of graded beds from several millimeters to 7 m. thick over distances of 200 miles. The largest unit is 2–7 m. thick and covers an area of approximately 4,000 square miles. Variations in bottom topography and sediment properties show that the layers were deposited by turbidity currents originating near the Puerto Rico-Virgin Islands shelf. These currents flowed through numerous canyons northwestward down a high-level abyssal plain and into the lower main trench plain where they spread laterally. In at least two places the turbidity currents were powerful enough to deposit 20–50 cm. of fine sand 60 miles away from and 30 feet higher than the place near which they entered the main trench floor. There is a general decrease in the grain-size of the coarsest detritus as well as the thickness of the basal sandy section in each graded bed down the high-level abyssal plain, into and along the trench floor. Thick beds of homogeneous clay, commonly burrowed in the uppermost 10–20 cm. of the beds, make up most of the graded beds in the deepest part of the lower trench floor. The basal sections of most graded units consist of layers of graded or laminated sand whose modal grain-size decreases upward within each graded bed. Cross-stratified fine sand occurs mainly at the base of the graded beds at the distal margins of the lower trench floor.

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ALASKA, NEW FRONTIER FOR OIL

Effective exploration in a frontier such as Alaska is not a result of happenstance or luck. A careful geologic and economic evaluation is a prerequisite in any new frontier. The decision of an aggressive management to explore actively the potential of the area and to commit qualified, experienced, geological and geophysical personnel well versed in the modern integrated techniques of exploration is essential to a successful exploration program.

The explorationist must be versatile and adaptable to operations in an area of excessive costs, where exploration is completely dependent on climatic conditions, and where transportation facilities are poor to non-existent. These conditions are a challenge to the most competent explorationist, even with all the modern exploration techniques at his command. The most modern techniques are needed in Alaska.

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PHYSICAL AND BIOLOGICAL EVIDENCE FOR MAJOR MID-CRETACEOUS STRATIGRAPHIC BREAK

A sequence of essentially worldwide, major diastrophic episodes, which had a considerable influence on biological events, occurred during or near mid-Cretaceous time. Mountain ranges were built and a concurrent 95–105-million-year-old episode of granitization is confirmed by accumulated radiogenic data. There is also evidence of widespread withdrawal of seas at or near the end of the Early Cretaceous. Late Early Cretaceous and initial Late Cretaceous times were characterized by diastrophic events, which resulted in the deposition of clastic facies and in the formation of unconformities of different magnitude, the magnitude depending on proximity of the areas

involved to mobile belts. Moreover, the Cenomanian or basal Late Cretaceous sediments widely overlap Early Cretaceous beds, or the rocks of older systems, in many geographic locations. A major biological "crisis" also occurred during an interval which may be considered to include Albian-Cenomanian time. The paleontologic record indicates that the resultant biological changes are as significant as those which distinguish most other systemic boundaries. Thus the physical and biological evidence generally suggests that, according to classical concepts, the more than 70-million-year-long Cretaceous time interval should be regarded as comprising two periods.

Significant biological changes (*i.e.*, those involving the higher taxonomic categories) tend to occur at or near system boundaries. Such worldwide organic "crises" probably are caused by major diastrophic episodes which alter environments faster than highly specialized groups in the lower evolutionary categories can adapt to them. The primitive representatives of highly evolved organisms then invade and occupy the vacated ecological niches. The importance of mass extinctions resulting in conspicuous paleontological breaks between periods or eras probably has been overemphasized, compared with the importance of newly introduced and rapidly expanding types of plants and animals.

The mid-Cretaceous paleontological break is expressed in several ways. For example, among the higher taxa which were present but greatly restricted during the Early Cretaceous, and which are marked by population explosion in the Late Cretaceous, are the planktonic Foraminifera, pelagic crinoids, and angiosperms. Groups which were present in some abundance in the Early Cretaceous, but which expanded in the Late Cretaceous, are teleostei fish, bryozoans, and pulmonate gastropods. Significant declines occurred, however, in the abundance of ammonites, stromatopores, and sponges. Both extinctions and introductions occurred, for example, among the heterodont pelecypods, scleractinian coelenterates, opisthobranch gastropods, ostracods, and red algae. Examples of introductions during the Late Cretaceous include the ceratopsian dinosaurs, and the octopi and baculitids among the cephalopods.

The accumulating physical and biological evidence for a major mid-Cretaceous stratigraphic break, detailed in this paper, is more noteworthy than has commonly been appreciated in recent years.

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ORDOVICIAN ALGAL STROMATOLITES IN UPPER MISSISSIPPI VALLEY

Algal stromatolites locally comprise as much as half of the Willow River Dolomite (Prairie du Chien Group) in the upper Mississippi Valley. They exhibit two basic forms: mounds which may range up to 4 feet in diameter and mats which may be extensive. Laminations in both range from one to several millimeters in thickness and exhibit a variety of textures and compositions in thin section.

The structure of the mounds is distinctive in that the laminations are irregular and non-parallel. Thin sections show them to consist of fine silt-size dolomite debris and recrystallized micrite, and significant quantities of coarse debris including biogenic sand-size material and large pieces of shell material. Small spherical pellets are rare. Most samples contain some