"dump"—deposits composed of an unsorted mixture of clay and limestone fragments. These are thought to be fluxoturbidites or slumps.

Intermittent subsidence of the Nubrigyn shelf caused periodic transgression of basinal sediments over the littoral accumulations with the result that a complex interfingering of both facies developed near the former shoreline. This seems to indicate that the eastern limit of the reefs was *not* determined merely by a sudden increase in gradient of the shelf.

The intimate association of cross-bedding and grading in the littoral units suggests that grading can form under relatively shallow-water conditions, and one should be circumspect in using it as a depth indicator. Application of the "Law of Minimum in Environmental Reconstruction" is more reliable in establishing conditions of sedimentation.

Inasmuch as the basinal carbonate detritus is composed of material derived from the littoral bioherms, the *syngenetic* chemical composition of the material is an unreliable parameter for the discrimination between shallow- and deep-water limestones. Only if characteristic *diagenetic* differentiation occurred may chemical composition be useful in this regard.

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SEDIMENTOLOGIC DESIGN OF DELTAIC SEQUENCES, DEVONIAN CATSKILL COMPLEX OF NEW YORK

Recent investigations of modern deltas permit a refined interpretation of sedimentation in the Catskill Deltaic Complex. This complex demonstrates two separate patterns related to delta growth and migration in a framework of basin-source area tectonism.

The Middle and Upper Devonian stratigraphy of New York can be broadly separated into lithologic phases that can be related to distinct environments of deltaic sedimentation which recur during the clastic deposition of this period. These include:

Phase	*Deltaic Environment*
"Cleveland" ("Marcellus")	Delta toe (bottomset)
"Chagrin" ("Portage")	Prodelta slope (foreset)
"Big Bend"	Distal delta platform (topset)
"Smethport" ("Chemung")	Proximal delta platform (topset)
"Catskill" and "Pocono"	Alluvial delta platform (topset)

The initial pattern of delta growth in Middle Devonian time was produced during a period of constant subsidence in which a progressive increase of Hamilton clastics eventually exceeded the rate of basin downwarping and established the growth and migration pattern of the deltaic environments across the state. During periods of negligible source contribution, regional subsidence of the sub-basin, together with local compaction, caused a landward shift in the marine environments on the delta platform. These transgressive migrations permitted rhythmic deposition of limestones and enabled the shallow seas and interdistributary bays on the proximal delta platform to encroach and rework the nearshore or alluvial delta platform deposits. Following Hamilton time, renewed compaction and strong subsidence in the eastern part of the sub-basin permitted formation of the Tully Limestone on the distal delta platform at the beginning of the Upper Devonian.

Continued basin subsidence and renewed clastic deposition during this period established the second major deltaic pattern. This pattern contrasts with that displayed by the Hamilton delta in that it formed under nearly continuous sedimentation throughout Late Devonian time with frequent changes in the stratigraphic succession of deltas during times when subsidence predominated over deposition.

Each period of dominant subsidence in the Upper Devonian delta was marked by the formation of a black shale (delta toe environment) over a previously deposited gray shale or siltstone (prodelta slope or distal delta platform deposit) and initiated a new sub-phase of delta deposition and a new delta. The amount of subsidence controlled the thickness and relative position of the black shale on the previous delta slope or distal delta platform deposit, and was also reflected nearshore by the emplacement of marine tongues into the eastern red-bed deposits on the alluvial delta platform.

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MODERN ROLE OF PALEONTOLOGY IN BASIN GEOLOGY

The coming of age of facies geology is sharply highlighting the significant role that paleontology plays in understanding basin geology. Growing recognition that exploration for stratigraphic traps requires close time-stratigraphic control is also bringing paleontology increasingly into exploration work. As key members of stratigraphic teams, paleontologists must not only pick "tops" but, equally, must be aware of environmental effects on organisms in order to evaluate time-significance of so-called "marker bugs." Moreover, fossil assemblages must be analyzed comprehensively to facilitate interpretation of depositional patterns.

Increased need for paleontology has stimulated research on little-known fossils to supplement forms conventionally used. Improvements in microscopes have materially aided these investigations; magnifications of 500 to 2,500× can now be used routinely, and X-ray techniques permit examination at 10,000× or more. As a result of notable advances in techniques, concepts, and knowledge, a number of fossil groups, including spores, pollen, "hystrichs," coccoliths, tintinnids, favreinids, nannoconids, conodonts, and chitinozoans, have been increasingly used for dating and correlating, and for interpreting depositional environments. These "new" forms fill gaps in existing control based largely on foraminifera. Effort is also being made to expand knowledge and application of macrofossils and of biofacies to understand more fully the interrelationships of fossils and facies. This expanding knowledge of faunas and floras is bringing paleontology into its proper role as a key to basin geology and as the indispensable tool in stratigraphic-trap exploration.

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HIGH-PRESSURE ASSEMBLAGE CHANGES NEAR MOHO DEPTHS

Laboratory studies have been carried out on synthetic mineral systems representative of basalt, on natural basalts and eclogites, and on peridotites reconstructed from natural minerals. The transformation from basalt through pyroxenite to eclogite was found to take place over a broad pressure range, approximately 4 to 8 kb, depending on bulk composition and temperature. The mineralogical changes involve complex solid solutions of phases varying in velocity of transmission of compressional waves from about 5.5 to 8.5 km./sec. The series of assemblage changes do not appear to be accompanied by marked changes in velocity of compressional waves. High-pressure changes in hydrous sediments which produce assemblages of uniquely dense hydrous minerals or metamorphic assemblages will probably have