sea, and marine deltas. Other classifications may be based on the depth of the water bodies into which they prograde, or on basin structure.

Many delta types have been described previously. Most of these have been related to the vicissitudes of sedimentary processes by which they form. Names were derived largely from the shapes of the delta shorelines. The configuration of the delta shores and many other depositional forms expressed by different sedimentary facies appear to be directly proportional to the relative relationship of the amount or rate of river sediment influx with the nature and energy of the coastal processes. The more common and better understood types, listed in order of decreasing sediment influx and increasing energy of coastal processes (waves, currents, and tides), are: birdfoot, lobate, cuspate, arcuate, and estuarine. The subdeltas of the Colorado River in Texas illustrate this relationship. During the first part of this century, the river, transporting approximately the same yearly load, built a birdfoot-lobate type delta in Matagorda Bay, a low-energy water body, and began to form a cuspate delta in the Gulf of Mexico, a comparatively high-energy water body. Many deltas are compounded; their subdeltas may be representative of two or more types of deltas, such as birdfoot, lobate, and arcuate. Less-known deltas, such as the Irrawaddy, Ganges, and Mekong, are probably mature estuarine types. Others, located very near major scarps, are referred to the "Gilbert type," which is similar to an alluvial fan.

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ORIGIN AND TECTONIC SIGNIFICANCE OF HIGH FLUID PRESSURES, CENTRAL VALLEY AND COAST RANGE, CALIFORNIA

Abnormally high fluid pressures exist within the Cretaceous sediments of the Sacramento Valley and probably exist within similar sediments of the San Joaquin Valley. The existing fluid potential distribution and chemistry of the pore waters strongly suggest that the abnormally high fluid potentials result from tectonic compaction stemming from continuous uplift of the California Coast Range, at least from late Tertiary into Recent time. This uplift has squeezed, as in a closing vice, the prism of Mesozoic sediments within and between the rising Coast Range and the relatively stable Sierran basement. The distribution of these high fluid potentials, laterally and with depth, suggests that the great majority of the Mesozoic sediments occupying the Coast Range has fluid pressures which approximate those exerted by the lithostatic load. Low-angle thrusting may be an important future structural event of this region as a result thereof. The production of such high fluid potentials by regional tectonic compaction may be a normal occurrence during the regional uplift of a geosynclinal system.

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BASINS OF PERMIAN SEDIMENTARY ROCKS IN SOUTHERN NEVADA

Basinal Permian sedimentary rocks of southern Nevada accumulated west and northwest of the Las Vegas hinge-line in a depocenter east of the Southern Nevada Highland; a substantially thinner contemporaneous shelf or platform facies formed to the east and southeast. Transgressive-regressive sedimentation in Wolfcampian through Early Guadalupian time accounted for variations in facies in the basin, shelf and bank margins, banks, lagoons, and deltas. Organic reefs, back reefs, and fore reefs dominated the sedimentary pattern at some times and places.

Sediments of Wolfcampian and Early to Medial Leonardian age consist of 4,500 feet of fusulinal, coralline, algal, bryalgal, and micritic limestones, and thick bioclastic limestones. This sequence comprises the Spring Mountains Formation, a basinal succession that accumulated in the miogeosyncline.

During Medial to Late Leonardian time, influx of terrigenous material from adjacent uplands accounted for substantial amounts of silty and sandy detritals in the carbonates which were forming on the shelf, hinge-line, and proximal parts of the basin; areally extensive red-colored sandy limestones, dolomitic siltstones and sandstones, and sandy dolomites thus formed in lagoonal, intertidal, bank, bank margin, and epineritic zones. This sequence is 3,000 feet thick, and comprises an unnamed formation; it interfingers across the hinge-line area and onto the platform with deltaic, neritic, and eolian sandstones and red beds of the Queantoweap, Hermit, and Coconino Formations.

Late Leonardian and Early to Medial Guadalupian time saw the filling of the basin; red -bed sedimentation of the Toroweap siltstone-shale-gypsum sequence was followed by carbonate sedimentation of the upper Toroweap and Kaibab. This succession is normally less than 1,000 feet thick in the Spring Mountains, but thickens to the east. The Kaibab Formation is in large measure reefal, and resembles the reef-tract of the West Texas Permian, but differs in that it is stretched out, has greater length, and is substantially thinner. The sponge *Actinocoelia* sp., cf. *A. maeandrina* Finks is characteristic.

The Triassic Moenkopi Formation rests unconformably upon the Kaibab; east of Las Vegas the formation is dominated by red beds, but in the Blue Diamond Mountain area it contains more than 700 feet of micritic, oolitic, pelletal, and algal limestones (=Virgin Limestone Member) near its base.

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DIAPIRS IN THE WESTERN PYRENEES AND THEIR FORELAND (SPAIN)

The diapirs of the western Pyrenees and their foreland have cores mainly of salt and evaporites of Triassic (Keuper) age. Their shapes and tectonic positions differ. They are surrounded or overlain mainly by Cretaceous and Tertiary sediments. Groups of diapirs demonstrate distinct alignments. The distribution of the diapirs is believed to be controlled by variation in the thickness of the Upper and Lower Cretaceous sediments. These sediments, which reach a maximum thickness of at least 8,000 m., exerted the necessary pressure to start the movement of the saliferous beds towards the flanks of the trough. Shifting of the trough axis in Upper Cretaceous time separated the salt accumulation into two distinct welts. Diapirism started in early Cretaceous time and must have reached its maximum activity during the late Cretaceous because most of the diapirs had reached the surface prior to late Tertiary time.

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Salt Tectonics of the Cuanza Basin, Angola, Portuguese West Africa

The Cretaceous Cuanza basin is located in northwestern Angola on the Atlantic coast of West Africa. This composite basin, 315 km. long, north-south, and 170 km. wide, east-west, consists of an early Cretaceous carbonate-reef barrier-evaporite sequence succeeded by a late Cretaceous clastic-carbonate sequence. The basement is composed of Precambrian crystalline rocks, Paleozoic metasediments, and post-Paleozoic crystalline rocks. Surface of the basin consists of Upper Cretaceous, Paleocene, Eocene, and Miocene strata, with much of the area covered by a thick, red, lateritic, Pleistocene sandy soil.

The middle Aptian sel massif was deposited to a maximum thickness of about 600 meters in response to an early off-shore tectonic welt or fault in the basement, possibly coupled with early Aptian barrier reef growth to create a semi-locked evaporite basin.

Salt tectonism of early to middle Cretaceous age involves (1) regional lateral salt movement of 1 to 15 kilometers, probably initiated by basement faulting; (2) subregional salt shifts in response to clastic loading from the east and barrier reef loading on the west; (3) local to subregional horizontal salt shift and vertical expansion to form anticlines in response to local reef buildup, as well as basement folding and wrenching, and local trough-like clastic loading; (4) final diapiric salt intrusion in waves with amplitudes of 2,000 meters, initiated in Oligocene time, and operative today; (5) Miocene *fosse* foundering (normal graben faulting) with filling by deltaic clastics; and (6) renewed right lateral wrench-faulting.

An early, low-amplitude Cretaceous regional salt movement, important to initial oil migration and accumulation, was followed by Oligocene diapirism which destroyed several large oil accumulations. Both took place in locales where the initial deposition of the massive salt was the greatest.

Oil exploration of both the pre-salt and post-salt Cretaceous strata in the Cuanza basin today depends upon detailed unravelling of the salt tectonic history.

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Diapiric and Associated Structures on the Sabana de Bogotá, Colombia

Several diapiric and related salt structures are located on the Sabana de Bogotá, an elevated rolling upland 2,500 to 3,000 meters above sea-level in the central part of the Cordillera Oriental. The structures, which are exposed in locally exploited salt mines, are composed of salt and interbedded euxinic shales of late Triassic or Jurassic age. The association of the salt deposits with Upper Cretaceous formations necessitates a penetration of more than 13,000 meters of predominantly clastic sediments.

The structures, like those in Rumania, are thought to be the result of horizontal stress. It is believed that they had their inception during very recent geologic time, possibly as late as Pliocene or even Pleistocene.

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Response Model Design for a Rhythmic Delta-Platform Domain, Devonian Catskill Complex of New York

Investigation of the physical stratigraphy of the Middle and Upper Devonian of southeastern New York has shown that this sequence of the "Catskill Deltaic Complex" might be separated naturally into a set of sedimentary domains. The North Point (lowermost Upper Devonian), one of these domains, is characterized by rhythmic patterns in sediment color, texture, and petrology; sedimentary structures; sediment transport directions; lithologic sequences; and lithosome geometries. The rhythmically recursive sequence of the North Point consists of (in ascending order): (A) polymictic conglomerate, (B) gray conglomeratic subgraywacke, (C) gray subgraywacke, (D) red subgraywacke, (E) red siltstone, (F) red mudrocks, (G) olive mudrocks, (H) gray mudrocks, and (I) sub-protoquartzite.

Various physical and statistical models of source, distribution, accumulation, and modification realms of the process-response system of the North Point were simulated on an electronic computer. The algorithm for a model of the process-response system of a rhythmic sequence, obtained by integration of relative aspects of these models, may be approximated by six sub-sets of equations; each sub-set is an attempt to characterize the status of process elements in the development of a response phase.

Translated into operational format these phases are: (1) early regressive phase (units A, B,); (2) middle regressive phase (B, C); (3) late regressive phase (D, E); (4) paralic stability phase (E, F); (5) early transgressive phase (G, H); and (6) late transgressive phase (H, I). The general aspect of this model is coarse-grained sediments (A, B, C) passing upward into finer sediments (E, F, G. H), forming a platform sequence which is rhythmically recursive. Homogenization at the strand zone and re-organization on the distal portion of the platform produces an inverted sequence (fines grading upward to coarser units). This model recognizes two components of subsidence, local and regional, as dominant process elements of the accumulation realm. The regional component is decomposed into the effects produced by compaction of the underlying sediment pile and those produced by subsidence of the Devonian subbasin. The local component results from surface and near-surface compaction of sediment deposited during phases 3, 4, and 5 (units E, F, G, H) of a rhythmic sequence. The algebraic sum of the interaction of these two process elements may have profound effects on the character and mode of the response, producing transgression in one part of the domain, while regression or stability characterizes another part.

Within the framework of this model the rhythmic character of the North Point is thought to be the response to the interaction of: (1) source contribution activity; (2) design of transport and dispersal systems; (3) influence of sub-basin and platform dynamics on the character and mode of the accumulation; (4) modification of the accumulation by processes such as compaction, erosion, diagenesis, and structural adjustments.

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A Sedimentary Model of the Continental Margin off Oregon

The continental margin west of Oregon consists of a generally convex-upward surface 35 to 60 nautical miles wide. The continental shelf, which forms the upper part of the surface, slopes seaward at less than one degree and ranges irregularly in width from 9 to 35 miles. Several elongate hills or banks rise above the general