thrown block may contain shale barriers to vertical fluid flow i· the threshold subsidence rate was exceeded.

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Distinction of Glacial and Interglacial Cycles in Feni and Gardar Drifts, North Atlantic

The Feni and Gardar drifts of the North Atlantic are thought to represent large accumulations of current-deposited material and should record changes through time in direction and intensity of overflows in the Norwegian Sea and Iceland-Faereo Ridge, respectively. Both drifts were drilled by DSDP Leg 94. Initial shipboard examination revealed no visual differences between these sediments and typical pelagic North Atlantic sediments. Fourier shape analysis on quartz silts, augmented by SEM, showed that each sample consists of a mixture of 3 grain populations. One grain type is covered with surface fractures unmodified by subsequent abrasion. Lack of such abrasion and the fact that the abundance of these grains varies independently of other shape types suggest a glacial-ice rafted origin. A second shape family is covered with irregular, platy silica overgrowths, typical of diagenesis in a poorly sorted, clay-rich environment and is likely the product of erosion of submarine lutites. A third grain type, plastered with fine-grained silica, is characterized by protuberences and indentations typical of primary continental source terranes. These last 2 grain types vary inversely with one another, implying that at glacial maxima, bottom currents deposited first-generation continental material, but at glacial minima, they eroded material from the sea bottom and redeposited it as drift sediments.

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Exploration Potential of Paleozoic Rocks of Morocco

Paleozoic rocks of Morocco have some similarities with the producing Paleozoic sequences in Algeria. In Morocco, there is a basic division between the cratonal sequences of the Tidouf basin and contiguous areas and the Paleozoic megabasin to the north and possibly to the west under the present continental shelf areas. The Paleozoic of the northern megabasin has the following positive exploration elements. (1) Both wrench and normal extensional tectonics have produced significant structures that may have been reactivated during 2 later orogenic events. (2) Reservoir quality, although poor in outcrop, can be significantly improved in the subsurface. Wells from the Bojad region of the Tadla basin encountered porosities up to 30% in Devonian clastic sequences. (3) No area can be condemned on the basis of present published geochemical evidence. Burial depths are sufficient for mature hydrocarbons, and rocks with organic material are present in sediments ranging in age from Cambrian to Carboniferous. Paleozoic oil shows have been encountered and may actually serve as the source of hydrocarbon in the Essouira basin in a downfaulted Triassic red-bed sequence. (4) Quality of seismic data is good, even where Paleozoic rocks are onlapped by Mesozoic and Cenozoic sediments.

Drilling for Paleozoic targets has been sparse, hence, few data are available to test both source and reservoir potential. Paleozoic rocks still need to be tested by industry and must be considered a frontier area.

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Eocene Tidal Deposits, Northern San Diego County, California

A transgressive-regressive sedimentation sequence is recorded in a band of middle Eocene strata a few miles wide. An abundance of primary sedimentary structures, along with interfingering relationships and paleontology, define 12 lithofacies representing depositional environments including nearshore shelf, outer and inner barrier island, tidal flats and channels, lagoon and lagoonal delta. Tide-influenced sedimentary features are well defined and include meandering and abandoned tidal channels, oppositely inclined superimposed cross-strata, interlaminated mud and sand along the basal and lateral accretion surfaces of migrating tidal channels, flaser and wavy bedding, and storm-deposited strata.

The first sedimentary half cycle was transgressive and documents the compression of dominantly tidal-flat and lagoonal environments against a steep, hilly coastline by the overall rising sea level of early and medial middle Eocene time. The inboard tidal-flat and lagoonal mudstones (Delmar and Friars Formations) and outboard tidal flat, channel and bar sandstones (Torrey Sandstone and Scripps Formation) interfinger in a landward-climbing, 3-dimensional sedimentary mass that parallels and meets the basement with a pronounced unconformity.

The second half cycle was regressive and occurred in the medial and late middle Eocene. It formed due to the influx of coarser, more angular sediment from the adjacent basement into the narrowed paralic zone. This westward (seaward) progradation of lagoonal delta and inner tidal-flat sandy sediments occurred despite the still-rising sea level.

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Multiple Parallel Microstylolites and Early Diagenetic Pressure Solution in Chalk

Pressure-solution phenomena, including both early-stage microstylolites and late-stage macrostylolites, are locally common in chalk. It is now well known that Upper Cretaceous chalks of northwestern Europe exhibit a wide range of stylolitic development in association with nodular fabrics and hardgrounds, generally in *Thalassinoides*-rich facies. It is not widely recognized, however, that virtually uncemented chalk commonly exhibits extensive microstylolitization of remarkably unique character. Multiple parallel horizontal microstylolites are well-developed in homogeneously white non-nodular pure-calcitic chalks of Denmark and elsewhere. They can be seen, however, only when samples are treated with contrast-enhancing methods, such as the application of light oil, to increase the visibility of small-scale primary and secondary structures in the sediment.

The microstylolites are nearly planar and some are slightly wavy, but almost none are zigzag or sharply spiked. They occur in fairly evenly spaced sets that render a finely laminated appearance to the rock upon close inspection. Typically, each dark lamina is only about 10-50 μm thick, and they are spaced approximately 100-500 μm apart. The lamination planes obviously are diagenetic and not primary, because they are imprinted on top of a totally bioturbated ichnofabric; the tiny dissolution seams cut straight through some burrows and are diverted around others. The relationship of these planar microstylolites to healed hairline microfractures and to various trace fossils, especially *Zoophycos*, suggests that the microstylolites are very early diagenetic in origin, postdating the burrows but predating or coinciding with the microfractures.

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Initial Process of Rifting

The generally accepted model of rifting (the McKenzie model) has certain geometric and spatial constraints that seem to preclude its operation in the earliest stage of rifting. It may be a more advanced stage of the rifting process, if it is correctly described.

An aborted rift system can be studied in the subsurface of the Permian basin. The Delaware, Val Verde, and Marfa basins formed a rift-rift-rift triple junction in mid-Pennsylvanian time, but it never progressed far enough to cause permanent extension. It apparently rose thermally, and then settled back down in place during the cooling cycle. The details of earliest rifting are preserved.

Several geometric factors need to be considered in the rift model. The first is that the earth is a sphere. On a sphere, uplift causes extension, and downwarping causes compression. The dominant fracture system in the brittle crust tends to be vertical, and on a sphere, vertical planes converge at the center.

The rheology of the basement and the overlying sedimentary rocks is different. The basement can be extended areally by dilating the fracture system during uplift and extension, but the sedimentary rocks will be stretched plastically. During the cooling cycles, vertical fractures can close, but there will be sediment to spare. The rocks will be buckled, crinkled, and overturned during the cooling cycle as they are lowered from