able to recognize and map much gentler dips in the eastern part of the structure. The result of this is to move the mapped subcrop of the reservoir sands much farther eastward, thus extending the eastern limit of the field considerably.

Based on this 3-D interpretation, three successful oil wells have been drilled. These are located in parts of the field that could not be accurately mapped on the basis of the 2-D seismic data, because of its poor quality. This has increased the estimate of the field's reserves such that Statoil were able to declare the field commercial in late 1980.

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Diatoms in Sediments as Shelf-Slope Indicators

Diatoms, a group of unicellular algae, are limited to the upper 50 to 100 m of the water column, owing to their light requirement. Benthic diatoms, consequently, are restricted to the continental shelf, and primarily the inner shelf, coasts, and estuaries. Planktonic diatoms occur on the shelf (neritic) and in deeper waters (pelagic); certain genera are restricted to one region while others occur in both. Salinity appears to exercise an important control on these distributions, so that a salinity front frequently produces a sharp boundary between populations. The shelf-slope break is usually associated with a sharp salinity gradient, where low-salinity shelf waters encounter a high-salinity oceanic current. The result is that benthic and low-salinity planktonic diatoms characterize shelf sediments, while higher-salinity planktonic diatoms and an absence of benthic diatoms characterize the slope and ocean basin sediments.

A transect across the southeastern Bering shelf and slope, with stations at 25-km intervals, shows a dramatic change in species composition of the sediment assemblages at the 200-m isobath. Shallower samples are dominated by benthic marine species and a group associated with the presence of winter sea ice, while below 200 m the assemblages are dominated by a species common in the North Pacific and the Bering basin. The ratio of this pelagic species to the benthic species shows a high correlation with depth (r = .85). Other work in the literature, while not directly addressed to this question, suggests that similar transitions can be found off Peru, west Africa, and in Miocene deposits of the U.S. East Coast.

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Stratigraphy and Intertonguing Between Coal-Bearing Upper Cretaceous Blackhawk Formation and Star Point Sandstone, Central and Southern Parts of Wasatch Plateau Coalfield, Central Utah

Intertonguing of the lowermost part of the coal-bearing Blackhawk Formation and the uppermost part of the marginal marine Star point Sandstone has caused a progressive steplike offset of the Blackhawk coal beds in the central and southern parts of the Wasatch Plateau. The tongues of the Star Point Sandstone are marginal shore deposits representing episodic transgressions of the Upper Cretaceous epeiric seaway. The development of these sandstone tongues affected the geometry, lateral continuity, and thickness of the associated Blackhawk coal beds.

Mapping and exploration of sandstone tongues in the lowermost part of the Blackhawk Formation will help identify the thicker coal beds. Knowledge of their distribution can assist the exploration geologist in mapping the coal-bed geometry. Economic coal beds associated with the marginal marine sandstone tongues trend parallel to the paleoshoreline and may be thicker landward of the sandstone tongues. These coal beds are the primary targets of current drilling programs directed toward exploration and development of Blackhawk coals in the study area.

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Pennsylvanian Aragonite from Southeastern Kansas—Environmental and Diagenetic Implications

Unaltered acicular aragonite cements have been found in Pennsylvanian limestones from southeastern Kansas as spherulitic arrays encased in pore-filling spar in intragranular voids. Identical cements are documented in Pleistocene carbonate rocks. Associated early cements in intergranular pores include aragonite botryoids now altered to irregular noemorphic calcite, and bladed calcites inferred to have been precipitated as magnesian calcite. In addition, phylloid algal blades of *Archaeolithophyllum,* now altered to irregular neomorphic calcite mosaics, contain varying concentrations of oriented inclusions of original aragonite. The unaltered aragonite cement was apparently protected from diagenetic alteration by the enclosing calcite spar and organic matter on the skeletal substrate. Individual aragonite relics in the algae probably survived because of enclosure in organic envelopes, a phenomenon observed in Pleistocene examples.

We see two explanations for the precipitation of these metastable carbonate cements in Pennsylvanian seas, both of which raise perplexing questions regarding ancient carbonate deposition. (1) Several authors have suggested a domination of calcite in Paleozoic non-skeletal carbonate deposition; our cements could represent some local departure from that general pattern, or (2) these carbonates document part of a long-term temporal trend in non-skeletal carbonate mineralogy from a domination of calcite in Paleozoic seas to aragonite and magnesian calcite domination in Quaternary seas. However, later calcite domination as evidencd by calcite cements and ooids in the Jurassic and Cretaceous, suggests that if the latter explanation is accepted the postulated trend was neither simple nor unidirectional.

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