terozoic) is a high-energy, terrigenous shelf deposit. Chert is a minor but widespread component of the Wishart and occurs in three main forms: (1) interstitial cements consisting of a mosaic of fine quartz crystals; (2) thin layers and lenses of very fine-grained chert lutite with finely disseminated impurities; and (3) peloids to flat pebbles of fine-grained chert lutite. The clasts of chert lutite are clearly intraformational; they are closely associated with and texturally identical to the in-situ chert layers. Chert cements are also found in intraclasts. All of the chert types are restricted to a few thin intervals which form good marker beds, and none show any signs of replacement. These observations indicate the cherts are primary siliceous deposits. Based on their textures and the sedimentary structures in which they are found, the cements must have formed as rigid precipitates; the lutites as mud-like, slack-water accumulations; and the peloids to pebbles as rip-up clasts. The silica was probably hydrothermal in origin because the stratigraphic distribution of the chert is independent of facies and there is no evidence of basin restriction or evaporative conditions. The Fleming Formation, which lies directly beneath the Wishart, may have been the source of the postulated silica-rich hydrothermal waters. The Fleming consists mostly of brecciated and silicified rocks and an abundance of crystalline, void-filling quartz. The Wishart cherts offer proof that siliceous sediments and cements can accumulate rapidly in terrigenous marine environments. They provide an example of one mechanism for making the similar chert peloids which are abundant in early Proterozoic iron-formations.

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Comparative Anatomy of Cratonic Unconformities

Cratonic unconformities represent (1) coincidence of surfaces of sedimentary accumulation with depositional base level, or elevation of depositional surfaces above erosional base level and (2) renewed deposition covering surfaces of nondeposition or erosion. The chronostratigraphic record of unconformities is best displayed on Wheeler diagrams on which geographic distances are plotted against chronostratigraphic intervals or absolute time. Assessment of the lithostratigraphic significance of unconformities requires reconstruction of the pre-unconformity stratigraphy and estimation of the thickness (or volume) of the strata eroded and of their lithologic character.

Interregional unconformities fall into two major types: (1) those marked by subequal values of nondeposition and erosion, commonly involving 5 to 30 Ma and the stripping of as much as 1 km over very broad areas; the sub-Kaskaskia unconformity (Early Devonian to Early Carboniferous) is an example; and (2) unconformities characterized by short-term nondeposition (< 5 Ma) and extremes of erosional vacuity; e.g., the sub-Absaroka surface (Late Carboniferous).

Conventional wisdom would suggest that episodes of cratonic nondeposition and erosion should equate with accelerated detrital deposition at continental margins and with perturbations of marine chemistry. Evidence is accumulating to indicate a degree of concomitance between cratonic events and oceanic geochemistry but no complementary pattern is clear in terms of slope/rise depositional rates. Indeed, certain major unconformities identified on continental slopes appear to have equivalents on cratons. These and related questions demand increased communication between land-based and seagoing stratigraphic and tectonic specialists.

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Geochemical Correlation of Sedimentary Rocks

A geochemical method has been developed that can provide effective regional or local correlations in sedimentary sections. This method depends on careful selection and processing of well samples followed by quantitative spectrochemical analysis for both major and trace elements. It has been used successfully in numerous field studies involving sand/shale and carbonate sections of nearly every geologic age from Cambrian to Holocene.

The method relies primarily on compositional variables in the clay component of sediments because these have the best long-range continuity in a basin. Ratios of related elements such as V/Cr and Cu/Ni are useful because they minimize the effects of lateral changes in lithology or environment. Ratios that reflect primarily basinal changes in water composition are particularly useful, although environmental or provenance influences can be used as well. Abrupt changes in element ratios commonly record the locations of unconformities that are useful in correlation, whether or not they represent a major hiatus.

This geochmical method has proved to be especially well suited to defining correlation points within late Paleozoic strata of Devonian to Leonardian age in west Texas. Spectrochemical analyses of shale drill cuttings from wells covering much of the Delaware and Juno–Val Verde basins defined regional geochemical units. They extend throughout the Delaware basin, into the Juno–Val Verde basin to the southeast, and onto the Carlsbad shelf to the northwest. Individual correlation points were identified over distances of up to 300 mi (483 km). Data from later seismic surveys support the stratigraphic concepts developed from the geochemical correlations.

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Sedimentology of Tuscaloosa Sandstones from False River and Judge Digby Fields, Pointe Coupee and West Baton Rouge Parishes, Louisiana

Significant gas reserves at depths ranging from 19,800 to 20,400 ft (6,035 to 6,218 m) have been established in Tuscaloosa sandstones at False River and Judge Digby fields (Chevron U.S.A. Inc. discoveries) located within the deep Tuscaloosa gas trend. The sandstones are within an Upper Cretaceous clastic wedge that thickens in front of, and to the south of, a Lower Cretaceous carbonate shelf.

Reservoirs at Judge Digby field are part of a thick clastic section comprised of gray shales and medium to coarse-grained sandstones, in part conglomeratic. Paleontology, textural grading, bed contacts, and sequential arrangement of sedimentary structures suggest fluvial and deltaic environments. Reservoirs at False River field are stratigraphically younger and are interpreted as part of a barrier bar sequence. These sandstones are fine to medium-grained and occur at the top of upward-coarsening gradational sequences. In both fields, the reservoirs commonly have maximum porosities above 25% and permeabilities in excess of 100 md. Although these reservoirs are presently geopressured, petrographic evidence and density of the associated shales indicate that the sandstones are not undercompacted. A study of the sandstone framework suggests that burial diagenesis dramatically reduced the primary pore system, eliminating significant permeability. Leaching of the grain framework created an important contribution to effective secondary porosity and reestablished lost permeability. The secondary pores are easily identified by relic rims of authigenic, grain-coating chlorite cement which persisted after selective grain removal by dissolution. Commercial