Reef rims were flanked by steeply dipping marginal-slope deposits that descended to depths up to several hundred meters. These deposits include debris flows, huge allochthonous reef blocks, scheck breccias, and reefal tongues and bioherms built primarily by sponges and algae.

Platform margins are classified as advancing, retreating, upright backstepping, and roll-over types. Advancing margins are typical of the Famennian reef complexes; the others occur principally in the Frasnian and Givetian, where they are often associated with platform-margin unconformities resulting from submarine erosion or margin collapse.

The reefs and slowly deposited parts of the marginal-slope facies were subject to pervasive early submarine cementation by fibrous high-magnesium calcite (now radiaxial spar). The strongly cemented reef limestones formed rigid wave-resistant rims to the platforms. Fracturing of these limestones, probably largely associated with earthquake shaking, gave rise to extensive networks of neptunian dikes and sills, and to the collapse of some sections of the margins. Such collapses in turn initiated debris flows and the deposition of allochthonous reef blocks on the adjoining marginal slopes.

The reef complexes are being explored extensively for lead-zinc deposits in outcrop and oil in the subsurface. A significant oil discovery was made in a Famennian platform margin (the Blina field) in 1981.

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Neptunian Dikes and Sills in Devonian Reef Complexes of Canning Basin, Western Australia

Neptunian dikes and sills are conspicuous features of early-cemented limestones in Devonian reef complexes of the Canning basin. They are sedimentary fillings of fissures formed by fracturing of the limestones soon after deposition, and are most abundant in the reef subfacies, but also occur in some back-reef and marginal-slope deposits.

The dikes and sills were filled with contemporary sediment (including oolite, peloid grainstone, biomicrite, and calcareous sandstone), encrusting organisms (*Renalcis* and stromatolites), and early radiaxial calcite cement. Some of the sediment is dolomitized or mineralized. Some dikes contain concentrically coated balls of radiaxial calcite up to 0.3 m (1 ft) across. Sediment in the dikes and sills was cemented rapidly, and repeated refracturing and infilling occurred during brief intervals. The largest dikes are up to 6 km (3.5 mi) long, 20 m (65 ft) wide, and originally extended more than 80 m (260 ft) below the surface. However, most are less than 100 m (330 ft) long and 5 cm (2 in.) wide. Neptunian sills are up to 0.8 m (2.5 ft) thick. The principal strike directions of major dikes approximately parallel the original reef fronts of underlying basement ridges. Lateral extension through the development of fissures amounted to as much as 6.5%, and averaged about 3% in measured reef sections. The fissures allowed circulation of large volumes of seawater to considerable depth within the reef complexes, and must have played a significant role in early diagenesis.

Fissuring probably resulted from earthquake shaking, differential compaction of underlying sediments, and slippage along bedding planes, especially in the steeply dipping marginal-slope deposits.

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Uncertain Future of Natural Gas Production in U.S. Lower 48 States

The Office of Technology Assessment (OTA), an analytic support agency of the United States Congress, has examined the process of forecasting future supplies of conventional, domestically produced natural gas in the U.S. lower 48 states to the year 2000. Its investigation focused particularly on the technical sources of uncertainty, including the incomplete geologic understanding of the remaining resources and the difficulties involved in properly interpreting and extrapolating past trends in natural gas discovery. The OTA examined the arguments developed by supply "optimists" and "pessimists" regarding both the size of the recoverable resource base and the speed with which new resources can be discovered and produced. As part of the investigation, resource-base estimates, ranging from those of H. King Hubbert and Richard Nehring to those of the U.S. Geological Survey and the Potential Gas Committee, were reviewed and compared.

The OTA concluded that the credible ranges of estimates for lower-48 resources and future production potential are very wide—400 to 900 tcf for the remaining recoverable resources of conventional gas at near-current prices and technology, and 9-19 tcf/yr for the year 2000 production under the same price and technology conditions.

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Timing of Saddle Dolomite in Tuscaloosa Formation, Mississippi

Saddle (baroque) dolomites are characterized by curved crystal faces and sweeping extinction patterns. They are associated with hydrocarbons, sulfates, and base-metal mineralization, and occur as void-filling cements or replacement minerals. Most described saddle dolomites are from carbonates and are interpreted as a diagenetic product that formed under high temperatures during deep burial.

Saddle dolomites are present as nodular, poikilotopic cements in sandstones from a core of the Tuscaloosa Formation in southern Mississippi. The Tuscaloosa, a major oil producer in the area, consists of a series of fluvial/deltaic sands and shales. The sandstone is a fine to medium-grained lithic arenite whose grains are coated with isopachous layers of authigenic chlorite, which petrographic evidence indicates was precipitated at relatively shallow depths. The interrelationships of the chlorite rims and the saddle dolomite cements indicate that some of the dolomites were precipitated before the chlorite rims and that others formed shortly after the chlorite. This suggests that the saddle dolomites grew concurrently with the chlorite during a relatively early, shallow diagenetic event and not during deep burial.

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Sedimentation of an Upper Pennsylvanian Phylloid Algal Mound Complex, Hueco Mountains, El Paso County, Texas

A Late Pennsylvanian mixed carbonate-clastic sequence is exposed in the Hueco Mountains of west Texas. The sequence begins with deposition of a progradational fan-delta system and marine and tidal-flat carbonates. This unit is dominated by calclithite and shale with minor interbeds of shallow-water calcareous mudstone and wackestone. Shallow-water spiculites are commonly associated with these limestones. A thick carbonate unit composed predominantly of limestone overlies the clastics; it was deposited during or just after a major local transgression. The carbonate sediments were deposited on the submerged delta platform in the following sequence: (1) colonization of the shallow platform by rugose corals and early (or syndepositional) cementation of the zone; (2) establishment of shallow-water dasycladacean algal flats; (3) increasing domination of the environment by phylloid algae in response to increasing water depth; (4) accretion of phylloid algal sediments and formation of mounds (directly overlying the dasycladacean algal flats are a number of small mounds formed by accelerated sedimentation within phylloids algal "meadows." The high productivity of the phylloid algae and their sediment-trapping ability allowed sedimentation to keep up with sea level rise. Large bioherms resulted, but because of the difference in accretion rates of various mounds, some grew while others were buried by more successful neighbors); and (5) reestablishment of shallow-water dasycladacean algal flats as a result of shoaling of mound crests and subsequent increased sedimentation in deeper, quieter water on the lee side of the mound complex.

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Nature of Fort Chadbourne Fault System and its Relation to Petroleum Potential of Wilberns Formation (Upper Cambrian) of West-Central Texas

The Wilberns Formation (Upper Cambrian) in the subsurface of west-central Texas is composed predominantly of sandstone units. Subsurface mapping of the Wilberns shows the sandstones to be persistent through-