Dip-trending sandstones show southeast-northwest trends with a large degree of vertical persistence. Major fluvial axes occur approximately every 40 mi along strike and may also be a reflection of basement structure.

CARNEY, CINDY, and RICHARD SMOSNA, West Virginia Univ., Morgantown, WV

Sedimentology of Loyalhanna Member ("Big Injun Sand") of Mississippian Greenbrier Limestone

The Loyalhanna is a sparsely fossiliferous, distinctively cross-bedded, sandy calcarenite and calcareous sandstone. It occurs along the outcrop belt and in the subsurface of Pennsylvania and West Virginia where it is less than 100 ft (30 m) thick. In West Virginia, the Loyalhanna has produced more than 200 million bbl of oil, accounting for much of the state's total oil production.

In thin section, Loyalhanna lithologies consist of grainstones with varying proportions of quartz, ooids, fossils, and peloids. Quartz was introduced from a northern source area, and ooids were transported by currents from shoals to the south. Skeletal grains include crinoids, bryozoans, ostracodes, and foraminifera. Peloids are mainly micritized ooids and fossils.

The environmental setting was a high-energy, sublittoral sand flat that extended along the northern coastline of the Mississippian embayment into the central Appalachians. The sediment was deposited as low-relief sand waves with an internal structure of avalanche-style cross-bedding. As the sand built up, the cross-bedded units were capped by horizontal beds. Cross-bedding indicates that sand waves migrated to the northeast under the influence of longshore currents. Minor fluctuations in sea level and sedimentation rate produced a widespread blanket sand.

In the producing areas of West Virginia, porosity development has resulted from early dolomitization. Intercrystalline and moldic porosity is good, typically reaching 15-25%. However, this combination of porosities, which is closely related to original sedimentary textures, has led to only fair permeability and a fair recovery efficiency for the unit.

CARPENTER, GEORGE B., U.S. Dept. Interior, Minerals Management Service, Reston, VA

PRESTO—A Program for Estimating Oil and Gas Resources

PRESTO (Probabilistic Resource ESTimates, OCS) is a computer program developed to provide resource estimates for offshore areas considered for leasing by the federal government. The program uses Monte Carlo simulation techniques to "drill" prospects that are geologically defined by the user, and then calculates resources using a volumetric formula. Resource estimates are given as probability distributions that reflect uncertainties in the physical representation of the prospects, rather than as single-point values or qualitative assessments. The program also incorporates a number of levels of geologic risk.

Four types of hydrocarbon resources are assessed for each reservoir: oil, associated and nonassociated gas, solution gas, and condensate. All are reported as distributions that can be converted and aggregated to a distribution for equivalent barrels of oil.

Unlike subjective resource estimation methodologies, the program provides reproducible results and can be used in frontier areas as well as mature producing basins. In addition, it provides an analysis of hydrocarbon potential at the zone and prospect levels, which can then be aggregated for basin and planning area estimates.

CECIL, C. BLAINE, and KENNETH J. ENGLUND, U.S. Geol. Survey, Reston, VA

Origin of Quartzarenites in Upper Mississippian and Lower Pennsylvanian of Appalachian Basin

Quartzarenites in the Upper Mississippian and Lower Pennsylvanian of the central Appalachian basin have been attributed to fluvial or beach-barrier depositional environments. As part of the USGS basin analysis program, we reevaluated existing data and concluded that quartzarenites were deposited primarily in a high-energy marine environment dominated by tidal currents. These deposits are linear, trend toward the southwest, and are roughly parallel to the axis of the Appalachian geosyncline. Herringbone structures and bioturbation are abundant in the upper part of the deposits and near their margins. The lower and central parts of the deposits commonly display unidirectional festoon cross-beds having amplitudes up to 1 m. Basal contacts tend to be sharp and erosional in the high-energy central parts but are gradational near the margins. The spatial relation of these sandstone deposits to marine facies, their widespread distribution, and their lateral continuity are more compatible with a marine-dominated rather than fluvial origin. Their textural and mineralogical maturity also indicates winnowing typical of a high-energy marine system. Sedimentary structures typical of beach deposits or fluvial systems are rare.

These sandstones were apparently deposited in an epicontinental seaway, which, at times, may have been open at both ends. Because of the configuration of the basin, tidal and geostrophic energies were dominant over wave energy; tidal basin deposits predominated, and wave-energy beach-barrier deposits were rarely preserved. Ebb flow carried the winnowed fines into the southwestern part of the Appalachian basin or into the Ouachita geosyncline. Similar hydrodynamics and sediment transport occur today on the Sunda Shelf, the Bay of Fundy, and in the Bering Sea.

CLOSE, JAY C., and WAYNE D. MARTIN, Miami Univ., Oxford, OH

Mississippian-Pennsylvanian Unconformity near Somerset, South-Central Kentucky

The Mississippian-Pennsylvanian systemic boundary near Somerset, south-central Kentucky, is unconformable. Contact relationships in eastern Kentucky are controversial because of unclear genetic associations displayed by Chesterian(?)-Morrowan Lee Sandstone lobes, which have been interpreted as being of either barrier-beach or fluvial-deltaic origin. The barrier shoreline model stipulates that Meramecian, Chesterian, and Morrowan rocks represent carbonate sediment barriers and carbonate mud islands, offshore clays, quartzarenite barriers, and lagoonal-tidal flat sediments that were penecontemporaneously deposited during northwesterly progradational episodes. The tabular erosion model stipulates that Meramecian, Chesterian, and Morrowan(?) predominantly marine sediments were deposited and lithified as tabular units before and penecontemporaneous with deposition of Chesterian(?)-Morrowan fluvial-deltaic sediments.

Field study of exposures near Somerset indicates that the tabular erosion model satisfactorily explains contact relationships. Tidal flat, tidal channel, and lagoonal lithofacies without barrier sandstones are unconformably overlain by southwesterly progradational fluvial-dominated deltaic lithofacies. Elongate, fining-upward sandstone bodies typically above coal seams, which are oriented parallel with the southwesterly paleoslope, display lag concentrates of carbonized plant debris, epsilon cross-stratification (or apparently lack of stratification), and low-energy ichnofacies, and are enclosed in deltaic lithofacies.

CORNET, BRUCE, Independent, Houston, TX

Structural Styles and Tectonic Implications of Richmond-Taylorsville Rift System, Eastern Virginia

Recent drilling and seismic surveys in the Richmond basin have revealed unexpected results. Alternating episodes of extension and compression have created overprints of structural styles, and generated syndepositional unconformities as sediments were uplifted and rotated. Eroded Triassic sediments from structural highs were redeposited in adjacent synclinal or fault-controlled lows.

In addition, lithologic correlation has revealed the existence of large deltaic complexes prograding across the basins, followed by Mississippi-size meander-belt channel deposits in the subsurface. The early lacustrine-deltaic deposits (Vinita beds, etc) appear to have been deposited in a basin much larger than the apparent outcrop limits of the Richmond or Taylorsville basins. As much as 3,000 ft of these deposits accumulated prior to a compressional event that folded them into enormous anticlines and synclines, as Paleozoic thrust sheets were reactivated and sub-Triassic buried hills grew in height, raising the overlying Triassic sediments by as much as 2,000 ft over a distance of less than 2 mi.