

gradient, fluvial-paludal setting. Organic-rich black shales accumulated in lakes (oxbows?) and overbank deposits. An influx of cross-bedded fluvial sands, possibly triggered by renewed border faulting on the west, characterizes the final stage of basin fill. These sediments represent fan-delta systems that prograded northeastward across the lacustrine-paludal lowlands.

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Sedimentary Silica in Newark Basins of Eastern United States

One way in which low-temperature, near-surface excess silica was introduced into the Newark sedimentary system was by extensive chemical weathering in the source area, when tectonic quiescence allowed it. Further concentration of silica within the basins was accomplished in the following ways: (1) eogenesis, by fluctuating pH, with values greater than 9.5 causing silica to be extracted from silicates within playa lakes or within soil zones; (2) eogenesis, by stands of silica-concentrating plants such as *Equisetites*, within ponds, playas, or fringes of larger lakes; and (3) mesogenesis, by pressure solution among quartz grains and possibly other silicates, possibly associated with high pH, causing release of silica.

In all situations, the silica, either from solution or gel, probably initially formed as opal-A and proceeded to the opal-CT stage, and then to the stable quartz phases of chalcedony, microquartz, and the megaquartz that we find today. The stable quartz phases are associated with primary silica precipitation in playa lakes, replacement of carbonate in playa lakes, possible replacement of carbonate oolite in playa lakes, vadoids in silcrete paleosols, possible replacement of vadoids in caliche paleosols, replacement of wood cell walls, syntaxial overgrowths on quartz grains, and nonaffiliated pore filling.

The various processes of quartz formation, coupled with associated microfacies and paleoenvironments of deposition, may be used for finer delineation of fluctuating paleoclimates during Newark deposition.

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Petrology, Diagenesis, and Reservoir Potential of Upper Triassic Dan River Group Sandstones, North Carolina and Virginia

The Dan River Group, a thick sequence of conglomerate, sandstone, and mud rock, is preserved in the northeast-trending Dan River-Danville basin of central North Carolina and Virginia. Thick lenses of organic-rich lacustrine strata (Cow Branch Formation) are surrounded by potential reservoir sandstones of fluvial, deltaic, and fan-delta origin.

Dan River sandstones consist of fine to very coarse-grained, moderately to poorly sorted, immature plagioclase arkose and lithic arkose. Source terrane was nearby and consisted of gneiss and schist with small amounts of granite and metavolcanic rock.

Diagenesis has significantly reduced initial porosity and permeability. Measured porosity of 125 representative sandstones averages 5.7% (ranging: 0.3-18.1%), and geometric mean permeability is 0.14 md (ranging: <0.01-14.1 md). Variation in porosity and permeability results mainly from allogenic clay matrix, packing density, and cementation.

Porosity-reducing diagenetic processes include mechanical compaction (ductile grain deformation and pressure solution) and cementation. Calcite, siderite, quartz, albite, hematite, and authigenic clay (illite and chlorite) cements are widespread and are the main porosity occluding agents.

Rock-Eval pyrolysis T-max values, vitrinite reflectance data, and black coloration of spores and pollen from associated mud rocks indicate an advanced stage of burial diagenesis. These data and the low porosity and permeability values indicate that Dan River Group sandstones have poor reservoir potential.

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Environmental Controls on Accumulation of Thick, Low-Sulfur Coal (Peat) in Lower Pennsylvanian Pocahontas Formation, Virginia and West Virginia

Thick, low-sulfur coal beds are intercalated with a sequence of stacked delta-lobe deposits in the Pocahontas Formation of southwestern Virginia and southern West Virginia. Coal thickness and coal quality are

related to the distribution and thickness of the underlying deltaic sandstone beds.

During the Early Pennsylvanian, the northwestward progradation of deltaic lobes on the southeastern shoreline of a regressive Carboniferous seaway was interrupted by periodic stillstands. Sand at the delta front was reworked and segregated by coastal currents and waves to form a system of fringing barrier bars. Vegetation flourished in swamps behind these protective barriers, mostly on platforms created by the abandoned delta lobes. The growth and accumulation of plants on the inactive, sand-dominated delta lobes formed domed deposits of ombrogenous peat that were low in ash and sulfur. In contrast, interlobe areas accumulated high-ash mucks consisting of organically rich clay and silt. In modern analogous peat-forming environments in tropical southeastern Asia, accumulations of low-ash and low-sulfur domed peat are dependent on high rainfall, which contributed little if any mineral matter to the peat. The ombrogenous origin of the Pocahontas coal beds is similarly indicated by the distribution of thick, low-sulfur and low-ash coal over the thick central area of the sandstone lobes, whereas thin, impure, and discontinuous coal beds occur in the shale-dominated interlobe areas. This analysis demonstrates that knowledge of the geometry, thickness, and orientation of delta lobes can be useful in the exploration for thick, high-quality coal.

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Paleopalynological Insights on Dating of Newark Supergroup Rocks and Their Correlation with European Sections

Once thought to be prevailingly barren of palynomorphs, sediments from all of the known Newark basins have now yielded correlatable palynofloras. However, for various reasons, only poorly preserved floras (Danville-Dan River basin) or scarce productive zones (Fundy basin) have been found in some of the basins. Sedimentation in the Newark rift zone apparently began in late Ladinian to late Carnian time along most of the front. New analytical data from a buried basin in southern Georgia now extend this observation about 400 km (two stages) farther south. From south Georgia to the Richmond basin in Virginia, the youngest sediments are Carnian or Carnian/Norian. In the Culpeper basin, Virginia, new information indicates sedimentation beginning during the Carnian, in keeping with the other southern basins. However, in the Culpeper basin and all of the northern basins, sedimentation persisted much longer. Latest Triassic to late Liassic floras are found in all of them. Palynofloras as young as Toarcian have been studied in the Hartford-Deerfield basin of Connecticut-Massachusetts. Ultimately, these dates depend on correlation with palynofloras from classic marine fossil zones in south-central Europe, work which is in flux and progressing rapidly in European laboratories, boding probable changes in the Newark basin palynostratigraphic framework.

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Basement Controls on Lineament-Block Tectonics of Coastal Plain Province in Virginia

Linear features in the coastal plain of Virginia were interpreted from Landsat images and analyzed to define the geologic framework of the underlying basement. The lineaments were digitized, and length-weighted frequency distributions were calculated at 5° intervals on a 10-km² grid. Statistically significant peaks (>95%) and troughs (<5%) within each cell were identified. These significant trends identify 13 major lineament zones, which in turn were compared with structural domains recognized from a combined interpretation of geophysical, subsurface form-surfaces, and basement well-log data. Correlation between lineament frequency, aeromagnetic, and gravity data was tested on a regionwide and smaller domain basis.

The major lineament zones divide the western part of the area into north-south and northeast-southwest bound rhomboidal blocks. The eastern part is characterized by north-south and northwest-southeast bound rectangular blocks, quite different from the regional Appalachian grain. The lineament zones are documented to parallel basement domain boundaries because subsurface structure, lithologic and stratigraphic changes, and steep geophysical gradients occur along their extent. Some