mentary, low-grade metamorphic, and volcaniclastic detritus that was shed northwestward in an alluvial and/or fluvial system from an uplift produced during the Taconian orogeny.

Intermediate to felsic volcaniclastic rock fragments comprise approximately 3% of the framework grains. They consist of devitrified shards, partially kaolinized plagioclase laths, and biotite in a cryptocrystalline groundmass. Siltstone, mudstone, chert, radiolarian chert, and recycled grains are indicative of a sedimentary source. Chlorite-quartz, epidote-quartz, and muscovite-chlorite phyllite clasts indicate a low-grade metamorphic provenance. Quartz varieties plotted on a diagram are consistent with a low-grade metamorphic provenance. Metaquartzite, slate, and cataclastic lithic fragments indicate tectonic deformation in the source area.

Provenance criteria support a plate tectonic model involving an eastward-dipping subduction zone in the central Appalachians during the Middle to Late Ordovician. The climax of the Taconian orogeny has been described as a collision of an island arc with the North American continental margin. Petrologic data from the Bald Eagle and Juniata Formations suggest that this collision was accompanied by uplift of accretionary prism and continental margin or forearc basin sediments prior to the Richmondian. The presence of sedimentary, low-grade metamorphic, cataclastic, and volcaniclastic lithic fragments, and the notable absence of higher grade metamorphic and plutonic grain-types, indicate unroofing at relatively shallow levels of the orogene.

LEONARD, KATHERINE E., Univ. Vermont, Burlington, VT

Foreland Fold and Thrust Belt Deformation Chronology, Trenton Group Limestones and Overlying Shales, Northwestern Vermont

Outcrops of Trenton and younger limestones and shales between Plattsburgh, New York, and Malletts Bay, Vermont, show eastwardly increasing progressive deformation fabric in the foreland fold and thrust belt of northwestern Vermont.

The deformation sequence within the calcareous Stony Point and Iberville shales is: (1) bed-parallel slip, marked by grooved calcite-covered surfaces; (2) folding accompanied by pressure solution cleavage; (3) overturned folds with frequent faulting along overturned limbs; fault surfaces, marked by calcite slickensides, at high angles to calcite-filled extension fractures; cleavage frequency increases and is rotated into a lower angle with bedding; (4) late-stage features 2-3 km (1.2-1.9 mi) from the Champlain thrust include high-angle faults and pervasive shearing of early fabric. Less than 1 km (0.6 mi) from the Champlain thrust (Malletts Bay area), fold hinges are sheared out and closely spaced cleavage is folded.

The Cumberland Head Argillite (transitional between the Trenton Glens Falls Limestones and the younger Stony Point Shale) contains medium to thick micrite beams in a calcareous shale matrix. Deformation in the beams occurs by brittle failure and minor thrusting up ramps in the beams. The surrounding shale deforms by bed-plane slip and pressure-solution cleavage.

Glens Falls Limestone in the study area consists of medium to thick beds of fossiliferous micrite. A widely spaced pressure solution cleavage is intensified and rotated in ramp-and-fold zones. The cleavage is crosscut by late high-angle faults.

A progressive increase in deformation fabric from west to east across the Ordovician limestones and shales of the northern Champlain Valley allows the fold and thrust chronology to be determined for the different lithologies.

LEWIS, J. SCOTT, Mobil Exploration and Producing Services, Inc., Dallas, TX

Stratigraphy and Depositional Environments of Catskill Deltaic Sequence, Northern West Virginia

The Catskill deltaic sequence (Upper Devonian–Lower Mississippian) is inadequately mapped and subdivided in the subsurface of northern West Virginia (central Appalachian basin). Stratigraphic interpretations are often hindered by the liberal use of drillers' names for noncontemporaneous gas-bearing sandstones.

Base-line analysis of 275 gamma-ray logs permits the resolution of lithostratigraphic units in this sequence. Five regionally mappable units are recognized, within which the position, geometry, trend, and distribution of reservoir sandstones are interpreted. Three units are within the Upper Devonian Chemung Formation, and two are considered equivalents of the Hampshire (Upper Devonian) and Pocono (Lower Mississippian) Formations. Stratigraphic cross sections graphically display relative thickness variations of reservoir sandstones and document the intertonguing facies of the Catskill deltaic sequence that are attributable to "cyclic" marine transgression and regression, and/or to changing sedimentation or subsidence rates in the basin.

Five lithofacies (A-E) are identified by the study of equivalent strata on outcrop. Facies A consists of gray shales and thin-bedded siltstones, interpreted as interbedded hemipelagic shales and turbidites. Facies B is comprised of thick-bedded and amalgamated siltstones and sandstones containing hummocky cross-stratification, representing composite storm deposits of the shelf and slope. Facies C consists of thick-bedded to massive clean sandstones and interbedded red and gray shales, interpreted as barrier-beach and back-barrier deposits. Facies D is dominated by red beds (silty mudstones and siltstones) with some interbedded sandstones, representing vertical accretion and channel deposits of an alluvial plain. Facies E consists of gray sandstones containing marine fossils and greenish-gray shales (Pocono Formation), interpreted as marine and marginal marine deposits developed during net transgression of the subaerial "Catskill delta."

Contrary to some previous studies, this study indicates these strata are best interpreted within the context of deltaic sedimentation. More specifically, stratigraphic and sedimentologic evidence suggests deposition in a wave- and storm-dominated deltaic complex.

LIBBY-FRENCH, JAN, U.S. Geol. Survey, Denver, CO

Upper Cretaceous and Cenozoic Sedimentary Sequence, Baltimore Canyon Trough, United States Atlantic Margin

The extent and character of Upper Cretaceous and Cenozoic rock units in the Baltimore Canyon Trough are revealed by geologic data from 29 exploratory wells. These data, released to the public in 1982, have been used previously in the description of regional rock-stratigraphic units in the trough. Now, a more detailed interpretation and correlation of electric logs and mud logs from these wells and a petrographic examination of thin sections have revealed the composition and lateral distribution of these units. Four detailed stratigraphic cross sections were constructed to show rock-unit correlations among 19 exploratory wells based on lithology and electric logs. Thin-section photomicrographs of drill cuttings and conventional cores document the mineralogic composition of these units.

The Upper Cretaceous section is composed principally of gray to brown, calcareous mudstone and is 1,555-3,220 ft (475-980 m) thick. One major shaly, glauconitic quartzarenite within the mudstone is present at most of the well sites. An Eocene carbonate unit, 100-1,100 ft (30-335 m) thick, overlies the mudstone. This unit grades from fossiliferous wackestones to calcareous shale. Oligocene to Miocene calcareous mudstone overlies the Eocene carbonate. White to gray, calcareous clay, shale, and siltstone are common constituents, and limestone, dolomite, and sand are minor constituents. Miocene to Pliocene unconsolidated fine to very coarse-grained sand overlies the mudstone. An uppermost unit of predominantly gray clay is present in the eastern part of the basin.

LIBBY-FRENCH, JAN, U.S. Geol. Survey, Denver, CO

Upper Jurassic and Lower Cretaceous Sedimentary Sequence, Baltimore Canyon Trough, United States Atlantic Margin

The extent and character of Upper Jurassic and Lower Cretaceous rock units in the Baltimore Canyon Trough are revealed by geologic data from 29 exploratory wells. These data, released to the public in 1982, have been used previously to define regional rock-stratigraphic units. In this study, four detailed stratigraphic cross sections were constructed to show rock-unit correlations based on lithology and electric logs. Thin-section photomicrographs document the mineralogic composition of these units. The stratigraphic terminology used herein is informally adopted from the nomenclature used on the Scotian Shelf.

Most of the Upper Jurassic section consists primarily of "Mic Mac" gray shale and siltstone with minor amounts of very fine to medium-grained quartzarenite, red-brown shale, and lignite. This interval also