They are in order, from northeast to southwest, the Fulton, Mouth of Seneca, and Augusta depositional systems. The relatively brief time interval of Minnehaha deposition by three separate depositional systems strongly suggests a sea-level drop in the Appalachian basin as a causal factor. The overlapping of submarine fan deposits from three depositional systems could enhance the hydrocarbon reservoir potential of the Minnehaha member. The Minnehaha member may be the shoreward correlative of the gas productive Sycamore siltstone of north-central West Virginia.

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Exploration: Key to America's Energy and Mineral Policies

The current goals and objectives of the Department of the Interior have been formulated to support and assist the Reagan administration's overall program and to return balance to the management of the public lands.

The federal government's proper role is to insure that private enterprise has access to energy and mineral resources within the context of its responsibilities for protection of the environment. The Department of the Interior is formulating policies designed to: encourage exploration as a guarantee of adequate, accurate geologic data of the mineral resources of the nation; reduce excessive and unnecessary regulations, thereby encouraging increased responsibility and competition on the part of private enterprise; implement wise multiple use of the public lands; reduce this nation's reliance on foreign sources of strategic minerals.

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Predictive Geological Mapping of Mining Conditions in Appalachian Coal Fields

Recent case histories in the Appalachian region incorporating active mining operations with detailed geological hazards mapping prior to mining have confirmed the importance of certain geological techniques and applications. Applying these techniques to active operations in Pennsylvania, Maryland, West Virginia, southwest Virginia, and eastern Kentucky demonstrates that certain of these geological factors can be related to mining on a regional basis. Some of the applications involve the identification of weak, fractured rock zones underground through use of high-altitude satellite imagery. The simple procedure of intensity or the magnitude rating of the linear features appears to be the real key in identifying hazardous roof areas prior to mining. Composite and overlay mapping of significant, anticipated geological factors is the most important application to identifying safe, high-production mining areas as opposed to hazardous, low production mining. Again, it is necessary to apply rating factors to each potential problem and to design a presentation technique that can achieve simplicity and workability from a multitude of complex geological factors.

Although local or on-site physical and geological conditions largely dictate mining conditions, understanding and identification of regional geology and paleodepositional environments greatly enhance the more important ability to predict hazards prior to mining. Additional benefits derived from applying geologic hazards mapping are (1) identification of significant hydrologic factors which must be considered in meeting state and federal requirements for ground-water monitoring, and (2) establishment of confidence levels for coal reserve classifications.

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Lithofacies of Subsurface "Packer Shell" (Brassfield Limestone-Rochester Shale) Interval in Eastern Ohio

The interval between the subsurface "Clinton" (Medina) sandstone in Ohio and the base of the Niagaran dolomite was mapped using geophysical logs and samples over an area of 37 counties in eastern Ohio. The density of control approximated 1 well per 5 mi^2 (13 km^2) over the 23,640 mi^2 (61,228 km^2) studied. Between the "Clinton" sandstone and the Niagaran dolomite, the limestones and dolomites of the "Packer Shell," "Casing Shell," and other carbonate rock units are interbedded with shales called the Rochester in Ohio. On logs, the differentiation between the limestone or dolomite and shale was based on greater than 50% gamma-ray deflection and the density log readings.

Lithologically, the "Packer Shell" is a gray to dark gray, dense crystalline bioclastic limestone and/or dolomite. The Brassfield Limestone on the outcrop includes glauconitic oolitic grainstones, glauconitic molluscan crinoidal packstones with chert, and glauconitic bioturbated mudstones to wackestones. The "Casing Shell" and other carbonate units in the Rochester are gray to dark gray and contain bioclasts. At the base of the "Packer Shell" is a distinctive red, hematitic shale which is present over 65% of the area.

Regional cross sections show the three to four main carbonate units interbedded with shale in eastern Ohio. These carbonate rocks maintain their approximate individual thicknesses as the interbedded shales thin west and southwestward until the "Casing Shell" merges with the "Packer Shell" to form the unbroken stratigraphic unit recognizable on the outcrop as the Brassfield Limestone in southwestern Ohio.

The shale interbeds are thickest in east-central and southeast Ohio where they average 110 and 170 ft (33 and 52 m) thick, respectively, indicating the possible source direction for the shale influx from the east and southeast.

Correlations indicate a transgression of the Brassfield-"Packer Shell"-"Casing Shell" units so that the carbonate rocks appear to climb eastward in the section with respect to a datum at the base of the "Packer Shell." In Ohio, on the outcrop, the Brassfield Limestone is dated as Silurian, Albion, although part of its lithostratigraphic equivalents—the "Casing Shell" and other Rochester Shale carbonate beds—are Niagaran.

The "Packer Shell" is a useful unit on which to base a structural map, if care is taken at the critical locations of facies changes. The "Packer Shell" is porous locally and is reported to produce gas from some wells in Ohio. The production appears to be related to the occurrence of small structural noses, possibly associated with fracturing above the "Clinton" sandstone reservoir.

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Effect of Discontinuities on a Room-and-Pillar Coal Mine Plan

The highest safe extraction ratio is the goal of coal mine planning. This may be affected substantially by the interaction of regional in-situ stress with coal-measure discontinuities such as faults, interbedded weak and strong strata, rolls, and sandstone channels. The effect of discontinuities is to interrupt or concentrate the mechanics of stress transfer and cave development during coal extraction, often resulting in a costly change in mining plan. Heavy ground conditions were encountered when extracting pillars during retreat in a room-and-pillar panel at a mine in central Utah, resulting in the decision to bypass about 25% of the coal within the panel.

Conditions which led to abandonment of the central portion of the panel were observed in data obtained from instruments installed for subsidence monitoring purposes on the surface, in the overburden, and underground. Instrumentation included strain measurement at the surface and both absolute and relative stress measurement at mine level. Data from tape extensometer readings, overcoring, and borehole pressure cells support a rotated fault-block hypothesis. In the mine area, frequent nearly vertical faults are present and can be located on satellite imagery. Two major faults are present and can be located on satellite imagery. Two major faults striking obliquely across the panel appear to have isolated a block of rock that rotated toward the gob at the north end of the panel as mining progressed, creating adverse loading conditions at mine level. The combination of satellite imagery, ground mapping during mining, and selected instrumentation may hold some potential for improved mine development in areas experiencing similar ground control problems due to the interception of geologic discontinuities.

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Tuscarora Sandstone (Silurian), Central Pennsylvania: Preliminary Quantitative Grain Shape Analyses of Cotter's (1982) Facies—Fluvial, Estuarine, Beach, and Marine(?) Shelf

Cotter (1982) demonstrated a logical sequence of depositional facies in the Tuscarora Sandstone, both vertically and laterally, from braided river fluvial deposits to the southeast, progressing through local "estuarine" and regional beach facies, to marine(?) shelf sand waves to the northwest. Several examples of each facies were sampled and subjected to quantitative grain-shape analysis. Although the outcropping Tuscarora has suffered intense diagenesis (pressure solution and quartz overgrowth), these effects are less obvious in thin sections cut parallel to bedding, where the gross two-dimensional grain shapes are relatively unmodified. Preliminary results comparing the Fourier Analysis (FA) methods of Ehrlich and colleagues (1970 to 1982) and Boon (1982) with the Rotated Radials-Factor Score (RR-FS) method of Parks (1981) are presented.

In the RR-FS method, the two-dimensional silhouettes of several hundred grains from each sample are electronically digitized and the raw data (100+ points per grain) are stored on floppy disks. From this point on, the analysis is performed under operator control by a series of FORTRAN programs implemented on a microcomputer. For each grain, the digitized outline is rotated about a calculated "center of gravity" to a least squares best fit with an empirical "reference shape"; and 36 equal-angle spaced radials are calculated. The data set for each sample (400+ grains) is reduced by R-mode Factor Analysis. Computed factor scores are used to classify the gross grain shapes into a limited number of distinguishable categories. Associations of shape types are compared to specific facies.

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Computer-Generation of a Devonian Shale Production and Potential Atlas for West Virginia

In the final phase of an Eastern Gas Shales Project (EGSP) contract with the U.S. Department of Energy, the West Virginia Geological and Economic Survey compiled an atlas of Devonian shale production and potential. By using both the survey's existing oil and gas data base and a more detailed, computerized data file created during the project, 22 maps were computer-generated for areas of western and southern West Virginia. These multicolored maps show all wells with known gas production from Devonian shales, all wells drilled to the shales that were dry holes, and all other unsuccessful shale wells that produce either from shallower Mississippian or Pennsylvanian units, or from deeper units below the shales (e.g., the Middle and Lower Devonian Huntersville and Oriskany Formations or the Upper Silurian Newburg sand).

In addition, a gray screen pattern on the maps indicates wells from which shows of gas were reported from the shales, and isopotential lines contour initial open flows from the shale gas wells. Thus, the atlas can be used to locate further shale wells in areas with known high productivity, as well as areas with potential for dual completions in one or more zones in addition to the shale. This atlas is one of many products that can be generated from high quality, detailed computer files.

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Paleoecology and Structure of a Late Silurian-Early Devonian(?) Patch Reef, Northwestern New Jersey

Quantitative and qualitative field examination of an Upper Silurian-Lower Devonian(?) "patch reef" bioherm in northwestern New Jersey resulted in the identification of at least five distinct lithologic and biotic facies: (1) a basinal lithofacies of medium to thick-bedded pelagic limestones containing few discernable fossils; (2) a peloidal grainstone facies, which is dominated by pelmatozoan fragments and peloidal carbonate grains; (3) a reef-talus facies characterized by a high biotic diversity; (4) a coral-boundstone facies dominated by massive tabulate corals; and (5) a stromatoporoid reef facies composed of large juxtaposed hemispherical stromatoporoids (65%), tabulate corals (30%), and rugose corals (5%).

Facies evidence demonstrates that the stromatoporoids and corals organically cemented this buildup into a rigid, wave-resistant structure that controlled its surrounding environment. According to Heckel's 1974 classification of reefs, this type of boundstone lithofacies would indicate an "organic framework reef."

The patch reef grew in a moderate-to-high energy regime and was developed on a carbonate platform which was situated on the margin of an epeiric sea. Reef growth was progradational and upward in response to a relative rise in sea level. Investigation of the patch reef facies revealed compound growth and accretion zones, in addition to demonstrating distributional patterns similar to those of modern patch reef analogs.

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Geologic Interpretation of Gravity and Magnetic Anomalies in Western New York and Lake Ontario

The Bouguer gravity anomaly map of western New York State and Lake Ontario indicates a series of gravity anomalies extending north-northeast across New York State and Lake Ontario. These gravity anomalies are due to the extension of the Precambrian rocks of the Bancroft-Madoc area of southern Ontario, Canada. Mafic plutons intruded into a mafic-metavolcanic sequence produce gravity positives, while granitic batholiths cause negative gravity anomalies. The intermediate gravity values are due to a marble-rich metasedimentary group. In most places the gravity positives are located between a magnetic high and low, suggesting the center of the magnetized source is fairly identical with the center of mass surplus.

The Clarendon-Linden fault is the most prominent structural feature in the Paleozoic rocks of western New York. Some control of this Paleozoic structure by the Precambrian basement is suggested