Other applications of microphotometry are: (1) calculation of the effective organic carbon content from the amount of fluorescent oil-prone kerogen and its fluorescence characteristics, a technique providing a better estimation of the volume of hydrocarbons that may have been generated by a source rock, and (2)"fingerprinting" of various types of kerogen, bitumen, drilling contaminants, and caved rock material, and identification of kerogen and bitumen in the mineral matrix of rock samples.

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Organic Indicators of Thermal Maturity, a Review

Organic geochemical parameters include: (1) Rock-Eval data, including T_{max}, S_1, S_2, S_3, and plots of some indices, (2) extract and chromatographic data (i. e., several ratios and the shape of chromatograms), and (3) fluorescence colorimetry and 3-dimensional spectra of extracts.

Organic petrologic indicators are indispensable for assessing thermal maturity. Microscopic analysis provides a quality control of geochemical data and enables identification of kerogen mixtures and contaminants from caved rocks and drilling mud additives. Organic petrologic indicators are: (1) ranges of mean vitrinite reflectance (R_o) for the "oil window" (0.60-1.35%), for the onset of wet gas formation (0.90%), and for the occurrence of dry gas only (2.0%), (2) fluorescence observations and spectral measurements, such as double-peaked spectra for mature kerogen and a shift in its fluorescence at increasing maturity, extinguished when the oil floor is reached (parameters include spectral peaks, spectral ratio, F.C.I., and photochemical effect, and crude oil is microscopically identified by spectral data and kerogen liquefaction under UV-exposure), and (3) visual estimation of the TAI of spore colors in transmitted light.

Conclusions are routinely drawn only from those parameters that show reliable data from both geochemical and petrologic determinations. Lopatin calculations from maturity profiles in wells are used to determine both the thermal history of a basin and mature source rocks.

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Foraminiferal Paleoenvironments and Biostratigraphy of Eocene Nanjemoy Formation, Virginia and Maryland

Foraminiferal and sedimentologic data from 80 spot samples collected in Virginia and Maryland were used to investigate the paleoenvironments and biostratigraphy of the lower Eocene Nanjemoy Formation. The predominant lithology of the Nanjemoy Formation is variably glauconitic fossiliferous muddy sands, with foraminiferal abundance decreasing up section. The sediments of the lower Potapaco member are typically fine to medium-grained muddy sands containing abundant lignite and sparse glauconite. The upper Woodstock member is characterized by fine to coarse-grained sands with a decreased mud content and increased glauconite abundance.

Distributions of individual foraminiferal taxa, planktonic-benthic ratios, foraminiferal suborder ratios, and species diversity patterns were used to determine variations in the Nanjemoy paleoenvironment throughout the lower Eocene Salisbury embayment. Planktonic foraminifera place the samples sections within established biostratigraphic schemes. Supplemental evidence of paleoenvironmental variations was obtained from grain size and composition data of all samples collected.

Cluster and canonical variate analyses were used to investigate further similarities and differences in the foraminiferal content between samples, locations, and members.

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Carbonate-Anhydrite Facies Determination by Quantitative Seismic Stratigraphy in Paradox Basin

Recent advances in seismic acquisition and processing techniques have greatly improved the usable bandwidth and signal-to-noise ratio of seismic data collected in the Paradox basin. Historically, the irregular terrain coupled with shallow velocity gradients limited the usable stratigraphic thin-bed resolution to near 60 Hz. Analysis of filtered sonic logs of the upper Ismay formation suggests that even with 100-Hz seismic data, carbonate porosity will not be represented seismically as an individual low-velocity trough on wavelet-processed data. Conventional seismic stratigraphy attempted to interpret these zones based on a qualitative study of synthetic seismograms.

The purpose of this paper is to evaluate an inverse method of calibrating seismic data by the integration of quantitative analysis of filtered sonic logs from bore-hole data with seismically derived sonic logs (Seislogs). The Seislog display has a horizontal scale in transit time and a vertical scale in depth. In this format it is possible to compare quantitative variations observed on the Seislogs with changes derived in model studies that relate filtered velocity on sonics to lithologic variation.

This paper discusses the application of this method in an upper Ismay field (Patterson Canyon), located in San Juan County, Utah. The field is currently producing oil from a porous carbonate algal-mound facies, which in filtered-sonic logs is typified by a decrease in both velocity and thickness when compared to the anhydrite facies. When the carbonate facies becomes tight, there is a transit-time decrease and an apparent increase in thickness. The anhydrite facies sonically has the lowest transit time and also is the thickest facies. It is important to note that a limestone with intercalated clastics may have exactly the same sonic response as the porous carbonate facies. The distribution of these facies in map view provides the key to differentiation of the two types of low velocity response in this trend. The porous carbonate facies is typically narrow and lenticular in contrast to the more sheetlike clastic carbonate facies.

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Hydrocarbon Production Potential of Mississippian Rocks in Cowley County, Kansas

Petroleum geologists are continually searching for new and better techniques of exploring for hydrocarbons. This study uses one such technique, discriminant function analysis, to predict trends of potential hydrocarbon production of Mississippian rocks in Cowley County, Kansas, Discriminant function analysis is a method of studying differences between two or more groups, using a set of discriminating variables. The two groups used for this study were (1) wells producing from the Mississippian and (2) wells not producing from the Mississippian.

Variables used were thought to be potentially significant to hydrocarbon accumulation in Mississippian rocks within the study area. These variables included structural tops and thicknesses, surface elevation, presence of tripolitic Mississippian chert, trend surface residuals, and four types of satellite lineation data. A total of 564 wells, each with 21 distinct parameters, was used in performing the two-phased analysis.

The two phases, consisting of a principal components analysis and the discriminant function analysis, were accomplished through use of computer programs and resulted in a single discriminant score value for each well. These values were used to generate a discriminant score surface map. Statistical analysis of the map resulted in 80.6% of the producing wells being correctly classified within producing areas. Alternately, 75.9% of the nonproducing wells were correctly classified. These favorable results suggest that this technique could be successful in establishing trends of production and potential production while simultaneously delineating areas of nonproduction.

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Tectonics and Dispersal of Miocene Rift-Fill Sediments, Southern New Mexico

Late Tertiary rifting in southern New Mexico took place in two stages: early to late Miocene and Pliocene-Pleistocene. Sedimentary rocks of the earlier stage are represented by the Hayner Ranch and Rincon Valley Formations, which were examined at San Diego Mountain, Dona Ana County, New Mexico. The Hayner Ranch Formation consists of 950 m of red fanglomerate derived from volcanic rocks. The Rincon Valley Formation consists of 325 m of limestone- and volcanic-cobble fanglomerate overlain by 25 m of red playa shale.

Measurements of maximum clast size at 50 m intervals ($n = 1,820$) and cobble imbrications at 50 m intervals ($n = 650$) indicate that the initial stage of rifting took place in two distinct phases and involved two separate source areas. The lower 600 m of the Hayner Ranch Formation were derived from volcanic rocks north of San Diego Mountain. Following a period of tectonic quiescence, represented by a 150 m thick fining-upward sequence, uplift occurred to the south of the study area, depositing the upper 350 m of the Hayner Ranch Formation and the lower 300 m of the Rincon Valley Formation. Limestone cobbles recovered from the Rincon Valley Formation are identical to lithologies in the Permian Hueco formation exposed in the Robledo and Dona Ana Mountains, 15 km south and southeast of San Diego Mountain, respectively.