from the maximum sediment load. The unconformity is unusual because it formed during a sea level rise (Taghanic onlap) which apparently affected all of North America. Flexural modeling predicts upwarp in central and western New York, western Pennsylvania, and eastern Ohio, and offers a plausible explanation for this unconformity.

The tectonic component of the subsidence curve, coupled with the geologic constraints, offers an opportunity to model the location of the Acadian Mountains to the east, which have since been eroded to their roots.

ROLLINS, THOMAS W., Continental Resources Co., Houston, TX

Future Energy Invulnerability

The forces of supply and demand in a free-market economy will result in increased supplies and lower consumer prices for energy resources in the United States. This paper examines this thesis in light of post-World War II trends in oil and gas resources. A review of these trends shows the relationships between market price and the supply of oil and gas, and verifies the importance of profits in the economic cycle of energy development.

One of the main points considered in this analysis is the effect of government regulation on the oil and gas markets. Government price ceilings and incentive prices have encouraged both excess consumption and inefficient production of oil and gas resources. As the nation's oil and gas markets come out from under the labyrinth of government controls, one of the keys to success for those in the oil and gas business will be the ability to use innovative marketing techniques in nonregulated markets.

The abundance of domestic reserves of oil and gas remaining to be discovered in the United States is ample to carry our nation into the next century without excessive dependence on unstable foreign sources of supply. Free-market forces and successful "team effort" exploration will not only allow the efficient development of those reserves, but will also bring forth supplies of substitutes for oil and gas, such as coal, nuclear, thermal, wind, and synthetic fuels, as prices and costs warrant.

ROSE, PETER R., Telegraph Exploration, Telegraph, TX, and J. R. EVERETT and I. S. MERIN*, Earth Satellite Corp., Washington, D.C.

Potential Basin-Centered Gas Accumulation—Raton Basin, Colorado

The Raton basin of south-central Colorado is a small basin of Laramide age that is analogous structurally to other Rocky Mountain basins that contain commercial basin-centered gas deposits in tight Cretaceous sandstones. Moreover, the mineralogy, depositional setting, and stratigraphic succession of Cretaceous rocks in the Raton basin generally are comparable to gas-productive basins in the Rocky Mountain region where similar thick, gas-prone, thermally mature source rocks are present. Oil, condensate, and abundant natural gas shows occur in Cretaceous and Tertiary beds throughout the Raton basin, but substantial petroleum production has not yet been established. Certain geologic features may have influenced gas accumulation, such as ground-water movement, fracturing, igneous intrusions, CO_2 generation, mildly elevated heat flow, sandstone mineralogy, and diagenesis. Drilling density is low, particularly in the deeper parts of the basin. Prospects of developing a basin-centered gas deposit here appear favorable.

ROYBAL, GRETCHEN H., and FRANK CAMPBELL, New Mexico Bur. Mines and Mineral Resources, Socorro, NM

Coal Geology of Salt Lake Coal Field, West-Central New Mexico

Recent detailed mapping and drilling has defined the Cretaceous coal-bearing sequence in the little-known Salt Lake field in the west-central part of New Mexico. Structurally, the Salt Lake field is simple with only a few northeast-trending faults and small-scale flexures related to the Tertiary volcanism throughout the field. The regional dip in this field is 3°-5° to the southeast. The majority of the coals in the Salt Lake field are in the Moreno Hill Formation with a few thin coals in the underlying Dakota Sandstone.

The 3 members of the Moreno Hill Formation contain 4 coal zones. The upper member has one and the lower Moreno Hill contains 3 coal zones. These 4 coal zones vary in thickness, quality, and location within the Salt Lake field. The 4 zones contain resources in excess of 400 million tons of bituminous coal. Research has shown that the variations which occur within a zone and between zones are indicative of changing depositional environments. The better quality coals within the Moreno Hill Formation are directly related to particular sedimentation sequences.

ROYDEN, LEIGH, Harvard Univ., Cambridge, MA

Thin-Skinned Extension of Vienna Basin

The Vienna basin is an area of middle Miocene (Karpatian-Badenian, 17.5-13.0 Ma) extension and contains up to 6 km (20,000 ft) of Miocene to Quaternary sedimentary rocks. This basin is partly superimposed on the north-vergent flysch belt of the outer West Carpathians and partly on more internal Carpathian nappes. The obvious rhombohedral shape of the Vienna basin, the left-stepping pattern of en echelon faults within the basin, and the southward migration of basin extension through time strongly suggest that this basin is a pull-apart feature formed during middle Miocene sinistral strike-slip faulting along a northeast-trending fault (or fault system). This interpretation is supported by geologic mapping in the Carpathians indicating several tens of kilometers of Tertiary sinistral displacement along a fault that trends northeast from the Vienna basin.

This fault appears to have functioned mainly as a middle Miocene tear fault within the Carpathian nappes, separating the areas of active north-vergent thrusting east of the Vienna basin from areas west of the basin where thrusting had already been completed. Reflection seismic lines show that the autochthonous European plate basement continues beneath the allochthonous Carpathian nappes and beneath the Vienna basin, and that the European plate is not significantly disrupted by the normal faults that bound the basin. Thus both the normal faults that bound the basin and the associated strike-slip faults appear to merge into a gently southeast-dipping detachment horizon at depth. In this way extension of the Vienna basin appears to have been restricted mainly to shallow crustal levels above that detachment horizon (i.e., restricted mainly to the allochthonous nappes of the Carpathians). Detailed analyses of subsidence and heat-flow data indicate that little or no heating of the lithosphere occurred during extension of the Vienna basin, and support the interpretation that extension was confined to shallow crustal levels.

ROYLANCE, MICHAEL H., Marathon Oil Co., Casper, WY

Significance of Botryoidal Aragonite in Early Diagenetic History of Phylloid Algal Mounds in Bug and Papoose Canyon Fields, Southeastern Utah and Southwestern Colorado

Abundant altered botryoidal aragonite cement is recognized both in core slabs and thin sections from phylloid algal-mound facies in the Desert Creek interval of the Paradox Formation in the Papoose Canyon–Bug field area. This subsequently dolomitized cement occurs as individual to coalescing botryoids, which appear in cross section as rounded featheredge fans composed of radiating crystals. Botryoids locally comprise up to 90% of any given section of core. The botryoids are similar in appearance to Holocene botryoidal aragonite cement. However, it is deduced that, unlike modern counterparts, these botryoids grew both on the sea floor as well as within open cavities within the mound framework.

The diagenetic history of the mounds in the Papoose Canyon–Bug field area was initiated with precipitation of botryoidal aragonite cement penecontemporaneously with deposition of phylloid algal plates, creating rigid anastomosing frameworks containing abundant primary porosity. When compacted, these mounds were brecciated, thus opening up more porosity. Some of the porosity was subsequently infilled by internal sediment and calcite and gypsum cements. Finally, these mounds were extensively dolomitized, and some secondary porosity was created by leaching.

The fundamental significance of botryoidal aragonite at Papoose Canyon and Bug fields is that it helped to create and preserve very porous and permeable phylloid algal mounds by contributing to the formation of a rigid framework containing primary porosity, and by cementing the mounds early so that they became brecciated upon compaction. The preserved pores were ultimately filled with oil.