This paper is a synthesis of all data obtained on the geology and conditions under which hydrocarbon accumulations were formed in the Mio-Pliocene zone of the Ploieşti District, an important oil region in Romania and one of the most prolific ones in the world.

The zone studied is at the periphery of the Eastern Carpathians, at their western-plunging end, where their structure of overthrust sheets is masked by the upper Neogene cover.

Most of the fields discovered are included in the late Miocene-Pliocene cover deposits (Sarmatian, Meotian, and Dacian age), generally in structural traps, in the formation of which salt diapirism played an important part. Several less numerous accumulations are in the older sediments which underlie the cover deposits (Helvetian, Burdigalian, and Oligocene); these accumulations generally are in stratigraphic traps, just below the unconformity which separates the Sarmatian-Dacian from the Helvetian-Oligocene.

The presence of important hydrocarbon accumulations in the region studied may be explained by the following facts:

1. The zones of hydrocarbon accumulation are along the western uplifted edge of the Neogene depression at the maximum curvature of the Eastern Carpathians along the path of lateral hydrocarbon migration.
2. The Pliocene is developed completely in the form of conformable pelitic and psammitic sequences without any sedimentation breaks; this permitted the generation, accumulation, and preservation of oil pools.
3. Favorable structural conditions existed, particularly because of the diapirism of the Oligo-Miocene (Aquitanian) salt which was active during the deposition of the hydrocarbon-bearing Pliocene formations.

Among the oil fields so far discovered, the most important one is the Moreni-Gura Ocniţei field, situated on the main echelon of Teiş, Gura Ocniţei-Moreni, Filipeşti, and Tintea-Răicoi.

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Pennsylvanian Evaporite Cycles and Petroleum Production, Southern Rocky Mountains

Cyclic evaporite deposits of Desmoinesian Pennsylvanian age are associated with carbonate-mound petroleum reservoirs in the Paradox and Eagle basins of southeastern Utah and western Colorado. In both basins there are basin-type evaporites associated with starved-basin trough sediments that cover a complete range of evaporitic deposits including hypersaline potash beds, halite, anhydrite, very fine-grained dolomite, and black sapropelic muds. A broad facies belt of petroleum-bearing biogenic carbonates and fine clastics occurs in cyclic association on the mildly tectonic basin shelves. Coarse arkosic facies and narrow belts of biogenic carbonates occupy the tectonically active basin edges adjacent to the Uncompahgre and Front Range highlands of the "Ancestral Rockies." Five major juxtaposed evaporite-carbonate mound cycles are mappable in the Paradox basin. Each major cycle contains several subcycles showing different degrees of completeness; individual salt, anhydrite, and black shale beds demonstrate a well-defined microcyclic sedimentation pattern, perhaps related to annual or seasonal climatic changes. The major cycles and most subcycles can be correlated throughout the basin by use of mechanical logs. Microstratigraphic studies of evaporite cores indicate that individual microcycles can be traced for relatively large distances where sufficient cores are available.

The evaporite environment is believed to be directly responsible for the presence of petroleum deposits in the Paradox basin because of its role in the genesis of organic-rich basinwide potential petroleum source beds, improvement of reservoir quality by dolomitization in some places, and the indirect influence of the sapropelic shale-bed geometry in determining size and positioning of carbonate-mound reservoir belts. Conversely, some detrimental effect of the evaporite phase is found in the sealing of some original porosity by later anhydrite infilling.

Most of the petroleum deposits occur in shelf carbonate reservoirs along the southwest flank of the basin. However, probably even greater potential reserves are locked in sapropelic fractured shale beds in the central basin salt anticline area, not now recoverable under the limitations of present exploitation technology.

Evaporite deposits equivalent in age to those of the Paradox basin are present in the Eagle basin of northwestern Colorado. Although thinner than the Paradox evaporites, and more closely interrelated with clastic sediments, these beds occur also in a well-developed cyclic evaporite-black shale depositional sequence. Significant petroleum deposits in facies association with the evaporite section have not yet been found in the Eagle basin, although in most of the basin area drilling density is sparse.

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Shallow-Marine Currents on Early(?) Triassic Wyoming Shelf

Analysis of 690 asymmetric ripple-mark and 40 cross-stratification paleocurrent directions from 37 localities in the Red Peak Formation of Wyoming indicates three major current directions: northeast, southwest, and northwest. These are interpreted to represent respectively, wave drift, rip, and longshore currents moving on, off, and along a northwest-southeast-oriented coast that bordered the shallow, open-marine, Wyoming shelf embayment during the Early(?) Triassic.

Commonly used interpretive techniques based on calculated vector means of paleocurrent directions are inadequate for the polymodal distributions in the Red Peak. Instead, the major directions at each locality are determined and the resulting pattern interpreted visually. The use of vector means and moving averages would not define and could possibly mask the complex current patterns to be expected in the shallow, open-marine environment.

Ripple marks have been used infrequently as paleocurrent direction indicators. The long-standing misconception equating external shape with mode of formation has inhibited their use. Evidence from the Red Peak supports other studies which have suggested that "symmetric" and "asymmetric" ripple marks are not wave- and current-formed, respectively. Rather, most ripple marks possess some degree of asymmetry, either in shape or internal structure, and are formed by currents (including most waves in shallow water). Truly symmetric ripple marks formed by standing oscillatory waves probably are rare. Being current-formed, asymmetric ripple marks should prove increasingly important in reconstructing paleocurrent systems and paleogeography.

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TRADING BAY COMPLEX, ALASKA'S GIANT

(No abstract submitted)

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PANHANDLE-HUGOTON FIELD, "FIRST FIFTY YEARS"

A detailed study of the geometry and an understanding of the mechanics of entrapment are essential to unravel the complexities of the Panhandle-Hugoton field.

The reservoir in the Panhandle-Hugoton field is usually considered to be rocks of Wolfcamp age. Gas and oil appear to have migrated from Pennsylvanian marine shales in the Anadarko basin through granite wash into the Panhandle field.

The trap is primarily structural in the Panhandle field, and stratigraphic in the Hugoton field, with a hydrodynamic component in both.

Red Cave reservoirs above the Wolfcamp and Pennsylvanian reservoirs below the Wolfcamp usually are not considered to be a part of the Panhandle-Hugoton field pay. It is the writer's opinion, however, that these reservoirs could be considered to be Panhandle-Hugoton field pays, because they appear to have had the same source areas, initial pressure, and similar water contacts.

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CAMBRIAN OIL FIELD OF HASSI MESSAOUD, ALGERIA

The Hassi Messaoud oil field was discovered in 1956 by S.N. REPAL on the Saharan permits of the CFP(A) and S.N. REPAL Association, following a seismic-refraction study, which was the only method able to give, at that time, valuable data beneath the thick Mesozoic cover.

Regional and local geological studies showed that this high zone of the Saharan platform has remained relatively high during geologic time. The field structure covers an area of about 600 sq mi of this high platform zone.

At reservoir depth, the structure is a large, flat anticline, irregularly undulating eroded at the top; and its general orientation is south-southwest—north-northeast.

The stratigraphic succession may be described as follows: (1) On the granitic basement, the Paleozoic is represented by the Cambrian "Hassi Messaoud sandstones," about 1,700 ft thick; it is divided into three units: R3, R2, and Ra. Ordovician sediments are present around the structure; the most complete Ordovician deposits are on the flanks. (2) The Mesozoic formations cover the field to the ground surface. About 10,000 ft thick, they are unconformable on the Paleozoic. (3) The Tertiary is represented, away from the structure, by Eocene and Mio-Pliocene deposits.

The main Cambrian reservoir, Ra, is formed by sandstone-quartzite, the thickness of which ranges from 0 to 480 ft, according to the degree of pre-Triassic erosion. The average thickness is 200–330 ft.

Oil was trapped in the Cambrian reservoir mainly during the Mesozoic Period; had entrapment occurred earlier, hydrocarbons would have escaped during the pre-Triassic erosion.

The Hassi Messaoud oil field is operated jointly by S.N. REPAL and CFP(A); it has produced, since 1958, more than 600 million bbl of oil.

The primary-recovery mechanism at first was gas expansion in undersaturated oil; later, the field gas has been injected in order to maintain the pressure and to improve the final recovery ratio. Compression plants have been operating since January 1964. Tests of alternate injection of gas and water have been made.

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ALLOCHTHONOUS CARBONATE DEBRIS FLOWS AT DEVONIAN BANK ("REEF") MARGINS, ALBERTA

Field work suggests that allochthonous carbonate-debris flow deposits containing large blocks occur locally in the upper Perdrix and Mt. Hawk basinal strata adjacent to three Devonian bank complexes—Ancient Wall, Miette, and Southesk (Mt. MacKenzie). The deposits are mostly pebble to boulder carbonate mudstone conglomerate and breccia with pervasive, dark, interstitial micrite.

The largest of the deposits interpreted as debris flows occur southeast of Mt. Haultain (Ancient Wall). Here, disoriented blocks (as large as 20 by 50 m in cross section) of shoal-water limestone occur in two sheet-like deposits of irregular thickness (up to 25 m); these deposits are exposed for 1 km from the bank edge. Similar, possibly correlative, deposits up to 12 m thick and containing disoriented blocks 10 m across occur 3 km from the bank edge. The allochthonous clasts mostly are limestone and range from nonfossiliferous mudstone to grainstone rich in normal marine fossils. Some clasts are coral-growth frameworks several meters across. Smaller debris lenses commonly rich in basinal clasts fill channels adjacent to bank edges at all localities. Most debris deposits of both sheet and channel form have graded calcarenite-to-calcilutite tops a few inches thick.

The writers believe that these allochthonous materials were transported largely by submarine-debris flows from upslope basinal and bank environments. Many flows were followed by density currents. The larger debris deposits probably formed when the relief and slope at the bank margin were higher than normal, perhaps involving 30 m or more of relief and slopes of 5°–10°; some may be related to bank-margin unconformities.

Allochthonous-debris deposits containing large