cific environmental indicator on a simple presence or absence basis. However, since glauconite occurrences differ in kind of and variety of pellets, recognition of pellet types and their distribution is potentially useful for stratigraphic correlation or environmental determinations.

Glauconite is the only clay material occurring in sedimentary rocks which is known to be authigenic in origin, is abundant, and is relatively free from impurities. Thus the geochemistry of glauconite should be a fruitful area of study. At present, most of the emphasis has been restricted to age-dating aspects, but there are numerous other possibilities.

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November 23, 1964

DAVID A. SIX, Midwest Oil, Fort Worth

"Pennsylvanian-Atoka Producing Sands, Red Oak-Norris Gas Field, Arkoma Basin"

The Red Oak-Norris Gas field was the first of several recently discovered fields in the deeper part of the Arkoma basin which produces gas from the lower Atoka Spiro sand. However, this field is also capable of producing gas in large quantities from sands of lower-upper Atoka (Fanshaw sand) and upper-middle Atoka (Red Oak and Panola sands).

Not only is the Red Oak-Norris Gas field the largest single gas producing field in areal extent and reserves discovered in the deeper part of the Arkoma basin to date, but it is believed that it is also the most complexly faulted. Overthrust faulting from the south as well as normal down-to-the-north faulting are in evidence. Considerably more is to be learned concerning the geology of this field as continued development progresses along the north flank. Additional subsurface control is needed in this area in order to fully evaluate the areal extent of the Fanshaw, Red Oak, Panola and Spiro sands. Difficulty has already been encountered in making sand depositional studies along this flank which can only be ascertained by the drilling of additional wells.

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November 30, 1964

DAN E. FERAY, Texas Christian Univ., Fort Worth

"Tectonic and Environmental Factors in Sedimentation"

Ancient sediments (sedimentary rocks) are interpreted in light of evidence available from the examination of modern processes based upon the concept of uniformitarianism. Recent sediments models of the Bahamas, Florida Keys, Mississippi Delta and Northern Gulf of Mexico are reviewed as to their application to the interpretation of ancient sediments deposited in geosynclinal and stable shelf areas.

Puerto Rico, being in an area of active tectonic uplift and subsidence, demonstrates a variety of environmental conditions of diastrophism, physiography, and climate related to a variety of sediment types including graywackes, subgraywackes, arkoses, fine grained terrigenous clastics, bioclastic limestones, reef limestones, carbonate muds, and evaporates all in various facies relationships. Sources of sediments involve an orogenic belt of plutonic, volcanic, metamorphic and sedimentary rocks ranging in elevation from sea level to 4000 feet above sea level. The climate of the source area varies from tropical rain forest to desert. Depositional sites include fluvial, bay and lagoonal, littoral margin dunes, deltas, shelf basin-bank-reef complex, slope, and abyssal environments. The facies relationships between terrigenous clastics and carbonates provides a Recent sediment model of great significance when applied to evaluation of ancient sediments.

The sedimentary rocks of Pennsylvanian age in north-central Texas consist of a sequence of conglomerates, sandstones, shales and limestones exhibiting facies relationships representing fluvial, deltaic, lagoonal, littoral, and shelf environments of deposition. The shelf sediments involve both carbonate banks and reefs in a terrigenous clastic sequence. The effects of sea-floor topography on sedimentation are significant both in regard to type and thickness. Evidence of deep water or continental shelf-slope relationships are absent indicating deposition of sediments in a subsiding shelf environment.

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December 7, 1964

ERNEST W. SHAW, Imperial Oil Enterprises, Calgary

"Canadian Rockies Orientation in Time and Space"

The Canadian Rockies are located between the Rocky Mountain trench on the west and the edge of the disturbed belt on the east; to the north they plunge out near the Yukon-British Columbia boundary and to the south they extend over 150 miles

into Montana. The dimensions are 1,065 miles in length and an average width of 80 miles. Structurally, and thus scenically, they are unique as compared to the Mackenzie Mountains to the north and the central and southern Rockies to the south; this striking difference is principally due to an origin of extreme shortening by means of a series of flat, superimposed thrust faults as opposed to an origin dominated by vertical uplift both to the north and to the south.

The age of the Rocky Mountains has been determined as Eocene-Oligocene on the basis of very extensive studies of the derived sediments. By comparison, the age of the plutonization of the Western Cordillera is principally Jurassic-Cretaceous transition on the basis of recorded geological relationships or 100 plus or minus 10 m. y. on the basis of extensive radioactive dating.

The Rockies are made up of shelf sediments aggregating 20,000 feet at their eastern edge; by contrast, the Western Cordillera is typified by extensive plutonization of the thick sediments and volcanics of a eugeosyncline.

Shortening of the shelf sediments across the southern part of the Canadian Rockies is probably in excess of 100 miles, which has been accomplished by stacking of sediments on a rather uniform system of superimposed thrust faults, but without disrupting the underlying shield to any known extent. The restoration of these sediments to their pre-Laramide position requires that the adjacent plutonized complex of the Western Cordillera must also be restored a somewhat similar distance to the west. Such a restoration sets back the indented western continental margin of Canada and the Alaska panhandle and puts it into alignment with the western continental margin of the United States. The realization of such differential movement along the western continental margin of North America in the Tertiary and the attendant tensional junctions explains many anomalous conditions in the northwestern states and southern Alaska. The cause of such differential movement is much more speculative. An acceptable explanation appears to be that the rigid, simatic Pacific plate has underthrust the continental margin of the United States whereas it has pushed the continental margin of Canada ahead of it.

The eastern slope or "Foothills" of the Canadian Rockies has been an active exploration area for oil and gas since the turn of the century. Western Canada's "original" oil discovery of 1902 was made in Waterton National Park. The historic Turner Valley oil and gas field was Canada's first major discovery. Since then more than 20 gas and condensate discoveries have made the Foothills one of Canada's main gas supply areas, and as a consequence of the more than 60 years of exploration, an unusual amount of factual, three-dimensional information can be applied to structural interpretation.

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December 14, 1964

EDWARD F. HAYE, Photogravity Co., Inc., Houston

"Photography and Geophysics"

There are many ways in which surface geology can be useful to geophysics, not only as an aid to structural interpretation, but in refining the accuracy and improving the efficiency of geophysical methods. That the vast majority of geophysical work has been accomplished in relative ignorance of the surface geology is unfortunate. Many specific examples of misinterpretation and waste can be attributed to a lack of consideration of surface geology. Because of this historical lack of surface geologic consideration, there is a large reservoir of data which can be high-graded and refined inexpensively. Photogeology is by far the most rapid, effective and inexpensive way to obtain surface geology.

Possibly the geophysical tool most critically affected by the surface geology is gravity. Newton's first Inverse Square Law states that density changes closest to the gravimeter affect it most critically. Practical ways in which gravity and seismic data can be refined by coordination with photogeology are cited and slides used to demonstrate the problems.

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January 4, 1965

WILLIAM H. McGUIRE, Consultant, Lexington

"Recent Developments in Eastern and Central Kentucky"

The renewed interest of the oil industry in deeper possibilities of the Appalachian basin, and the discovery of Cambrian production in Ohio, have resulted in leasing and drilling activity in Kentucky. The amount of acreage already under lease in-