Abstract

The 17 authors of papers in the AAPG special volume on the Pennsylvanian system wrote of their several areas with view points colored by the special conditions of each region. A national point-of-view of the Pennsylvanian history of these regions, coordinating the information in the several articles, seems desirable. The talk consists of discussions of inter-regional relationships, of reefs and limestone banks, of cyclical sedimentary sequence, of basinal deposits, and of other general geologic problems.

The Pennsylvanian System is a complex and intriguing sequence of rocks. Economic products from Pennsylvanian rocks include oil and gas, ceramics, iron, stone. An understanding of these rocks is an economic and scientific necessity. The problems of the various areas differ greatly as the rocks differ. In New England the Pennsylvanian rocks are metamorphic, in the Appalachians they are non-marine, in part of the Cordilleran area they are limestone, in Arkansas and southern Oklahoma they are sandstone and shale, in most midcontinent states they are cyclical. In each area a particular system of classification is employed and methods of study are used unlike those of the other regions.

Regional patterns in Pennsylvanian rocks will be discussed, and these compared with patterns of other regions.

December 10, 1962

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"Utilizing Geological-Geophysical Cooperation for Successful Exploration"

Abstract

Geological-geophysical cooperation, while an accepted procedure today, sometimes falls short of its potential effectiveness. This paper sought to derive some principles of cooperation whose application might improve geological-geophysical teamwork.

The recently established Joint AAPG-SEG Cooperative Committee is one step toward more effective cooperation since it emphasizes the equality of the two partners in their joint venture.

In exploration the interests of geologists and geophysicists overlap to considerable degree, but it is most important to recognize also the differences between them. This was illustrated by a variable density presentation of seismic reflection data which showed evidence of dip. The horizontal dimension of such a section is distance, the vertical dimension reflection time. The vertical dimension can be translated into feet by a time depth scale derived from first arrival times of a velocity survey, but it would be erroneous to assume that the substitution of a depth scale automatically makes the section equivalent to a geologic section. A physical principle, Snell's Law, must first be satisfied with the resultant migration of dipping horizons, not only in the plane of the cross section, but also at right angles thereto. Once the spatial relationship of the data are determined, a "fourth dimension" must be evaluated. In a real sense a fourth dimension is present because two types of time are involved in the section. The one time is directly translatable into depth by means of the appropriate scale, but the other time is virtually independent of the first. This second time is in part the delay caused

by the filtering action of the earth, the recording instruments, and the playback instruments. If unrecognized, the estimates of reflection depth are too deep by possibly several hundred feet. Multiple reflections can, if present, cause further exaggeration of depth and dip. Variation in the magnitude of this "fourth dimension" is due principally to multiples and an associated phenomenon, ghost reflections. Another factor, potentially variable, is related to the fact that few reflections are from a single interface but are the resultant interference pattern of reflections from several interfaces spaced, possibly, a hundred feet apart. Evidently the geophysicist with his background of physics is usually best qualified to evaluate correctly the influence of this "fourth dimension." The speaker disclaimed qualification to describe technically the corresponding problems which are totally within the geologists' province, but insisted that every geophysicist must recognize and respect their existence.

An example of effective cooperation between geologist and geophysicist in mapping the Cement Field, described in the talk, has been published in the AAPG Buttletin, Volume 46, July, 1962, pages 1058-1062.

The principles of effective cooperation were summarized with emphasis on the human relations factors involved by considering a final slide showing the picture of a comely young lady employed in geophysics. Quite evidently, most geologists would be willing to cooperate to the fullest with this geophysicist! They would recognize that there were important differences between themselves and her and would respect and applaud those differences. To establish a mutually satisfactory degree of cooperation with such a geophysicist would justify hard work, thoughtful work, and finesse. The rewards of attainment are obvious.

December 17, 1962

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"Use of Photogeology and Geomorphic Criteria To Locate Subsurface Structures"

Abstract

Photogeology is literally the interpretation of aerial photography for geological purposes. In the strictest sense, photogeology includes geomorphology. Most domestic photogeology, until the mid-1950's, was done in the Rocky Mountain area where bedrock exposures were relatively easily mapped, structurally and stratigraphically. By the mid-50's oil companies began to search for surface data which might give clues to subsurface structural features not directly expressed at the surface. The hope was to acquire more economical surface data on which to base future geophysical work, and with which to re-evaluate existing records. The two activities have been combined with good results.

In the Gulf Coast and Mississippi Embayment country from Southwest Texas to Florida, geomorphology should be the primary tool of surface mapping for oil and gas exploration. Geomorphology, as applied in the oil industry, is a science, and should not carry the old connotation and stigma of "creekology." The logical application of geomorphic principles is proving to be a valuable exploration tool.