

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 Bulletin, 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.

Basic concepts which are well documented in the published literature are necessary to the comprehensive application of geomorphology, and are discussed.

Geomorphic analysis is concerned primarily with the determining of the degree of influence which the structure and lithology of the surface rocks have had on the morphological development of the area. The four basic categories of this approach, generally in order of their importance, are:

1. Drainage analysis
2. Land form analysis
3. Fracture pattern analysis, and
4. Tonal characteristic analysis

Although more stress may be placed on one of the above categories in a given area, a comprehensive analysis includes consideration of all of them. Drainage analysis is usually the most important, and drainage terminology carries a structural connotation. The terms consequent, resequent, subsequest, and obsequest can be used in a structural sense. All these streams can be related to the original consequent surface, which is the initial slope of the land surface upon regression of a sea. All streams are lazy and take the direction of least resistance; thus, all streams controlled by folding definitely migrate down dip and all streams controlled by faulting are linear in nature. The greatest deterrent to the structural analysis of drainage is the homogeneity of surface rocks.

Photogeology and geomorphology are not the panacea for all exploration activity. They are tools which will be of value to each geologist only if he coordinates his interpretations of subsurface and geophysical data with them.

January 7, 1963

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"Petroleum Technology in Russia"

Abstract

Geochemical Research

The USSR has embarked on a major program of geochemical research and the use of geochemistry in field operations. At present there are about 30 institutes doing geological, geophysical, and geochemical research. Some of these are attached to the operating branches of the industry and primarily do applied research. Other institutes conduct more basic and fundamental studies or work on problems of general application. These are directly under the Ministry of Geology. About 25 per cent of the research is in geochemistry, half of which is on surface methods and half on subsurface. In addition, geochemical research is carried out in the Academy of Science Institutes, the Ministry of Fuels, and the University of Moscow. In 1962 there were about 1,000 field parties looking for oil and gas. Some 60 per cent of these are in geophysics and the rest in geology, geochemistry and logging.

Research in surface geochemistry is concerned with such problems as rates of diffusion and filtration of hydrocarbons through sedimentary rocks, micro-