January 13, 1964

PAUL L. LYONS, Sinclair, Tulsa
"The Crust and Mantle of the Earth"

The accumulated geophysical data for the Gulf of Mexico, combined with the known geology, make a number of maps possible which serve to define the modern geosyncline and provide some evidence as to its inception. The velocities and depths of interfaces observed in seismic reflection and refraction profiles may be tied to layers of rock, and the gravity and magnetic data assist in determining the tectonic framework. The inception of the geosyncline appears to be related to widespread collapse in Triassic time; this had been preceded by deposition of Paleozoic sediments and the possible extension Gulfward of the Appalachian orogeny. The problems dealt with are (1) the shallow Jurassic and Cretaceous aspect of the Gulf, (2) the widespread extent of the salt and the resultant domes, (3) the lateral or wrench faults and the restoration of transposed elements, (4) the pattern of shifting depocenters, (5) the tremendous acceleration of depositional rates in Tertiary time culminating in the rapid present day rate of 24.4 cm/century determined by Hardin and Hardin, (6) the engimatic Atlantic trench, (7) the unexpected axial directions of magnetic anomalies and (8) the intermediate (between continent and ocean) depth of the Gulf Moho. The combined result of the complex history is a Mesozoic and Cenozoic geosyncline with a sedimentary thickness of perhaps 60,000 feet. The final problem is why this great prism of rocks does not fold into a mountain range after exceeding the accepted depth limit for other geossynclines.

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January 20, 1964

CHARLES MILTON, USGS, Washington
"Mineralogy and Geology of the Green River Formation of Colorado, Utah, and Wyoming"

The Green River formation of Eocene age outcrops over many thousand square miles in each of the three states, Wyoming, Colorado, and Utah, and underlies similar large areas. It contains the world's largest known accumulation of hydrocarbons as oil shale, and the world's greatest deposits of sodium carbonate minerals, mined to produce soda ash, a basic industrial commodity. Both the hydrocarbons, if converted into marketable fuels, and the soda ash, could fill the nation's needs for centuries to come. At present besides the soda ash, produced in two large mines in Wyoming, gilsonite, a solid hydrocarbon is mined for gasoline production in Utah, and oil and gas are produced in all three states.

The geological history of the formation, essentially a lacustrine deposit in a basin cut off from the sea for millions of years, appears to be unique. Conditions of sedimentation included formation of thousands of feet of rich oil shale, apparently from a lake whose upper waters supported teeming animal and vegetable life, but whose bottom waters were depleted of oxygen and high in hydrogen sulphide. Tremendous quantities of sodium compounds, mostly carbonates, accumulated in the bottom waters or underlying muds with significant boron and barium.

The Green River formation contains an extraordinary variety of authigenic minerals, many found nowhere else in the world, and containing such elements as uranium, niobium, rare-earths, zirconium, and titanium, not normally found in lacustrine sediments. There are likewise many minerals, here formed at temperatures not thought to exceed 200°C, such as pyroxenes, amphiboles, biotite, and feldspars, which ordinarily are formed only under relatively high temperature magmatic or metamorphic conditions.

Recent work has made known extensive apatite deposits, a new type (non-marine) of bedded phosphate, which carries significant uranium. Also the thick series of oil shales in Colorado appear to be vertically zoned mineralogically, a new development in sedimentary petrology.

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February 3, 1964

R. A. BAILE, AAPG Distinguished Lecturer
Independent Exploration Company, Houston
"Some New Concepts in Geophysics"

New methods are rapidly being introduced in geophysical prospecting which are greatly enhancing the oil-finder's ability to discover additional reserves at lower cost. A movie is shown which briefly depicts a method, now in common use, wherein a free-falling weight develops seismic energy sufficient to examine subsurface strata to great depths. In addition to the weight dropping method as shown, other surface initiated energy systems have been developed, notable among which bears the trade name "Vibro-Seis"*. In experimental and initial usage stages are various other methods which offer considerable potential for vastly improved methods of geophysical prospecting. Improvements in magnetic tape recording and processing have provided new impetus to better methods

In a more general sense, consideration must be given to personnel, economic condi-

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