ronmental observations in Grande Isle-Grande Terre area of south Louisiana 25 min.

Delta Study Group: HOUSTON GEOLOGICAL SOCIETY

Presiding: J. BEN CARSEY, MARTHA LOU SHIRLEY

WALTER A. ANDERSON: Introduction to Delta Symposium 20 min.

CHARLES R. KOLB AND JACK R. VAN LOPIK: Depositional environments of Mississippi River deltaic plain—southeastern Louisiana 20 min.

JACK L. GREGORY: Study of Vicksburg delta of Harris and Ft. Bend Counties, Texas 20 min.

A. H. WADSWORTH, JR.: Recent deltation of Colorado River delta, Texas 20 min.

WILLIAM F. TANNER: History of Apalachicola River delta area, Florida 20 min.

ABSTRACTS OF PAPERS

1. M. KING HUBBERT, U. S. Geological Survey, Washington, D. C.

HISTORY OF PETROLEUM GEOLOGY AND ITS BEARING ON PRESENT AND FUTURE EXPLORATION

(No abstract)

2. JAMES E. FINLEY, Continental Oil Company, Houston, Texas

EXPLORATION OPPORTUNITY—THE PRODUCT OF APPLIED TECHNOLOGY

(No abstract)

3. DANIEL A. BUSCH, Consulting geologist, Tulsa, Oklahoma

A.A.P.G. CONTINUING EDUCATION PROGRAM

The A.A.P.G., in recognition of the constant and rapid changes occurring in the art of oil exploration, is initiating a program of continuing education to affiliated and cooperating societies, oil companies, and university departments of geology. A series of 12-hour courses will be presented by the top authorities in this country on the following subjects: Stratigraphic Principles and Practice, Structural Geology, Petroleum, Economics, and Electronic Data Processing. It is anticipated that some local geological societies might wish to schedule lectures on only several course offerings, whereas others might wish ultimately to schedule the entire program over a period of years. Two lecture series per year are considered to be a realistic course offering for local geological societies, whereas only one per year might be all that a university geological department can justify. Oil companies might find it more expedient to sponsor three or four topics in concentrated fashion all within one week. The entire program is designed to update the technical background of practicing geologists.

4. MICHEL T. HALBOUTY, Consulting geologist and petroleum engineer, Houston, Texas

ECONOMICS—THE NEW DIMENSION IN GEOLOGICAL THINKING[1]

The current problems of expensive exploration, imports, overcapacity in production and refining, and the continued loss of investment capital through increased government control have brought about reduced margins of profits and steady declines in drilling, discoveries, reserves, and employment to the United States petroleum industry in recent years. The average petroleum geologist knows little about these matters. He has limited his interest to geology—period! The geologist has not concerned himself with these complexities and, therefore, knows very little of the many difficulties the petroleum industry continually faces.

The geologist must come out of hibernation and look at the industry as a whole. His knowledge must expand beyond his own science. He has to broaden this thinking into the area of economics more than ever before. The geologist must keep up with the changes in every phase of the industry.

The geologist must look outward—not just straight ahead, but in all directions. He must be aware of what is happening in today's new technology, the ever-changing economic conditions, new political concepts, the intense fuel competition, world petroleum outlook, and world markets—but above all, he must learn what significance these things have on his industry, his company, and on his own future as an explorationist.

The geologist should realize that the petroleum industry must prosper within all of its phases if he, himself, is to prosper. He, therefore, must take a more direct and positive interest in the four dominant problems which constantly confront the industry: geological, technological, economic, and political. The geologist has an inherent knowledge of the first, knows a little about the second, and is completely oblivious of the third and fourth. To become more effective as an explorer or developer he must become more involved and astute in all of these challenges.

The economic factor is the most important to management; therefore, the geologist must begin to make economics the new dimension in his geological thinking. The growing pressure on management to produce profits demands that the geologist prepare a comprehensive economic assessment of his exploratory planning, efforts, and recommendations. Such appraisals surely will sharpen and upgrade the exploratory effort and will do much toward bringing about greater success in the explorer's search for petroleum to meet the demands of the future.

5. E. RALPH DANIEL, Vice president, Bank of Southwest, Houston, Texas

BANKING YOUR OIL INTERESTS

This paper deals with bank financing of oil and gas properties. It concerns, principally, the conventional production loan which is a loan to an individual, partnership, or corporation that is secured by interests in oil- and (or) gas-producing properties; this loan will be liquidated out of the income from the properties. The ramifications of this type of loan from the standpoint of both the banker and oil man are reviewed. A method of determining the loan value of oil and (or) gas properties is presented as well as the information needed to negotiate an oil loan.

6. WALLACE SCOTT, JR., Lawyer, Austin, Texas

GEOLOGIST AS AN EXPERT WITNESS IN TEXAS RAILROAD COMMISSION HEARINGS

(No abstract)

7. LEONARD C. BRYANT,[1] Cities Service Oil Company, San Antonio, Texas

SOUTH COPANO BAY FIELD, ARANSAS COUNTY, TEXAS[2]

An extensive province of upper and middle Frio production exists along the Gulf Coast of Texas, and in this province the Melbourne Sand is one of the prime reservoirs for oil and gas.

[1] Publication of abstract and presentation of address have been permitted by Distinguished Lecture Committee of The American Association of Petroleum Geologists.

[1] The writer wishes to express his thanks to the Cities Service Oil Company for permission to publish this paper.

[2] Published in *Bull. Houston Geol. Soc.*, v. 7, no. 10, June, 1965.

Production from the Melbourne in Matagorda and Calhoun Counties is trapped primarily in closures against the upthrown sides of down-to-the-coast faults. In contrast, anticlinal closures, located on the downthrown sides of down-to-the-coast faults, form the primary traps through Aransas, San Patricio, and Nueces Counties.

A case history of the South Copano Bay field illustrates basic exploration techniques that are useful in exploring for buried depositional-type structures.

8. DERRELL A. SMITH, Shell Development Company, Houston, Texas

SEALING AND NON-SEALING FAULTS

Differentiating between sealing and non-sealing faults and their effects in the subsurface is a major problem in petroleum exploration, development, and production. The fault-seal problem has been investigated from a theoretical viewpoint in order to provide a basis for a better understanding of sealing and non-sealing faults. Some general theories of hydrocarbon entrapment are reviewed and directly related to hypothetical cases of faults as barriers to hydrocarbon migration and faults as paths for hydrocarbon migration. The phenomenon of fault entrapment reduces to a relationship between (1) the capillary pressure and (2) the displacement pressure of the reservoir rock and the boundary rock material along the fault. Capillary pressure is the differential pressure between the hydrocarbons and the water at any level in the reservoir; displacement pressure is the pressure required to force hydrocarbons into the largest interconnected pores of a preferentially water-wet rock. Thus the sealing or non-sealing aspect of a fault can be characterized by pressure differentials and by rock-capillary properties.

Theoretical studies show that the fault seal in preferentially water-wet rock is related to the displacement pressure of the media in contact at the fault. Media of similar displacement pressure will result in a non-sealing fault to hydrocarbon migration. Media of different displacement pressure will result in a sealing fault, provided the capillary pressure in the reservoir rock is less than the opposing boundary displacement pressure. The trapping capacity of a boundary, in terms of the thickness of hydrocarbon column, is related to the magnitude of the difference in displacement pressures of the reservoir and boundary rock. If the thickness of the hydrocarbon column exceeds the boundary trapping capacity, the excess hydrocarbons will be displaced into the boundary material. Dependent on the conditions, lateral migration across faults or vertical migration along faults will occur when the boundary trapping capacity is exceeded. Application of the theoretical concepts to subsurface studies should prove useful in understanding and in evaluating subsurface fault seals.

9. J. A. GILREATH, Schlumberger Well Surveying Corporation, New Orleans, Louisiana

LOG CHARACTERISTICS OF DIAPIRIC SHALES

High-pressure diapiric shales, commonly associated with domal structures along the Texas and Louisiana Gulf Coast, characteristically exhibit low values of resistivity, density, and acoustic velocity. Thus, well logs enable identification of these intrusive shale masses.

However, deep-water marine shales—of the types which are source beds for diapiric shales—also are high-pressure formations. These shales, in normal stratigraphic positions, exhibit log characteristics which are similar to those of diapiric shales. Therefore, although resistivity, density, and acoustic-velocity logs may indicate that a domal shale core may have been penetrated, additional data are required for confirmation.

Dipmeter surveys provide information to confirm or deny the intrusive nature of the shale. In addition, if the shale is found to be intrusive, dip information locates the well position with respect to the apex of the diapir. As the shale diapir is approached from above, dips (away from the apex) increase in magnitude—just as if a salt dome were being approached. Within the low-resistivity shale, the dips are relatively constant in both magnitude and azimuth, and dips approximate the dip of the contact between the bedded formations and the diapiric shale. This consistent dip within the domal core is distinctly different from the random dips found in gouge shale adjacent to piercement salt domes.

In an offshore field, resistivity values were used to map the top of a shale dome. None of the wells drilled on this structure penetrated salt. The deepest penetration into the domal shale was approximately 2,000 ft. Contour lines were drawn, using as a datum the depths where the various wells encountered a decrease in shale resistivity to 0.5 ohm-meter. The map indicates a minimum structural closure of 6,000 ft. Dips computed from the map agree closely with those measured within the domal shale by dipmeter surveys.

10. ROBERT S. DOLLISON, Pan American Petroleum Corporation, Houston, Texas

BIG HILL FIELD, JEFFERSON COUNTY, TEXAS

Big Hill field is in the Frio sand trend on the western flank of the Big Hill salt dome. Multiple reservoirs in Miocene and Oligocene sandstones are on the downthrown side of a regional, up-to-the-coast growth fault across which early Miocene and older sediments increase in thickness by 57%. One reservoir in the Oligocene Hackberry is bounded by two growth faults and an unconformity (Hackberry unconformity). The hydrocarbons trapped in this reservoir evidently were generated within the surrounding rocks. An isopachous map of the interval between the top of the Frio and the Hackberry unconformity indicates that growth of the Big Hill salt dome occurred prior to the close of Frio time, and that the crest of the dome was north of the present-day salt spine. This map also suggests the presence of a buried, down-to-the-coast growth fault which traverses the western flank of Big Hill field but which does not intersect any wells.

Pressure-performance histories of two reservoirs and of two wells producing from other reservoirs are shown graphically in order to illustrate the problems involved in explaining wells that are in pressure communication. Four gas-fluid contacts in a continuous *Marginulina* sandstone reservoir differ in elevation by 600± ft. These original gas-fluid contacts were established by the migration of hydrocarbons into a complexly faulted area. Accumulation of oil downdip from these gas-fluid contacts can be explained reasonably in terms of gravity-segregation effects.

11. JAMES P. SPILLERS, Louisiana State Mineral Board, Baton Rouge, Louisiana

DISTRIBUTION OF HYDROCARBONS IN SOUTH LOUISIANA BY TYPES OF TRAPS AND TRENDS—FRIO AND YOUNGER SEDIMENTS

INTRODUCTION

Since Frio time, the south Louisiana part of the Gulf Coast geosyncline has been characterized by regressive sedimentation, progressive southward and eastward shifting of successively younger depocenters, southward