east) is the Fayette fluvial-delta system consisting of dip-oriented, lobate wedges of sand, mud, and lignite. The vertical sequence in updip subsurface and outcrop, with gradation upward from marine mud through several delta facies and into fluvial sand and mud, reflects net regression and progradation of the system. Southwestward, transport of sand and mud from the delta system, principally by longshore drift, resulted in the South Texas strandplain-barrier bar system, made up of strike-trending sand bodies interbedded with marine and lagoonal mud. Landward of the strandplain–barrier-bar system and extending into outcrop is a complementary lagoonal–coastal-plain system consisting of mud and minor, dip-oriented sand units. Gulfward of the strike-trending strandplain system is the South Texas shelf system, formed by marine mud derived largely from the delta system on the northeast. Beneath the South Texas strandplain-barrier bar and Fayette delta systems and extending eastward into Louisiana and Mississippi is the Caddell-Yazoo shelf system consisting of marine, fossiliferous mud and minor glauconitic marl. Delineation of depositional systems, and specifically component facies of the various systems, facilitates definition of significant mineral trends (oil, gas, lignite, and uranium) that show the relation between current and potential areas of production.

JAMES M. FORGOTSON, JR., Petroleum Information, Inc., Denver, Colo.

WELL-DATA FILES AND COMPUTER—EXPLORATION TOOLS FOR THE SEVENTIES

Since the development of computer-processable well-data files began in 1961, more than 600,000 wells have been included in systems covering most of the United States and Canada. These systems contain information on ownership, location, well classification and status, drilling and completion activities, tests, depths to formation tops, core descriptions, shows, and other data. Data are obtained from the most reliable and complete source for each area and are upgraded by computer editing and the feedback of missing data and corrections from file users.

Well-data files are used at various stages of the exploration process for basin evaluation, for selection of prospective stratigraphic intervals and areas for further study delineating prospects for acreage acquisition or drilling, and for building peripheral files containing proprietary, technical, and economic data. A study of the Muddy Sandstone in the Powder River basin illustrates an exploration application of computer processing a large well-data file. Prior to the discovery of Bell Creek, data from the file revealed areas in Wyoming and southeasternmost Montana with abundant hydrocarbon shows in the Muddy Sandstone. North and South Dakota and the rest of Montana had no oil shows in the Muddy Sandstone. In the area of abundant shows geologic maps based on formation tops obtained from the file indicated trends on which subsequent drilling has discovered more than 525 million bbl of reserves. Two types of depositional areas favorable for hydrocarbon occurrence were indicated. One was related to deposition around a pre-Muddy positive feature defined by Skull Creek structure and isopach residual maps of the Muddy Sandstone. The other was a channel system defined on an isopach residual map. Approximately 750 wells have been drilled in the "no show" area without discovering commercial oil.

At the time of discovery of Recluse and Bell Creek, information was available within the Rocky Mountain Well History Control System to suggest areas favorable for similar types of production from the Muddy. With addition of new well control and proprietary information, the well-data file can aid in the planning of development drilling, analysis of completion practices, and reservoir evaluation. Large well-data files and proper application of the computer to these data will become increasingly important in the discovery of oil and gas during the 70's.

ROBERT F. GOLDSTEIN, Amerada Hess Corp., Lafayette, La.

CORRELATION OF SILURIAN STRATA BETWEEN GEORGIA, ALABAMA, AND FLORIDA BASED ON CHITINOZOAN BIOSTRATIGRAPHY

Silurian chitinozoans have been described previously from 4 wells in north-central Florida. These wells also have been correlated previously with each other as well as with known Silurian sections. The youngest assemblage is of Ludlovian age; the oldest is of late Llandoverian age.

Outcrop samples were collected from the Silurian Red Mountain Formation in Alabama and Georgia. This formation has been dated as Llandoverian on the basis of megafossil evidence. Four Red Mountain Formation sections are divided into biostratigraphic zones on the basis of chitinozoan assemblages.

Attempts at correlating the well and outcrop samples on the basis of frequency of chitinozoan taxa proved unsuccessful, because only a few taxa are abundant throughout the sections. Instead, correlations are made on the first or last occurrence of certain taxa. A comparison of the assemblages in the oldest (Ludlovian) Florida well section and the youngest (late Llandoverian) Red Mountain Formation section indicates that they have only 2 taxa in common. A comparison between the other parts of the Florida and Alabama-Georgia sections was not feasible because of the great age differences.

The general aspect of the Florida assemblages is quite different from those in Georgia and Alabama. It is concluded that the sections in Georgia and Alabama are of ages different from those in Florida. The rocks are not different faunal facies of isochronous strata because chitinozoans are planktonic and are therefore not lithofacies dependent.

One problem encountered in this study was that 3 wells did not penetrate very deeply into Silurian strata. Three of the Florida wells only penetrated the Upper Silurian, and only one went as deep as the Lower Silurian. Future work in correlating the Silurian rocks from these 3 states must depend on new wells being drilled to greater depths.

MICHEL T. HALBOUTY, Consultant, Houston, Tex.

EXPLORATION GEOLOGIST IN THE SEVENTIES

The 70's promise to be a period of turmoil and change for the petroleum industry, not only in the United States, but throughout the world. These conditions will have a significant effect on explorationists.

Ecology and environment are rapidly becoming common words in our vocabulary and, as scientists, we must make our technology compatible with the environment.

The explorationist (the geologist and the geophysicist) will have to search for and locate large reserves in this country, if we are to meet the anticipated increase in domestic demand for petroleum products in the next decade. It is evident that the needed reserves *will not be found by employing current exploration* methods. We must take a hard look at present exploration methods and philosophies and at ourselves, as petroleum geologists, to determine whether we, individually, and as a scientific group, are traveling in exploratory directions which will lead to the discovery of *large, needed, new domestic reserves.*

The direction and growth of oil companies during the 70's will, to a great degree, depend on the quality and loyalty of the petroleum scientist. The scientist who feels that the company regards him as an asset will be an asset to that company. Make him fear for his job and *he will be not only nonproductive, but a liability.*

I stress, as I have done in the past, that the geologic profession as a whole must start looking purposely for the hidden and subtle traps—those which are stratigraphic and paleogeomorphic—by employing all of the known disciplines to assist in this search, but more particularly, to use the geologic mind to determine indications that initiate and lead to the discoveries of those traps.

GEORGE C. HARDIN, JR., Royal Resources Corp., Houston, Tex.

IMPACT OF FUNDED OIL AND GAS PROGRAMS ON OIL INDUSTRY

Since 1966, funded oil and gas programs have supplied more than $1 billion of much needed capital to the oil and gas industry. Although precise figures are not available, it is safe to say that at least 25,000 wells have resulted from the activity of funded drilling programs since 1966. This is a significant portion of the total of 138,666 wells drilled in that period.

This nation is in dire need of both oil and gas reserves and productive capacity. We have no way to determine how much oil and gas has been found and developed by funded programs since 1966, but even a pessimistic view of their cost for finding and development would lead to a conclusion of at least 500 million bbl of oil or gas equivalent. A continuation of this new source of capital is vital if we are to close the gap between the $100 million needed for exploration and development in the next decade and the estimated $50 billion the oil industry can generate internally.

More than 800 petroleum geologists are now employed full-time by drilling programs, either as employees or consultants. Other professionals, such as landmen, attorneys, and petroleum engineers, would add at least another 1,500 people. Adding the usual complement of staff, at least 5,000 people are employed today by the oil and gas programs.

JOHN F. HARRIS, Consultant, Tulsa, Okla.

SEARCH FOR THE SUBTLE CLUE—CARBONATE EXPLORATION IN THE SEVENTIES

Exploration of carbonate reservoirs in the next decade will necessitate knowledge of the diagenetic and epigenetic processes influencing porosity origins.

New tools and methods (some exotic and expensive) will be used to extend our analytic and perceptive ability. However, most of our exploration effort will rely on less expensive disciplines, combined with original exploratory thinking and studies of the rocks.

Most current carbonate research programs are concerned with depositional environments and fabrics and their relation to currently productive areas. The less-explored changes induced by burial, uplift, and structure are of equal importance in modifying or destroying *original fabric. Porosity traps are formed through* recrystallization, fracturing, and tectonic dolomitization.

Surface studies of structurally controlled carbonate porosity can be related directly to major, structurally complex, oil-producing reservoirs.

During the 70's our responsibilities will include the search for *the subtle clue, which may indicate a nearby* potential reservoir, modify our thinking on preexisting reservoirs, and refine our techniques of predictability of both depositional and structurally controlled porosity.

C. WAYNE HOLCOMB, Humble Oil & Refining Co., Houston, Tex.

FUTURE PETROLEUM PROVINCES OF GULF COAST—UPPER CRETACEOUS

According to the findings of a geologically oriented study of the National Petroleum Council's Region 6, the prospects for significant additions to reserves in the Gulf Series are good in southeast Louisiana, Mississippi, Alabama, and Florida, and fair to poor in the rest of the area. In order to assign more finite terms to the potential of the unexplored area of the Gulf Series of Region 6, the following parameters have been derived: an area classed as "good" has a yield of 150,000 bbl/cu mi; "fair" has a yield of 80,000 bbl/cu mi, and "poor" has a yield of 50,000 bbl/cu mi. The presence or absence of reservoir-type rocks, source beds (which usually can be assumed to be present in the Gulf basin), and trap-forming structural deformation is used as criteria for rating the various geographic areas.

In the explored area of southeast Louisiana-Mississippi-Alabama-Florida, which contains 30,000 cu mi of sedimentary rock, limited additional reserves may be expected in new discoveries and extensions. In the unexplored area containing 17,000 cu mi of sedimentary rocks, lenticular Tuscaloosa sandstones should provide excellent possibilities for both structurally and stratigraphically trapped oil. Fair possibilities exist in similar sandstones of the Eutaw Formation. Carbonate buildups of reeflike limestones are possible in beds of the Navarro Group on the carbonate banks off the Florida Gulf Coast.

Louisiana-Arkansas' explored area (10,000 cu mi) may have minor additions. The unexplored part (4,700 cu mi) of south Louisiana has poor potential with one possible exception; where Woodbine sandstones may occur as turbidites or as deep-water sands swept out past the Comanchean shelf, prospects are fair.

The explored part of East Texas (11,200 cu mi) will have minor additions to reserves through further exploitation. The potential of the unexplored area (3,600 cu mi) is rated poor to fair. In the Woodbine, possible turbidites and marine sandstones on the south and southwest flanks of the Sabine uplift offer fair prospects. In the Austin-Eagle Ford section, possibilities are poor to fair on the south and southeast flanks of the Sabine uplift.

South Texas potential in the explored area (8,800 cu mi) is poor except for minor additions. The potential of the unexplored area (10,200 cu mi) is also rated poor, because of the expected absence of reservoir beds.

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