press. Moreover, we have approached the economic limit of our conventional structural oil and gas finding methods, except for a few favored locales.

It is impossible to separate the discovery of oil and gas. Reasonable calculations indicate that 75 percent of all the 641 Tcf of natural gas discovered in the "Lower 48," whether nonassociated or associated-dissolved, has been discovered (not necessarily developed) incident to the search for oil.

All exploratory activity has declined drastically since 1955, until it is now less than at any time since the end of World War II. Since 1955, more and more effort and money have been diverted to foreign exploration and production. This resulted from ever-increasing domestic costs and a continuously deteriorating political climate for oil and gas activity. As the excess oil producing capacity in this country diminished, those countries with excess capacity were quick to take advantage of the situation. Declining discoveries of natural gas lie at the root of the energy crunch. Whether or not increased incentives to spur exploration and drilling, offered at the eleventh hour, will forestall shortages in the next 3 to 5 critical years is highly problematical.

The oil and gas industry has no reason to apologize or take the defensive. Studies by the Chase Manhattan Bank indicate that less than 4 percent of its "Group's" revenue comes from the sale of dry natural gas at the wellhead. Moreover, the independent operator, so important in discovering oil and gas in this country, is being forced out of the industry by adverse government regulation and political interference. The First City National Bank's studies of annual yield on stockholders' equity clearly refutes charges of both excessive earnings and monopoly. It would appear that a group of ultra-liberal congressmen and much of the press would rather see the consumer dependent on foreign sources of energy, which not only are far more expensive but also jeopardize our national security, than see a viable healthy domestic industry with adequate excess productive capacity to meet any emergency.

BERG, J. ROBERT, Wichita State Univ., Wichita, Kans.

HELIUM IN HUGOTON GAS FIELD

The chronologic development of the Hugoton field of Kansas, Oklahoma, and Texas, and the related Panhandle field of Texas has been reviewed as background for a study of the problems of origin, migration, and accumulation of the helium, nitrogen, and natural gas in these areas. Within the past decade, the release and publication of analyses from the Hugoton field and other areas have been commonplace. In addition, in-depth studies concerning helium, resulting from the past few years of litigation, have provided abundant data on the occurrence of helium, which may shed light on, and give impetus to the study of problems of origin, migration, and accumulation in general.

BRADFORD, WILLIAM E., Magcobar Well Logging and D.A.T.A. Control, Oklahoma City, Okla.

DEEP DRILLING TECHNOLOGY

The involvement of the geologist in the total planning of deep exploration wells and the reduction of total well cost is advocated. The planning stage utilizes all available wire line logs for pressure plots and the correlation of lithology for optimized programs. The drilling stage utilizes drilling variable plots for pore pressure and rupture-pressure determination. All geologic, mechanical, and hydraulic components are monitored closely for maximum penetration, evaluation, and safety. A final evaluation and data storage method is recommended.

CARVER, HERSHEL, Jake L. Hamon, Amarillo, Tex.

MATHERS RANCH

The Mathers Ranch field in Hemphill County, Texas, represents another major discovery of gas reserves from the Siluro–Devonian Hunton limestone in the Anadarko basin of Oklahoma and Texas. It is the seventh significant Hunton field discovered in the deep Anadarko basin and is the result of continued exploratory drilling for Hunton and deeper objectives in the Cambro–Ordovician. Mathers Ranch field has more than 10 wells completed and the field limits are not yet defined in any direction. The discovery lies on a south–plunging structural nose transected by east–west faulting which, coupled with north dip, contributes structural entrapment. The degree to which porosity development is important as an entrapment agent is not yet defined and may be as important as structure, or even more so when the field is outlined completely by drilling. Production comes from below 17,000 ft from both intergranular and fracture porosity.

CLARKE, DONALD S., Tilco, Inc., Denver, Colo.

OIL AND GAS FUNDS—THEIR FUTURE IN FINANCIAL PLANNING

(No abstract submitted)

DAVIS, HERBERT, Davis, Northcutt and Cochrane, Oklahoma City, Okla.

MORROW-SPRINGER TREND, ANADARKO BASIN, TARGET FOR THE 70'S

The Morrow Formation has accounted for much of the gas reserves on the shelf area and a limited part of the deep area in the Anadarko basin from 1947 to 1970.

The Morrow-Springer Formations offer multiple stratigraphic targets in this vast sedimentary basin. Deep drilling during the 70's could account for additional gas reserves from the Morrow-Springer.

As the stratigraphy, sedimentation, and depositional patterns are revealed through drilling, additional fields similar to Buffalo Wallow upper Morrow gas field, Hemphill County, Texas; East Elk City Springer gas field, Beckham County, Oklahoma; Indianapolis Springer gas field, Custer County, Oklahoma; and Laverty Springer gas field, Grady County, Oklahoma, will account for much of this reserve.

GRAFF, TOM, Amarex, Inc., Oklahoma City, Okla.

GEOLOGY, PETROLOGY, AND RESERVOIR CHARACTERISTICS OF MARCHAND SANDSTONE IN GRADY AND CADDO COUNTIES, OKLAHOMA

Marchand sandstone (Pennsylvanian-Missourian) oil production was discovered in 1967 at NE Verden, T8N, R8W, Grady County, Oklahoma. The play developed slowly but discoveries since 1970 by Samedan Oil Co. at Dutton townsite, Apache Corp. at NW Chickasha, and Midwest Oil Co. and Eason Oil Co. at NW Norge led to the most concentrated drilling boom in Oklahoma's Anadarko basin in recent years.

The fields are on the east flank of the east end of

the deep Anadarko basin. Production to date has been excellent. Initial potentials are more than 1,000 BOPD. Liberal allowables of up to 580 BOPD and payouts of 4–6 months for the better wells account for the rash of drilling activity.

At the end of May 1971, 74 producing wells had been completed on 160-acre spacing in a producing trend extending over 15 mi from just west of Chickasha in T6N, R8W, to Dutton townsite in T9N, R9W. There are presently 10 wells drilling to the Marchand sandstone, 5 announced locations, and 18 wells that have run production casing and are in some stage of completion. Depths range from 10,100 to 11,000 ft and drilling costs are from $100,000 to $120,000 to casing point and $180,000 to $200,000 for a completed producer.

The Marchand is a fine-grained, well-sorted sandstone and is generally highly laminated with shale. Silt and clays are found in the matrix. Regional correlations and examinations of samples, cores, and thin sections lead the writer to believe that the sandstone is of deltaic origin. The deltaic deposition apparently was complicated by channeling and offshore bar development. Regional structure at the Missourian level is relatively uncomplicated, dip being monoclinal at approximately 1°/mi toward the basin axis and interrupted only by slight nosing. The trap appears to be purely stratigraphic.

Marchand sandstone pay thicknesses range up to 125 ft. The reservoir is undersaturated and oil wet with solution gas drive. Gas/oil ratios are approximately 700 to 1 and original bottomhole pressures between 4,600 and 6,300 psi. Primary recoveries should range between 12 and 16% of the oil in place and reserves for the better wells with the thickest pay sections should be more than 750,000 bbl of oil.

The excellent production from the Marchand sandstone touched off an extensive leasing campaign in southwestern Grady and southeastern Caddo Counties, Oklahoma. The Marchand is only one of several sandstones developed in the Missourian section and chances are good that wildcat drilling will uncover additional stratigraphic production from the Missourian section in this part of the Anadarko basin.

HARRELL, B. E., Arkansas Louisiana Gas Co., Shreveport, La.

PROBLEMS OF NATURAL GAS SUPPLY

Since 1968 the United States has produced more gas than it discovered. This trend will continue as more heavy industry turns to natural gas and away from other fossil fuels in efforts to stem air pollution. New and proved reserves in Alaska are far from the marketing stage. The decline in drilling, to a 28-year low in April 1970, has been the result of 17 years of unnatural price ceilings on natural gas and, more recently, of the reduction in 1969 in the depletion allowance. However, current pricing trends by the Federal Power Commission, and incentives by pipeline companies and funds, now make deep wildcatting in the Anadarko basin and elsewhere very attractive.

HEFNER, ROBERT A., III, Glover Hefner Kennedy Oil Co., Oklahoma City, Okla.

NATURAL GAS IN ANADARKO BASIN

Geologists tend to think of natural gas in geologic terms. However, Mid-Continent geologists also should think of gas in the Mid-Continent, and particularly in the deep Anadarko basin, in terms of the economics of the total system of production and delivery to market from the Mid-Continent area, and the overall economics of the energy industry in the United States.

Good exploration geologists have understood for years the importance of the interface between their discipline and others, but there are now more disciplines to which they must relate as they think of gas exploration in the long term. Geologists have included in their thought-processes operating constraints of the production phase of the business, but with the search for greater reserves, and particularly ultra-deep reserves, production technology has changed so substantially that a new and more comprehensive view of this developing technology is required. In addition, geologists must become economists in a sense, because the development of commercial reserves is closely related not only to the cost of production, transportation, and distribution, but also to the costs of all alternate sources of energy when delivered to the consumer.

LOUDEN, L. R., Dresser Magcobar, Houston, Tex., and BILLY W. AUD, Dresser Olympic, Houston, Tex.

INTERDISCIPLINARY APPROACH TO SUCCESSFUL DRILLING

A multidiscipline approach to well planning has proved successful in determining "drillability" lithology and pressure profile in unknown or relatively undrilled basins. The marriage of seismic velocity information to classic historical geology, facilitated by translation of the combined information into drilling parameters, guides the planning and drilling of technical wildcats. Work done in the Santa Barbara Channel and a case history of the GHK #1-22 Farrar are examples of the multidiscipline approach.

MASON, JOHN W., Amarex, Inc., Oklahoma City, Okla.

HAMON LOCKE MULTIPAY FIELD

The Hamon Locke field on the Wheeler-Roberts county line in the Texas Panhandle was discovered late in 1970 by the Jake L. Hamon No. 1 Locke. To date, 4 wells have been completed and 1 is currently staked. Producing formations are the Ellenburger, Simpson, Hunton, and Brown dolomite with proved productive granite wash and Mississippian zones behind pipe in 3 of the wells. The field is structurally controlled and was drilled on seismic information refined by subsurface data from 2 nearby dry holes which were also drilled on seismic information, emphasizing again the need for continuing review and interdisciplinary coordination. The hydrocarbons produced are significantly different from other nearby lower Paleozoic fields, and some conjectures are presented to stimulate further work to account for these differences.

MOORE, CARL A., Univ. of Oklahoma, Norman, Okla., and BIJAN ESFANDIARI, Univ. of Tehran, Tehran, Iran

GEOCHEMISTRY AND GEOLOGY OF HELIUM

Helium is formed as a product of radioactive decay of trace elements in several rocks and minerals. It is being produced continually in the earth's crust by the disintegration of uranium, thorium, and other elements which are alpha-particle emitters.