miles southeast of the town of Canadian in Hemphill, Texas. Buffalo Wallow is considered one of three major ultra-deep Hunton discoveries in the Western Anadarko Basin in the last 5 years. Shallow structural interpretation intrigued oil finders with the anomalous condition of the area for years, yet it remained for Phillips to complete the No. 1 Carwile, (the Gageby Creek discovery well for 320 MMCFG/D from the Hunton with 123' of effective pay) to spur the search for similar deep production. Seismic work, utilizing the new stacking method was undertaken by many companies in the area; and, apparently several mapped approximately the same fault structure. This conclusion is drawn by the rush of companies to get a piece of the action. And, subsequently, the Union-No. 1 Bradstreet was commenced in July of 1966, projected as a 20,000' Hunton test. While the Union-Bradstreet was drilling, Phillips Petroleum Co. made their second major Hunton discovery, the Washita Creek Field, approximately 10 miles east, and completed for 265 MMCFG/D in November of 1966. Following the Phillips-Bowers Washita Creek discovery, the Union-Bradstreet was completed as the discovery well for Buffalo Wallow in the Hunton for 73 MMCFG/D, September 14, 1967, as the third major Hunton discovery found in a span of 4 years in an area of less than 200 square miles. Certainly, the success of the Hunton is all too apparent now when, within three short years, the Buffalo Wallow Field has 13 completed wells, 3 dry holes, and 2 wells in process of drilling, with a proven reserve of almost one trillion CFG.

*Jake Hamon Company, Amarillo, Texas

## PETROLEUM POTENTIAL OF THE UNITED STATES

IRA H. CRAM*

April 19, 1971

Important oil and gas fields continue to be found in unusual and surprising geological environments. Each discovery improves the petroleum geologist's understanding of the habitat of oil, and sharpens his oil finding ability. An adequate supply of domestic petroleum in the future depends upon such unique discoveries to a greater extent than in the past.

The existence of many more such accumulations and others at customary or greater depths in both the less explored and more thoroughly explored areas is not doubted by the authors of the Association's Memoir 15 "Future Petroleum Provinces of the United States." They have approached the problems of the country's petroleum potential positively, not negatively, and have expressed their opinions qualitatively and usually quantitatively. An enormous amount of oil and new geological and other exploratory data has been assembled which should provoke alternate opinions leading to additional discoveries.

The extent to which the vast petroleum resources are reduced to possession depends on the impact of ever-changing economic and political events upon the rising tide of technological competence and knowledge. The role of the petroleum geologist as earth scientist, explorer and salesman is destined to grow in importance, particularly onshore in the conterminous United States where a significant percentage of the visualized undiscovered crude oil and natural gas is in stratigraphic traps, combination stratigraphic and structural traps, reefs, and complex structural situations.

Clearly a great deal more exploratory drilling is needed, not only to explore such traps, but to provide much needed geological and production data in the large undrilled areas. To the extent industry and government policies militate against expanded exploration, particularly drilling, a large part of the petroleum resources will rest uselessly in the ground.

*Consultant, Austin, Texas

## PEORIA FIELD, ARAPAHO COUNTY COLORADO

GEORGE D. ECKER*

May 24, 1971

The Peoria Field, approximately forty miles east of Denver in Arapahoe County, Colorado, is situated in the south-central portion of the Denver-Julesburg Basin. The field was discovered in July, 1970, by Tom Vessels in partnership with Amoco Production Company (Pan American Petroleum Corpo-

ration). The discovery was drilled in an attempt to extend the prolific production developed in the 1950's in Washington County southwestward into Arapahoe County. As of March 1, 1971, the field had fifty-three wells producing from the Lower Cretaceous "J" sand. Cumulative production was 742,000 barrels of oil. Development drilling is still being conducted.

Production in Peoria is from a Lower Cretaceous Muddy "J" channel sand with a maximum thickness of forty-five feet. Porosities are as high as 19%, with permeabilities ranging as high as 1,400 md.

Relatively shallow drilling depths (top of pay at 6,500 feet), inexpensive drilling costs, and high yield wells exhibited by this field have been the stimulus for extensive drilling activity in the south-central D-J Basin.

*Amoco Production Company, Denver, Colo.

## PROJECT RULISON AND OTHER UNDERGROUND NUCLEAR TECHNOLOGY

G. W. FRANK*

December 14, 1970

Austral Oil Company's Project Rulison is the second joint industry-government sponsored gas stimulation experiment in the United States using a nuclear explosive, and was made possible under the provisions of the United States Atomic Energy's Plowshare Program.

Project Rulison, detonated September 10, 1969, was designed to evaluate the potential of developing the 2500'-3000' thick gas bearing Mesaverde formation in the Rulison Field, Garfield County, Colorado, using nuclear explosives.

The 40-kiloton explosive was emplaced and fired at a depth of 8426' inside 10-¾" casing on a .72" diameter multiconductor armored cable. The detonation created a chimney in the order of 300-350' high and 75' in radius.

The project was accomplished in complete safety without harm to any person. Gaseous radiation concentrations were approximately ¼ of that originally predicted and have radically declined during the early testing.

It is presently apparent that nuclear explosives can be developed which will have in the order of 1/10th the Rulison residual tritium, the main gaseous radionuclide of concern.

Although technical feasibility has been proven, economic feasibility has not yet been proven. It appears, however, that the use of multiple explosives fired simultaneously in the same wellbore will expose the massive sand thickness to a single elongated chimney and consequently greatly increase the flow rate.

At this point many of the major technological problems have been solved and the remaining ones will surely be solved in the near future. If this technology is successful it could be extremely helpful in meeting our increasing energy requirements.

*Austral Oil Company, Inc., Houston, Texas

## PETROLEUM EXPLORATION

DR. WILLIAM C. GUSSOW*

November 9, 1970

Recent studies in petroleum exploration have been concerned with the application of reservoir and production engineering to the problems of migration and accumulation of gas and oil underground. The law of gravity explains the distribution of gas, oil, and water in a reservoir, but the principle of differential entrapment explains why many good traps are dry while adjacent structures are prolific oil fields. This simple principle explains why some traps are gas fields and contain no oil and why gas is trapped downdip in some areas while synclinal oil occurs in others. In reality, the principle of differential entrapment carries the structural theory to its logical conclusion. Whenever two or more fluids of different gravities accumulate in a trap, the heavier fluid is displaced. This is a fundamental law and is the basis of differential entrapment. Every oil accumulation owes its origin to the fact that a lighter fluid (oil) displaces a heavier fluid (water). Without differential entrapment, there would be no oil fields.

*Union Oil Company, La Brea, California