years eleven deep (Mississippian or Ellenburger) wildcat tests have been drilled in the Texas Panhandle part of the Anadarko basin. These have served to give some insight into what the structure and deposition in this part of the basin is going to be: a few questions have been answered and a great many more have been posed which only additional drilling can answer.

18. EASTERN COLORADO OIL AND GAS PROSPECTS, by Harry W. Oborne, Colorado Springs, Colorado.

Prospective regions of eastern Colorado are divided naturally into two main classes: the basins which have in the past, because of depths, been thought of as limited to Cretaceous possibilities; and those areas in which the Paleozoic formations present the principal, or only, chances of production. With the advent of deeper drilling techniques the phantom barrier to prospects below the Cretaceous in the basin areas tends to disappear. This barrier is also modified by the fact that excessive drilling depths, formerly predicated for the deeper parts of the basins, can be scaled down in line with sections measured along the Rocky Mountain front, and from a few scattered well logs in the east.

The areas of Cretaceous prospects are the three basins in the western part of the region. Oil and gas have long been produced from all three of these basins and the recent discovery in southwestern Nebraska has centered much attention on that and other parts of the Denver basin. Additional prospects exist within the Cretaceous, and beneath the Cretaceous, especially in large parts of the Denver basin.

The areas which have heretofore been considered the particular loci of Paleozoic prospects are the Sierra Grande uplift and the so-called Las Animas arch, plus the territory north and northeast toward the northeast corner of the state. The Apishapa uplift, connecting the Sierra Grande uplift with the Wet Mountains, and separating the Denver and Raton basins, has been included in this area of Paleozoic prospects. Parts of these areas still hold excellent prospects, especially on the flanks of the uplifts, and in areas east and north.

In the literature Sierra Grande uplift and Las Animas arch have been used as synonymous terms. The Sierra Grande uplift is a very old feature in New Mexico and southern Colorado, and the so-called Las Animas arch is a much younger feature due mainly to the subsidence of the Denver basin contemporaneous with Cretaceous sedimentation, and probably modified by later Laramide orogeny. The northwestward continuation of the Anadarko basin, in the older rocks, may be traced directly across the present surface expression of the Las Animas arch.

The geologic history and paleogeography are briefly traced to show what the writer believes to be excellent prospects in the Paleozoic formations in the deeper parts of the basins, especially the Denver basin, at what are not drillable depths.

19. RESULTS OF HYDRAFRAC TREATMENTS, by W. D. Owsley, Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

The Hydrafrac process, originally developed by the research department of Stanolind Oil and Gas Company, has now been in use throughout the industry for 10 months. The results during the research period and those in the succeeding months of commercial operation have been of great benefit in increasing the production of oil and gas. The Hydrafrac process generates new and increased effective permeability in the well. This is accomplished by hydraulic fracturing of the particular zone being treated. The fracture formed is held open by graded sand carried into it with the fracturing medium. This sand acts as a propping agent to hold open the fracture thus produced. While the Hydrafrac process is applicable to many types of formations it is, nevertheless, highly important that the well conditions be properly evaluated before a decision is made to use the process. Such factors as thickness of the zone, state of depletion, permeability and the general condition of the well with regard to isolation of the zone, must be taken into account in the planning of a job. Where applied in a properly planned manner, either as a completion method on new wells or for rejuvenation of existing wells, the Hydrafrac treatments have resulted in a high degree of success. It is believed that this method will give greater ultimate recovery, as well as a higher rate of recovery. A complete résumé of the Hydrafrac process treatments is given in the paper with regard to various areas, formations, and production history of the wells thus treated.

20. GEOLOGIC RESPONSIBILITY IN SEISMIC EXPLORATION, by B. W. Beebe, Anderson-Prichard Oil Corporation, Oklahoma City, Oklahoma.

The seismograph, after more than 20 years of successful operation, remains the most important mechanical instrument available to assist in locating new petroleum reserves. However, it is evident that the "honeymoon" has been over for some time, that the seismograph in the hands of the geophysicist alone is not the most efficient method of operation. The seismograph as an instrument has proved its usefulness and is not on trial, but in far too many instances its employment and the interpretation of observations have either failed or left much to be desired. The primary responsibility in any geophysical exploration program with the object of locating commercial deposits of petroleum is and must be jointly that of the geologist and geophysicist. Geologists as a group have failed to recognize and assume their full share of the responsibility insofar as geophysical prospecting is con-