The A.A.P.G. executive committee held a meeting on Wednesday, May 14, at which all members were present.

Officers of the Tulsa Geological Society at the time of the convention were: V. L. Frost, president; Garvin L. Taylor, 1st vice-president; Eugene P. Neal, 2d vice-president; and Mrs. H. V. P. Branson, secretary-treasurer. The convention committee included the following chairmen: general chairman, Frank R. Clark; program, John G. Bartram; reception, W. E. Horkey; entertainment, Paul E. Fitzgerald; student panel discussion, A. I. Levorsen; exhibits, Thomas E. Matson; registration, Glenn R. V. Griffith; housing, C. T Jones; finance, E. Floyd Miller; field trip, Ralph A. Brant; and publicity, Philip C. Ingalls.

## ABSTRACTS OF TECHNICAL PAPERS

H. H. KAVELER, Phillips Petroleum Company, Bartlesville, Oklahoma. The Obligation of Petroleum Technologists.

Technology is the art of applying the laws and principles of science in an economic manner for social benefit. The American petroleum industry stands as an outstanding example of the social service accomplished by technology in competitive industry under the American republican form of government. Petroleum and its products are made available in large volume and at low cost to all citizens. Petroleum and its products are the bulwark supporting American industry, military defense, and standard of living. Modern petroleum production technology is relatively new, although it is founded on long established scientific principles. The new production technology is founded in part on the principle that America must conserve its petroleum resources, and in remaining part on the principle that the production industry must continue to supply America with petroleum in large volume at ever lower and lower cost to consumers. The new technology came into existence with the acceptance of the principle of petroleum conservation. Conservation involves the concept of "wise use" in elimination of obvious waste and the utilization of practices that bring about the maximum recovery of oil and gas consistent with economic use. Conservation is accomplished by maintaining production within the limits of reasonable market demand for petroleum and by resort to practices that efficiently utilize reservoir energy usually by the practice of pressure maintenance operations.

The objectives of conservation are best achieved with the new technology by resort to unit operation of oil and gas pools whereby the inescapable necessity to divide the common source of supply among its owners is accomplished before the oil and gas are recovered in order to eliminate destructive competition and to permit all owners to work cooperatively to reduce the maximum amount of the petroleum to beneficial use.

The public has a very substantial interest in conservation, and, therefore, the modern petroleum technology is of great public benefit. In addition, a large segment of the public has direct or indirect ownership of the petroleum industry and a large segment of the population finds employment. Conservation is achieved in the leading oil and gas states through appropriate legislative enactments which are accomplished only as a consequence of public understanding of the problem involved. An obligation rests upon technologists interested in petroleum production who have a regard for the importance of petroleum conservation to educate the public and those charged with the administration of conservation laws in the purpose, the method and the objective of the new production technology.

Any competent person can practice the new production technology. It is not, however, a field for amateurs, the uninformed, or the individual who would substitute opinion for fact and who would be satisfied to sacrifice a part of the resource for individual gain. Under the new technology, outmoded concepts in respect to well spacing must be re-examined, and an understanding of the conservation aspects of unit management and operation of common sources of supply must be developed.

JOHN G. BARTRAM, Stanolind Oil and Gas Company, Tulsa, Oklahoma. Regional Geology of the Pennsylvanian in the Mid-Continent Area.

A large proportion of the Pennsylvanian sediments in the Mid-Continent area are dark shales, which tend to grade eastward into sandstones, and westward into limestones. Most of this dark shale is believed to have come from a land mass (Llanoria), located to the southeast. The large part of the rocks in this land mass consisted of closely-folded, faulted and uplifted shales, sandstones, and limestones previously deposited in geosynclinal troughs, during Mississippian and earlier Paleozoic periods.

The Pennsylvanian is divided into six series—Springer, Morrow, Atoka, Des Moines-Strawn, Missouri-Canyon, and Virgil-Cisco. Several maps show regional conditions of deposition, the location of land masses, and the source of sediments during each of these series. Since it is impossible at this time to satisfactorily show the Springer, Morrow, and Atoka on separate maps, they are presented together on one map.

At the beginning of the Pennsylvanian, during Springer time, the sea was quite restricted and sediments of that age were deposited only in southern Oklahoma, in adjacent parts of Arkansas and North Texas, and in the Marathon region of West Texas. During Morrow time, the Pennsylvanian sea expanded somewhat and dark shales and limestones were deposited over a larger area. During Atoka time, conditions changed markedly in the Mid-Continent area, and the Wichita period of orogeny occurred. In addition to the continued uplifting of the Llanoria or Ouachita Mountain land mass to the southeast, three other different kinds of uplift occurred. One set of the new uplifts formed large anticlinal islands, such as the Wichita Mountains and Uncompahgre Uplift, trending northwest-southeast in the expanding Pennsylvanian sea. These large islands were eroded rapidly and clastics accumulated on their flanks. Some of the other uplifts were smaller and were rapidly buried by later sediments. The sea expanded to form new marine basins between uplifted land-masses.

During Des Moines-Strawn time, the Pennsylvanian sea probably extended to its maximum limit in this region. Thick sands which have produced much oil were deposited on the eastern side of the area and many limestones accumulated in the western area.

During Missouri-Canyon time, there was relatively little uplift or structural movement. Conditions in the seas were most favorable for reef building by calcareous organisms, particularly in West Texas.

During Virgil-Cisco time, another period of orogeny, the Arbuckle, occurred in southern Oklahoma and extended into the Panhandle of Texas. The Arbuckle and Wichita mountains were again uplifted and the thick series of Pennsylvanian shales and sandstones in the Ardmore and Anadarko basins were folded and faulted to form traps that produced many prolific oil fields.

ROBERT J. BEAMS, Sunbeam Oil Company, Ardmore, Oklahoma. Oil Development and Possibilities of Springer Sandstones.

The Springer sandstones of the Ardmore and Anadarko basins have attained in recent years a prominence previously held only by the Wilcox sands in the oil industry of Oklahoma. This paper is given in recognition of this current interest, and is intended as a progress report on those aspects of the Springer which are pertinent to oil exploration.

The Springer formation is composed of fine grained sandstones and dark gray to black fissile shales in the Morrowan series; overlain by the lower Dornick Hills formation and underlain by the Mississippian Caney formation.

The present subsurface distribution of the Springer was determined by erosion which took place during the Wichita orogeny and the Arbuckle orogeny. The truncated boundaries of the formation, as shown, represents the outcrop pattern of these strata previous to the deposition of younger Pennsylvanian, Permian, and Cretaceous beds. The Springer formation or its stratigraphic equivalent is present in the Ardmore, Anadarko, and McAlester basins and the Ouachita Mountains.

As shown by local conditions in typical fields, the Springer sandstones are oil productive from both anticlinal and stratigraphic traps and often associated with complex systems of faults and tightly folded beds.

A brief discussion of the reservoir characteristics including ultimate oil recoveries reveals the motivating force for the intensive search for Springer oil.

Geological comparison of oil producing fields with unexplored areas indicates that vast oil accumulations are undiscovered. These Springer sandstone potentialities are of a sufficient magnitude to insure Oklahoma of much additional exploration and production activities for many years.

T. E. WEIRICH, Phillips Petroleum Company, Bartlesville, Oklahoma. History and Petroleum Geology of the Early Pennsylvanian Rocks in Eastern Kansas and Eastern Oklahoma.

Early Pennsylvanian sediments exhibit the existence of a continental shelf in the sea progressively migrating northwestward in sympathy with subsidence of the Ouachita trough. This platform is defined on the northwest by an encroaching shoreline, on the southeast by a migrating flexure or hinge line. Littoral deposition, that is, barrier beaches, bars, lentils and general discontinuity prevailed in the sands over the shelf. Accumulation of commercial petroleum, whether in anticlinal or stratigraphic traps, is limited to the shelf. This condition is strong evidence of local origin, migration and accumulation of oil. The progressive migrating character of the shelf may be depicted by a series of isopach maps grouping the strata as follows: 1. Atoka and Hartshorne; 2. McAlester, Warner and Savannah ("Lower Cherokee"); 3. Boggy ("Middle Cherokee"); 4. Stuart, Thurman, Senora and Calvin ("Upper Cherokee").

HENRY J. MORGAN, JR., Atlantic Refining Company, Dallas, Texas. Paleozoic Beds South and East of the Ouachita Folded Belt.

In recent years five wells have been drilled in the rearward areas of the Ouachita Folded Belt. These wells, under the old conception, should have either encountered pre-Cambrian rocks or the usual sequence of dark, steeply dipping, varyingly metamorphosed beds characterizing the Ouachita Folded Belt.