is ascribed to increased efficiency in shortening rigging-up and shut-down periods due to greater demand for rigs and crews.

A clear correlation is shown between the number of wildcats drilled and the number of discoveries made. The less obvious correlation between geological employment and discoveries may be due to the lapse of time between the working-out of a play and the drilling of it, in some cases 5 or 10 years. The increased demand and price of dry gas is reflected in the increasing number of gas field discoveries.

The correlation of reserves, production, and new reserves by discovery is discussed. The new reserves discovered have failed to keep pace with the production. The production, which reached a new high of 311 million barrels in 1944 and possibly will reach 315 million in 1945, has been maintained by increased development drilling and the discovery of new pools and extensions. By the end of the war the California reserves had declined only 185 million barrels, from 3533 million in 39 to 3348 million in January, 1945. The effect of Order M68 on development drilling is well marked by a slump, while practically no effect is visible on wildcat drilling. As was intended, that order provided materials to keep up the pace of exploration at the expense of development drilling. The prompt recovery of development activity by the fall of 1942 and its rapid increase from then through the war is illustrated by the curve.

The amount of oil found by wildcatting alone, that is, the amount of oil in the discovery pool only of the fields is compared with the total ultimate by years. The curve shows that approximately three-eighths of the oil has been in pools discovered by later exploratory drilling.

Also, it is seen that the discoveries in California have come in steps of half billion or more size additions to reserves at intervals of 8 to 10 years which are timed by advances in geologic exploration, drilling technique, and seismic exploration. The present year should be the period for another advance in discoveries according to the chart, but so far has not differed from the last 6 or 7 years in volume of oil found. The writer estimates roughly 25 million barrels of oil as the reserves of the new fields. With the data so far in hand no estimate of the new gas fields or of the new pools and extensions can be given.

The various exploration methods or combinations of them leading to the drilling of the dry holes and discoveries are compared graphically. The chart showed 20 wildcats to be successful out of a total of 202 drilled. Of these only sixteen will eventually be regarded as having found fields rather than extensions, and five of these were of dubious commercial value. The greatest footage and number of wells were drilled on subsurface work, with both seismic and surface work less and about equal. Other methods and combinations had much less footage. The over-all wildcat success percentage was 10.2%. New-pool tests were 31% successful and outposts 42% successful. It appears that at the present rate 1945 will end with somewhat less wildcat footage but with a greater number of wells drilled. Other types of exploratory wells will exceed substantially 1944 both in footage and number.

EVAN BURTNER, Standard Oil Company of California, Taft. Buena Vista Hills (27-B Pool).

The Buena Vista oil field is situated on the southwestern edge of the Great Valley of California immediately north and east of the town of Taft. It has produced oil since 1909 from two formations, the San Joaquin clays and Etchegoin, both of Pliocene age. Although the "27-B" pool was not discovered until March, 1944, the sand had been penetrated as early as 1915, but because of unfavorable structural position, no production was realized.

The hills consist of two major anticlines, the United and the Honolulu, in northwest-southeast *échelon*, each anticline having separate closure, but with production continuous across the saddle. Limiting closure is determined at the intersection of the United anticline on its northwest plunge, with the Midway Valley syncline. Closure in the Pliocene increases with depth, due to over-all thinning in a southeasterly direction, to a point of minimum section at about the NW. ¼ of Sec. 9, 32-24. The southwest flanks of the folds are locally oversteepened, without resultant shift of axes, suggestive of similar folding. A probable fault, referred to as the "Maguire" fault, separates the old "Maguire" sand pool from the "27-B" pool. The "Maguire" sand is considered to be the southeastern extension of the "27-B" sand.

The assignation of the "27-B" sand to the Etchegoin (Pliocene) is considered erroneous. Conclusive faunal evidence is lacking, but from other evidence available at present, a Pliocene-Miocene break is preferred above the "27-B" sands.

A maximum net sand thickness of about 110 feet occurs in Sec. 36, 31-23. The individual sand lenses (E_1-E_4) pinch out not far downdip on the northeast flank of the hills, at higher structural elevations than is the case on the southwest flank. This is the apparent reason for the much higher water table on the northeast flanks,—a case of water entrapment against a permeability barrier. Edge water on the southwest flank is found to be 300 feet structurally lower than the structural spill point. This is explained by pinch-out of the individual sand lenses in the W. ½ of Sec. 28, 31-23.

At the peak of the war demand the pool produced at average rates as high as 40,275 barrels per day. The current maximum efficient rate is set at 25,000 barrels per day, which permits top wells a daily production of 180 barrels, subject to a gas restriction in the case where a well produces gas at rates in excess of 600 cubic feet per barrel.

The absence of a water drive will probably require some form of pressure maintenance for maximum oil recovery.

JOSEPH HOLLISTER, consultant, Gaviota, California. Geology of Tierra del Fuego, South America.

The paper is a brief résumé of the stratigraphy and structure of that part of Chile. The presence of a Cretaceous-Tertiary basin, 20,000 feet or more deep, east of the main Cordillera, is pointed out and the suggestion made that a landmass lay on the west as well as one on the east of this basin during late Mesozoic and Tertiary time.

THOMAS CLEMENTS, University of Southern California, Los Angeles. Stratigraphic Section East of Bogotá, Colombia.

A geologic traverse was made by the author in 1939 along the road from Bogotá to Villavicencio, a distance of 122 kilometers. The purpose was to attempt to correlate the rocks of the little known east side of the Cordillera Oriental with the better known formations of the Magdalena Valley on the west side of the mountains.

The rocks exposed along the traverse are sedimentary and metamorphic, and range in age from possible Cambrian to Pleistocene; only the Cretaceous rocks yielded abundant fossils. Igneous rocks reported to occur both north and south of the line of traverse were not encountered in this particular section, although the basal conglomerate of the Cretaceous contains fragments of granite.

The formations observed along the road, with their respective ages, are the following: Quetame, Cambrian (?); Vinculo, Devonian (?); Pipiral, Carboniferous (?); Colorado, Permian (?); La Argentina, Cretaceous (?); Cáqueza, Cretaceous (Lower Valanginian); Villeta, Cretaceous (Upper Valanginian, Hauterivian, Barremian, and Aptian); Guadalupe, Cretaceous (Middle Albian and Cenomanian); Buena Vista, Tertiary (?); Guaduas, Tertiary, Eocene (?); terraces, Pleistocene.

The principal structural features are the Bogotá fault, an overthrust to the west; the Cáqueza fault, an overthrust to the east; the San Martín fault, normal, with the westerly block downthrown; the Argentina fault, normal, with the easterly block downthrown; and the Cientoquince fault, an overthrust to the east. In addition, the Guada-