New oil discoveries and expansion of Green County oil field have made 1959 the best year in the history of oil production in Kentucky with 21,007,141 barrels produced to end of September. Green and Taylor counties had produced respectively 8,015,382 and 548,462 barrels in the same period from approximately 2,000 wells at depths from 350 to 500 feet. The Silurian Laurel dolomite, the main pay of the field, is found at depths of a few feet to about 60 feet below the New Albany black shale. Intercrystalline and vuggy porosity averages about 12 per cent and ranges up to 16 per cent. Permeabilities vary from a few up to 2,500 millidarcys. Thickness of the pay varies from a few feet to 25 feet, with 12 feet common.

An abundance of highly saline water produced with the oil from the field has posed a serious pollution problem of fresh-water supplies. The Kentucky Water Pollution Control Commission is making progress toward correction of the situation.

The search for oil has spread throughout central and eastern Kentucky on both flanks and crest of the Cincinnati arch. New oil fields and pool extensions have been found in Lincoln, Metcalfe, Allen, Barren, Hardin, Simpson, Cumberland, and Clinton counties. These relatively shallow areas produce from Lower Mississippian, Devonian, Silurian, and Ordovician rocks. Porosity zones truncated by New Albany black shale and fracture porosity in the Ordovician rocks form most of the oil traps. Some reef production is present in the Granville pay of the Ordovician in Clinton County.

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Geologic Mapping of Submerged Continental Margins

In the late nineteenth century it was discovered that rocks dredged by fishermen from the continental slope contained Cretaceous and Tertiary fossils. In the mid-1930s, Stetson systematically dredged such rocks from the Georges Banks' submarine canyons, concluding that the canyons had been cut deeply into a presumed sequence of "foreset" and "topset" beds.

Subsequently ancient rocks have been discovered on linear segments of the continental slope not near submarine canyons and it now appears that the continental slope from Newfoundland to Puerto Rico forms a continuous outcrop of Tertiary and Cretaceous sediments.

Echo-sounding profiles of the continental slope show a succession of topographic benches and gradient changes which have been correlated in a few areas with the outcrop pattern determined either by coring and dredging or by extrapolation from nearby drill holes. Scattered and less complete data from other parts of the world suggest that continental-slope outcrop benches are of common, if not of general occurrence. By correlating benches dated and verified by dredging, it is possible to construct geological maps of the continental slopes. In addition to greatly adding to the geological understanding of the continental shelves, extensive continental slope outcrops are of great significance in such major geological problems as the origin of the continental slopes and the origin of the continents and oceans.

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Scientific Objectives of Mohole, and Predicted Section

The major scientific objective of the AMSOC project is to obtain samples of the upper part of the earth's mantle and to determine the nature of the Moho discontinuity. Boisse's analogy of 1850 suggesting that meteorites were a fair approximation of the composition of the earth's interior was a brilliant idea for its day, but is too inexact for present purposes.

Above the discontinuity is a layer commonly called the "crust" and generally considered to be basalt. It is extraordinarily uniform in thickness suggesting that its base represents a phase transition and that the Moho under the oceans might represent the level of some isotherm, or past isotherm, at which a reaction took place.

Above the "crust" is a layer of variable thickness and seismic velocity thought to be consolidated sedimentary or volcanic rocks. Finally one comes to the unconsolidated sediments of the ocean floor which are a few hundred meters thick and no doubt resemble the material obtained from shallow cores. In these last two layers one might hope to find fossils going far back in the history of the oceans and to derive from this record information of extraordinary scientific importance.

The following predictions are made.

(1) The mantle will be peridotite resembling the olivine nodules found in basaltic volcanoes and St. Paul's rock.

(2) The "basalt crust" will be serpentinized peridotite, hydrated mantle material.

(3) The Moho discontinuity represents a past isotherm above which serpentine was a stable phase.

(4) The sedimentary column will be very incomplete and have many great hiatuses.

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Geometry of Producing Mesaverde Sandstones, San Juan Basin

Within the San Juan basin the sandstone zones that occur at the top and bottom of the Mesaverde group were not deposited as a continuous blanket sand. In some areas thick, relatively clean sandstone units occur. In other areas thin, poorly sorted sandstone zones are found. These sandstone units exhibit a definite geometric pattern of distribution. Sandstone beds of the Point Lookout formation were deposited as a shoreline phase of a sea regressing northeastward. Sandstone zones of the Cliff House formation represent the shoreline of a sea transgressing southward at a later date. The shoreline along which these sands were deposited moved rapidly across some areas. In other areas, it remained stationary for relatively long periods of time. The thicker sands correspond to places where the shoreline remained stationary for the longer periods of time.

The successive positions of the various Cliff House and Point Lookout shorelines have been established both vertically on cross sections and laterally on maps. Those positions where the shoreline stabilized for relatively long periods of time are apparent in the form of "steps" that can be traced across the central part of the San Juan basin. The relatively thick, well sorted sandstone units that correspond with the positions where the shoreline stabilized have been divided into a series of "benches" of varying widths.

Excellent examples of major "steps" in the Cliff House shoreline can be seen in surface exposures in the southeast and northwest parts of the San Juan basin. Those "steps" exposed at the surface in the northwest part of the basin exhibit the same strandline trend and in general are correlative with the "steps" found in the subsurface.