overhanging banks, at depths of 7.5, 17, and 32 m, were deposited less than 185 years ago according to C^{14} dates. Historic records indicate that the major river discharge shifted away from this tributary about 100 years ago. Thus the canyon apparently was deepened by at least 25 m in 100 years.

It is concluded that canyon cutting can progress at rapid rates, that submarine processes can form tributaries, and that, therefore, a dendritic canyon pattern is not necessarily indicative of subaerial erosion.

K. B. HALL, Ojai, Calif., and JOHN F. CURRAN, Santa Barbara, Calif., consultants.

SUMMARY REPORT ON RECENT DEVELOPMENTS, SANTA BARBARA CHANNEL, CALIFORNIA

The Santa Barbara Channel is between the Oxnard plain in Ventura County on the east and Point Concepcion in Santa Barbara County on the west. It is approximately 75 mi long and 22 mi wide, and encompasses an area of about 1,650 sq mi. It is bounded on the north and east by the Santa Barbara County-Ventura County coastline and on the south by the westward-trending Channel Islands chain. Maximum water depth is 2,050 ft. The areal extent of federal acreage in the channel is approximately 1,250 sq mi.

Geologically, the area comprises the western half of the prolific oil-producing Ventura basin. More than $100 million has been spent on channel exploration during the past 20 years and has indicated substantial oil-producing potential.

On February 6, 1968, 165 bids totaling $1,293,601,113.26 were submitted on 75 of the 110 tracts offered for lease by the U.S. government. These covered the most promising of the known geologic structures within the federal channel area. Bids ranged from a high of $61,418,000 ($11,373.70 per acre) to a low of $92,736 (16.10 per acre). Four bids were rejected as too low for the tracts offered. The amount overbid by successful bidders totaled nearly $273 million. Exploratory drilling commenced immediately after the awarding of leases. All available drilling vessels and platforms are being utilized and activity has proceeded continuously.

Statistics covering exploration and development activity during the first year of channel operations under federal leases have been compiled.

ROBERT S. YEATS, Dept. Geology, Ohio Univ., Athens, Ohio 45701

ANACAPA RIFT, CALIFORNIA

The Channel Islands, like the Salinian block, have been explained as a granitic spur projecting westward into the Franciscan realm of coastal and offshore California. According to Ralph Reed, this spur was the autochthonous Anacapia, but according to P. B. King, the spur was an allochthonous sliver derived by lateral fault movement.

Both interpretations require a boundary fault south of the Channel Islands; actually, the fault picture is more complex. The Malibu Coast fault, arcuate and convex southward in plan, appears to extend from Beverly Hills across the Mugu-Hueneme submarine fan into the eastern Santa Barbara Channel north of Anacapa Island. The Santa Cruz Island fault, also convex southward, continues south of Anacapa.

San Onofre Breccia flanks both faults. San Onofre paleocurrent indicators on Santa Cruz Island and limited San Onofre outcrops on the northern tip of Santa Rose Island indicate the blueschist basement source was northeast of the Santa Cruz Island fault, thereby invalidating the Anacapia spur-silver concept. Instead, Anacapia is a microcontinent of granite with a Cretaceous-Eocene sedimentary veneer. The granite tectonically overlies Franciscan and is separated from the mainland by a rift bounded by the Malibu Coast and Santa Cruz Island faults.

The pre-Mohnian terrane in the rift is mainly volcanic, and presumably overlies Franciscan basement. This basement was exposed during Miocene time, when the Channel Islands raft drifted westward from the Santa Monica Mountains. At first, the ductile Franciscan welled up in the rift as a tectonic ridge, shedding San Onofre talus on either side. Subsequently, the ridge in the rift sank, and gravity tectonics were produced in the Santa Monica Mountains.

Palinspastic restoration of the 80-km lateral offset and the 20-km rift extension brings together similar Cretaceous-Eocene sequences of the Channel Islands and Santa Monica Mountains, and connects Poway Conglomerate clast assemblages of the islands with their mainland source.

B. NOLF, Fresno State College, Fresno, Calif.

MIOCENE VOLCANIC ROCKS OF NORTHERN CHANNEL ISLANDS, CALIFORNIA

(No abstract submitted)

BRUCE A. BLACKERBY, Fresno State College, Fresno, Calif.

MIOCENE VOLCANICS OF WESTERN SANTA MONICA MOUNTAINS, CALIFORNIA

In the western Santa Monica Mountains the Miocene volcanics consist of olivine basalt, basalt, andesite and dacite flows, breccias, pyroclastic rocks, volcanic-derived epiclastic rocks, and associated intrusive bodies of related compositions. Pillow breccias are abundant in some areas, almost everywhere near the base of the volcanic sequence. True pillow lavas are scarce. Chemical analysis of these rocks show them to be low in FeO, Fe_2O_3, and MgO, and very low in K_2O. Silica content ranges from 45.31 to 66.12 percent.

The more basic rocks generally are present in the lower half of the volcanic sequence and the less basic are present in the upper third of the sequence. However, there is no consistent variation trend and the tendencies are of limited usefulness for purposes of stratigraphic correlation. Some tentative statement about a rock's probable stratigraphic position can be made if it contains olivine or is largely a pillow breccia (low in sequence), or if it contains primary quartz with or without oxyhornblende (high in sequence).

A comparison of the volcanic rocks near the eastern end of their continuous outcrop area with those near the western end shows the latter to be of similar petrographic types but much more extensively altered. Toward the western end, fresh ferromagnesian rock types are scarce, the minerals having been replaced in part or completely by bowlingite, iddingsite, *etc.* The plagioclase is commonly affected and partly replaced by kaolinite or carbonate and commonly partly albitized. The glass has devitrified or has been replaced.

The dominant structure of the volcanics in the mountains is that of a north-dipping homocline broken by steep east-west or east-northeast to west-northwest faults. Broad east-west folding also is recognized at several places.