level and local tectonic movements combined to permit stream erosion. Bedrock outcrops have been seen from research submersibles. These outcrops are in the walls of the gullies as deep as 400 meters below sea-level. Only a thin film of silt covers the gullies which show a very youthful V-shape cross section. Their identity also is lost at depth beneath the encroaching prism. The gullies do not extend inshore close enough to trap sand, but may serve as channels for funneling silt to the basin in concentrated turbid flow. Likewise considerable transport may result from sheet flow of turbid layers down the slope itself. (*Buffington*)

CANYON TRANSPORT

Coarse-grained sediments moving parallel with the beach are intercepted by the nearshore heads of submarine canyons. Diverted seaward, coarse sand is known to be mixed with large amounts of plant material. The fill in these canyons accumulates rapidly and is marginally stable. Periodic failure causes mass movement of sediment down the canyons. The dominant present-day processes of sediment movement are (1) slow gravity creep of the entire sedimentary fill of the canyon, (2) progressive slumps and slides of parts of the fill, (3) sand flows and falls in areas where the bottom slopes exceed 30°, and (4) traction resulting from strong bottom currents of various origins. This mass movement of sediment causes both downward and headward erosion of the canyon walls. Box cores from basins fed by nearshore canyons suggest that the coarser and cleaner sand occupies the seaward side of the basin and fine-grained clay the nearshore side. Approximately 70 per cent of the sand contains current-derived structures, indicating reworking after deposition. (*Dill*)

DEEP-BASIN SEDIMENTATION

The California continental borderland contains 17 major basins 20–80 miles long, with depths to more than 1,600 fathoms and distances to sediment source 0–110 nautical miles. Numerous gullies and several large canyons are associated with the basins. Earlier investigations led to conclusions that the coarser silt- and sand-size sediments of the inner basins were largely turbidity-current deposits, whereas the finer sediments were hemipelagic. A recent study, based on the interpretation of more than 1,700 miles of continuous reflection profiles, has produced new data on the structure of both the regional rocks and the basin sediments. The principal objective has been to differentiate between sequences of folded and faulted pre-orogenic rocks which form the present topographic basins, and post-orogenic sedimentary fill of these basins. Sections accepted as post-orogenic fill are divided into turbidity-current and hemipelagic deposits. Post-orogenic sediment thickness is also determined areally to define geographic distribution and relation to topographic features. It is concluded that deposition by turbidity currents has been of paramount importance, virtually to the exclusion of hemipelagic deposition. Because relatively fine sediments constitute the bulk of the basin fill, this conclusion is incompatible with earlier theories which classify only the relatively coarse-grained layers as turbidites. It is postulated (1) that the fine turbidites are of a very low-density, low-velocity variety with a shelf-depth origin, (2) that these layers travel diagonally from the shoreline under control of downslope gravity flow, orbital wave motion, and local tidal currents, (3) that these turbid layers commonly intercept canyon and gully systems where they then flow long distances down distributary systems to basin floors and basin-slope aprons where gradual dissipation occurs, and (4) that they do not erode or carry shallow-water forms into the deep basins, but are deposited slowly and gently enough to be incorporated with the benthonic forms. (*Moore*)

CECIL, CHARLES B., and M. T. HEALD, Department of Geology, West Virginia University, Morgantown, W.Va.

Experimental Investigation of Effects of Coatings on Quartz Growth

Observations made on sandstones indicate that in many places coatings on quartz grains may have inhibited the development of secondary quartz. Experimental data substantiate these observations in that thin synthetic coatings of muscovite, chlorite, kaolinite, and illite inhibit the development of synthetic secondary quartz. Basal plates of quartz were coated with these materials and placed in the growth zone of hydrothermal reactors at temperatures ranging from 300°C. to 330°C. and pressures from 6,000 psi. to 10,000 psi. Solutions of 0.03M K_2CO_3 were used as the solvent.

The precise effects of calcium carbonate and iron oxide coatings could not be determined because these materials altered to calcium silicate and iron silicate. However, thin coatings of these silicates were effective in restricting the formation of secondary quartz. Quartz grains naturally coated with clay minerals and iron oxide also showed practically no growth; whereas clean sands became highly cemented under the same experimental growth conditions.

If the various mechanisms for the formation of coatings are understood and environmental conditions of deposition are known, then it may be possible to predict the location of zones in which considerable porosity would be preserved by grain coatings which restricted the development of secondary quartz.

CHAVE, KEITH E., and CALVIN C. DAETWYLER, Lehigh University, Bethlehem, Pa.

Recent Shallow-Water Carbonate Sediments

The "feedback" from studies of Recent carbonate sediments to studies of ancient carbonate rocks is small. The reason for this unfortunate state of affairs is that the approaches used in the two problems are so different. For example, the materials are different; carbonate sediments are conventionally nearly pure carbonate, whereas carbonate rocks contain up to 50 per cent non-carbonates.

Sediment studies usually involve rather elaborate size analyses, mineralogic studies, and individual particle descriptions. For most carbonate rocks diagenetic alteration has made size analysis difficult or meaningless, the minerals have changed, and only a part of the original particles can even be recognized.

The best understanding of carbonate rocks comes from conventional isopachous maps, stratigraphic associations, insoluble-residue studies, and fossil content. Only in a few cases can petrographic studies of size or particle type do more than support conclusions based on field relations.

The writers do not see any immediate way of changing drastically the methods for studying carbonate rocks. However, new approaches are possible in the study of sediments. By simply enlarging the