south of McKittrick. Small, flat, mud-cracked clay surfaces much like the familiar desert dry lakes developed on either side of the highway fill. The playa-like area east of the highway, where the occurrence was noted, is approximately 230 feet wide and 300 feet long.

The playa scraper, which was part of the fill material, is a crudely ellipsoidal boulder of quartz conglomerate weighing about 175 pounds. Movement was from close to the fill embankment along a slightly arcuate path for a distance of 99.2 feet toward the outer margin of the dense clay surface. The playa furrow developed on the still-moist surface is 20 inches wide, its edges having been raised ½ inch above the level of the surrounding area. Depth of the trail increased from 2 inches at the starting point to 2½ inches at the terminus. Mud pushed by the moving boulder was left as a low mound of dry clay in front of the scraper.

Movement of the scraper by wind does not seem to be a feasible explanation. Not only is the area sheltered from air currents, but the direction of movement is nearly at right angles to, and away from, the protective embankment. Transportation by ice floes is equally difficult to defend because the McKittrick area is one of rare freezes and it is doubtful that, even if freezing did occur, the thickness of ice formed would be sufficient to move a 175-pound boulder. Hydraulic action promoted by a drain beneath the fill is suggested as the possible motivating force for the McKittrick scraper. A similar occurrence at the Racetrack Playa in Death Valley, California, supports this supposition.

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NATURE AND RECOGNITION OF LIMESTONE TURBIDITES, MARATHON REGION, TEXAS

The Dimple Limestone (Pennsylvanian) of the Marathon region represents a period of carbonate deposition which interrupted the deposition of a thick terrigenous flysch section in the Ouachita geosyncline. It consists from north to south of laterally adjacent shelf, slope, and basin facies. The shelf facies is characterized by cross-bedded oölith carbonate grainstone. The slope and basin facies consist of sequences of distinctive limestone turbidite. Paleocurrent analysis indicates the existence of a uniform paleoslope dipping southward, with no apparent slope break.

Slope-facies turbidites (proximal turbidites) display a wide variety of internal characteristics. They may be graded, reverse graded, or non-graded in their lower parts, but grade abruptly in their upper parts. Basal parts commonly are conglomeratic, and carbonate-mudstone upper parts commonly are absent. Floating pebbles are common, and 3-foot-thick cross-bedded units have been observed. Small-scale cross-bedding is rare, and large-scale convolutions are abundant. Associated rocks are subaqueous slump conglomerate, spicular carbonate mudstone, and black spicular marl. This facies is 5 miles wide.

Basin-facies turbidites (distal turbidites) are nearly always graded. Pebbles are scarce, and the coarsest sizes are sand or silt. Carbonate mudstone beds are well developed, and were deposited from turbidity currents because (1) thick mudstone beds overlie thick graded beds, and (2) the normal pelagic sediment is radiolarian-bearing marl. Small-scale cross-bedding is abundant and convolutions are common. Thick beds are commonly massive, becoming laminated and cross-bedded on a small scale upward. Thin beds are commonly laminated. Associated rocks are black radiolarian-bearing marl and spicular chert.

Information gained from the Dimple Limestone was applied to lower Paleozoic rocks in the region, and revealed slope-and-basin-facies limestone turbidites in the Ft. Pean Formation and Maravillas Chert (Ordovician).

It appears that some geosynclinal limestone turbidite is the product of major tectonism, and is introduced from the cratonic side.

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AUSTRALIA, GEOPHYSICAL EXPLORATION, AND GREAT ARTESIAN BASIN

Petroleum exploration began in the Great Artesian basin of Australia in 1900 with the recovery of a strong flow of gas from a depth of approximately 3,500 feet in a hole drilled on Hospital Hill at Roma, Queensland, in an attempt to strengthen the town's artesian water supply. Drilling, both sporadic and intense (including 20 holes in the boom exploration year of 1929), has continued in the area through the years.

The lack of significant surface outcrops in much of the basin, and an unconformity at the base of the Mesozoic cover, made structural analysis by means of surface studies difficult, if not impossible. At the request of the exploration companies still operating in the Roma area in 1947, the Bureau of Mineral Resources carried out magnetic and gravity surveys and two experimental seismic surveys from 1947 to 1953. Electric logging of test wells was begun in 1954 but, by the mid-1950s, few of the basin's structural or stratigraphic problems had been solved.

Encouraged by liberal concession terms and government subsidies, serious geophysical exploration was started by the Australian-owned Associated Group in 1959. Major world oil firms joined the search in 1960 and the exploration techniques developed in other parts of the world were brought to bear on the problems of the basin.

Geophysical data, augmented by information from many test wells, have made it possible to "strip" the Mesozoic mantle from the basin and have disclosed not a single large basin but many basins. The commercial return from a large exploration investment has been disappointing to date but the chapter is not yet complete. Gas has been found in abundance, yet the Moonie field remains the only oil field of consequence. Moonie and Alton oil are reaching the market but gas still awaits a gathering network of pipelines.

The structural and stratigraphic framework of this great basin is still being drawn from a decelerated program of geophysical exploration. Somewhere within the assemblage of data probably lies the key to discovery of a major oil field which, when found, will provide the impetus for completion of the geophysical-geological mapping job.

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NOMENCLATURE FOR SEDIMENTARY ROCKS

Despite the many excellent papers on classification of sedimentary rocks, there is still so much loose and variable usage of names that it is not possible to be certain—or, at times, to have even a good notion—of the intended meanings of names found in the literature. If intelligible communication contributes anything to progress in sedimentary petrology, then the existing state of affairs must constitute an appreciable drag on progress. This paper is presented to re-draw attention to this lamentable state, to plead for wider employment of clearly defined names, and to offer a general system of nomenclature which could provide a means of achieving greater uniformity and precision in terminology.

This system is not in the least revolutionary but merely proposes restricted meaning for many existing names and a general scheme for systematically deriving other names. Guiding principles are: (1) names should be based on petrographic features; (2) these features should be established, not inferred; (3) the system for naming rocks should be flexible enough to apply both in the field and in the laboratory; and (4) names should be just as quantitative as the means of examination permits.

The classical concept of sedimentary rocks as mixtures of mechanical and chemical fractions is the principal nomenclatural basis in this system. The main name reflects the most abundant constituent of the dominant fraction. A finer division of silicate sandstone than is customarily made is believed practical and desirable.

Three terms are proposed to fill a conspicuous gap in terminology. *Aggregal* and *integral* describe textures of mechanical and chemical origin, respectively, but are defined petrographically. *Accretic,* a correlative term with clastic, describes aggregal textures composed of grains formed by accretion. Integral textures include those which are crystalline and amorphous.

The most important point concerning nomenclature is that the reader understand the terminology employed by the writer. This can be assured by reference to an explicit classification or nomenclatural system.

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CRITERIA USEFUL IN INTERPRETING ENVIRONMENTS OF UNLIKE BUT TIME-EQUIVALENT CARBONATE UNITS, CAPITAN REEF COMPLEX, WEST TEXAS AND NEW MEXICO

The Tansill Formation and the Lamar Member of the Bell Canyon Formation are the uppermost carbonate units equivalent to the Capitan Formation of West Texas and southeastern New Mexico. The Lamar is restricted to the Delaware basin and is equivalent to the lower and middle parts of the Tansill. Surface and subsurface stratigraphic studies by many workers show the Tansill-Capitan-Lamar to represent classic examples of shelf, shelf-margin, and basin deposits.

Because these units will continue to serve as a model for environmental studies of ancient rock, this paper reviews some of the criteria useful in distinguishing the various environments.

In the Guadalupe Mountains area, carbonate units of the Tansill Formation are predominantly light colored, well-bedded dolostone which grades shelfward into evaporite. Along the margin of the Northwestern shelf, the Tansill quadruples in thickness and becomes less dolomitic before grading into the Capitan Formation. Well-preserved depositional textures and sedimentary structures in Tansill carbonates suggest shallow-water environments ranging from supratidal flats and evaporite lagoons to shoal-water areas.

The Capitan Formation of Tansill-Lamar age consists of light-colored, massive to thick-bedded carbonate along the shelf margin and steeply dipping, massive beds of carbonate detritus along the basin margin. Texture and skeletal components of the Capitan are different from those of the Tansill. The Capitan generally is interpreted to be a shelf-edge and slope deposit.

The Lamar Member is a basinward-thinning tongue of limestone debris derived largely from shelf (Tansill) and shelf-edge (Capitan) deposits. It tends to be dark-colored, cherty, and evenly bedded but contains some slump structures. Units of micritic skeletal-intraclast calcarenite grading upward to micrite are common near its transition with the Capitan Formation. Farther basinward, the Lamar is characterized by evenly laminated micrite. Relative to the Tansill the Lamar is interpreted to have been deposited in deeper water (partly by turbidity currents) on a smooth basin floor.

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RELATION OF GRAIN SIZE TO SEDIMENTARY PROCESSES

Sand samples from known environments of deposition along the Gulf and East Coasts of the United States were collected to determine the effects of provenance, tidal range, average wave height, and sand supply on grain-size distributions. More than 300 samples were collected along profiles across 26 different tidal inlets, bays, and beaches. Samples were taken from the dune ridge to the plunge point, and in many places beyond the breaker zone. Additional samples were analyzed from the mouth of Southwest Pass of the Mississippi River.

At each sample locality information was collected on (1) the beach profile, (2) sedimentary structures, (3) tidal cycle, (4) average breaker height, and (5) relation to sources of sediment supply. The information gathered was compared with log-probability plots of the size distributions. Probability plots of similar form were grouped to determine how different physical conditions affected the size distribution, and to determine the presence of genetic associations.

Specific aspects of the grain-size distributions were found to be uniquely associated with differing depositional environments. The dune, swash zone, plunge zone, and wave-rippled sands exhibit characteristic size distributions even though they included samples from widely divergent provenance, energy, and tidal conditions.

Grain-size distributions of samples collected from both the Gulf and East Coasts illustrate the environmental and provenance variations. Localities with high wave energy and limited supply include Cape Hatteras, North Carolina, Long Beach, North Carolina, and Pensacola Beach, Florida. These three areas show a limited fine fraction and a large coarse fraction. Other beaches close to a major source of supply and of lower average breaker height include Folly Beach, North Carolina, Forest Beach, South Carolina, Indian Beach, Florida, and Grand Isle, Louisiana. These show a large fine fraction and little coarse material.

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TIME SURFACES, VACUITY, AND MAPPABILITY IN STRATIGRAPHY

Recognition of regional lithologic marker beds is accelerated by refined mechanical logging techniques and adequate drilling density. These correlative "punctuations" are considered to be geologically instantaneous, and to yield time surfaces bounding reli-