hill topography on the south side of Cuyama Valley, California. Further investigation of this significant anomaly led to the mapping of an anticline closed on three sides with indications of the presence of faulting on the fourth side to aid in creating a trap. On the basis of this information a test well was drilled which resulted in the discovery of the South Cuyama oil field May 4, 1949. Illustrations are shown on the key seismograph cross sections and some of the difficulties of the work discussed. The original seismograph contour map as well as the map drawn from well data are shown to enable an evaluation of the seismograph prediction. As of June 30, 1953, the field contained 235 producing wells and had a cumulative production of 44,172,749 barrels of oil and 29,312,888 Mcf. of gas.

19. WALLACE L. MATJASIC, Honolulu Oil Corporation, Bakersfield. Case History of Wild Goose Gas Field, Butte County, California.

The discovery well of the Wild Goose gas field was drilled and completed in 1951 on a structure located by a reflection seismograph survey conducted in 1950. An additional seismograph survey was made subsequent to discovery to define better the structure for future development. Two seismic cross sections and a contour map based on the original reflection data are shown, along with an aeromagnetic map which was made after the discovery.

The producing sands are in an interval between the Forbes shale of upper Cretaceous age and the overlying Capay shale of Eocene age.

## S.E.P.M. ABSTRACTS

1. W. L. NOREM, California Research Corporation, La Habra, California. Classification of Spores and Pollen for Paleontologic Correlation.

One of the more important recent developments in micropaleontology is the use of plant spores and pollen for correlation purposes. These minute bodies are found in many sediments previously considered barren of diagnostic fossils. The classification of spores and pollen presents a complex problem because of the large number of types that represent almost every phylum of the plant kingdom and cover the geological time span from the Paleozoic to the present.

Classification under the International Rules of Botanical Nomenclature is confusing because materials of known affinities are classified according to phylogenetic relationships and those of unknown parentage according to morphological characteristics. No clear-cut distinction is made in the nomenclature between fossils classified in the natural and the artificial systems. A natural system is not necessarily the most satisfactory for the stratigraphic paleontologist because of the vast knowledge of systematic botany required for its application.

If fossil spores and pollen are to be brought quickly into usefulness for paleontologic correlation, a system of classification that is easy to use must be developed. Such a system must have a minimum possibility for confusion in its application. It must be comprehensive enough to cover all spore types from the Paleozoic to the present. It should contain the elements of a key for quick and easy reference. Like the International Rules of Botanical Nomenclature, its use should be universal so as to permit the free interchange of information on spores and pollen.

The classification based on morphological characteristics and proposed by G. Erdtman contains the elements of such a system. It must, however, be expanded in scope before it will be complete.

This artificial system is not intended to replace the natural system under the International Rules in paleobotany but it is intended as a practical substitute for use in stratigraphic paleontology. The fossil spores or pollen can be reclassified under the natural system when and if the affinities are ascertained.

2. K. O. EMERY, University of Southern California. Size Distribution of Gravels.

More than 60 samples of gravel from beaches of Mexico and southern California were mechanically analyzed in the field by use of a new method. Median diameters range between 20 and 800 mm. Trask sorting coefficients are characteristically lower than 1.5 and have a median of 1.25. Comparison with published analyses shows that the marine beach gravels are far better sorted than gravels from streams and alluvial fans. The difference is sufficiently great that sorting may be a useful supplementary means of determining the environment in which ancient conglomerates were deposited.

3. JOSEPH J. GRAHAM, Stanford University. Eocene Foraminifera from the Woodside District, San Mateo County, California.

An Eocene foraminiferal assemblage from the Woodside district near Redwood City, San Mateo County, California, is described and its similarity to Cushman and Siegfus' Canoas siltstone faunule from the type area of the Kreyenhagen shale of California noted.

4. RICHARD STONE, University of Southern California. Recognition of Playa Sediments in the Geologic Column.

Playa sediments are sometimes reported in oil-well cuttings, particularly in sediments whose age is Miocene or younger. A careful investigation of the sedimentary properties of playa sediments of the present has revealed certain characteristics which it is believed will enable the geologist to definitely recognize older sediments which were deposited in the playa environment. These diagnostic properties include the average grain size, sorting coefficient, color, organic carbon content, alkali and salt content, hydrogen-ion concentration, and the oxidation-reduction potential. In playa sediments most of these properties have rather definite ranges. This makes it possible to recognize playa sediments with a greater degree of certainty.

5. GUSTAF ARRHENIUS, Scripps Institution of Oceanography. Genesis of Pelagic Sediments.

The pelagic sediments form polydisperse systems where the liquid phase is the interstitial water, and the solid phase is built up by several genetically different components. In E. D. Goldberg's genetical system these are grouped according to the geological sphere in which the solid phase was separated. The solids are thus classified as lithogenous, hydrogenous, biogenous, atmogenous, cosmogenous, and authigenous. Modern analytical methods make it possible to determine quantitatively the concentrations, and in ideal cases the rates of accumulation of these components.

6. THOMAS CLEMENTS, JOHN F. MANN, JR., RICHARD O. STONE, and JAMES L. EYMANN, University of Southern California. Some Spectacular Effects of Wind Erosion near Palm Springs, California.

A short distance northwest of Palm Springs, California, a climbing dune has been formed in a gap in a spur of the San Jacinto Mountains that extends easterly into Coachella Valley. Wind funnelling through the pass between the San Jacinto and the San Bernardino Mountains picks up sand from the dry wash at the base of the spur and carries it up through the gap. The sand is coarse and the wind is almost constant, as a result of which spectacular wind effects have been achieved.

Juniper trees that have managed to grow at all have been bent over until the trunks have broken, and they are now growing in a prone position, with smaller plants crowding closely in their lee. Small plants also cluster in the lee of the larger projecting rocks, growing laterally rather than vertically. These rocks, which are principally granitic, with some gneiss, schist, and quartzite, are pitted, grooved, and fluted in a most fantastic way. More fantastic still, however, is the fact that the grooving and fluting are continued without variation in the bushes sheltering behind the rocks.

7. STEWART EDGELL, Stanford University. Some Guide Foraminifera of the Upper Cretaceous and Lower Tertiary in Australia and California.

A number of stratigraphically restricted species of Foraminifera are found in the late Cretaceous-early Tertiary of Australia and California. These cosmopolitan species are also found in many other parts of the world, often under different names. They have been noted in samples collected here for the Richfield Oil Corporation and for the Bureau of Mineral Resources in Northwest Australia. Their identification permits direct or indirect correlation with standard European stages and thus contributes to a universal stratigraphy, as well as to the knowledge of paleogeography. In addition, the widespread occurrence of index Foraminifera for the Maestrichtian and Danian-Paleocene often permits an exact distinction between uppermost Cretaceous and lowermost Tertiary.

8. V. STANDISH MALLORY, University of Washington. California Lower Tertiary Foraminiferal Sequence.

A preliminary statement of the formal names proposed for the major divisions and subdivisions of a chronologic-biostratigraphic classification of the California Lower Tertiary, and a summary of the criteria on which each of these is based will be presented in this paper.

Evaluation of the faunal changes found in a complete stratigraphic sequence of foraminiferal faunas in the California Province has shown that this sequence of faunas resolves itself into six distinct major units of Stage magnitude which are differentiable throughout the California Province, and several units of Zonal magnitude which subdivide the Stagial units based upon the joint occurrences of species of Foraminifera.

The major subdivisions of the Paleocene are the Ynezian and Bulitan Stages constituting the oldest and next oldest Stages of the Tertiary. The Eocene subdivisions are the Juniperan Stage, Lower Eocene; the Middle Eocene Ulatisian Stage; and the two Upper Eocene Stages, the oldest, the Narizian, and the youngest, the Fresnian Stage.

The Zonal subdivisions of these Lower Tertiary Stages of the California Province are the *Silicosigmoilina californica* and *Bulimina excavata* Zones of the Ynezian Stage; the *Bulimina bradburyi* and *Valvulineria wilcoxensis* Zones of the Bulitan Stage; the *Plectofrondicularia kerni* and *Alabamina wilcoxensis* Zones of the Juniperan Stage; the Ulatisian Stage with three distinct Zones, only one of which, the uppermost Zone, the *Amphimorphina californica* Zone is named; the *Uvigerina churchi* and *Uvigerina garzaensis* Zones of the Narizian Stage; at least two Zones exist within the Fresnian Stage, but these are not named at the present time.