Pseudoparrella Cushman and ten Dam, *Epistominella* Husezima and Maruhasi, *Megastomella* Faulkner, de Klasz, and Rerat, *Stetsonia* F. L. Parker, and two undescribed genera. Species of the Pseudoparrellidae occur in Oligocene? to Recent deposits. Although some genera and species have been reported from much older rocks, these reports are based on misidentifications. Pseudoparrellidae are known from all parts of the world: *Pseudoparrella* is cosmopolitan; *Epistominella* is known from the northern Pacific and Arctic Ocean areas; *Megastomella* is known from the Miocene of Africa and California; *Stetsonia* is reported from the Gulf of Mexico and Arctic Ocean; and the other genera are known from the eastern Pacific area. Recent species generally are found in relatively deep water on fine-grained substrates and extinct species apparently had similar ecologic requirements.

JERE H. LIPPS, University of California, Los Angeles, California

MIOCENE PLANKTONIC FORAMINIFERA FROM NEAR NEWPORT BEACH, CALIFORNIA

Planktonic Foraminifera are present in abundance in the middle to upper Miocene (upper Luisian and lower Mohnian) Monterey Shale exposed at Newport Bay, California. About 20 species of planktonic Foraminifera are tentatively recognized. The greatest number of species and individuals occur in the upper Luisian, including species of *Globigerina*, *Globoquadrina venezuelana*, *Orbulina suturalis*, and *Globigerinoides trilobus*. In the uppermost Luisian, just below the Luisian-Mohnian boundary, is a local zone characterized by *Hastigerina* (*Bolliella*) sp. nov. which may prove useful in regional correlation. Species and individuals are less numerous in the lower Mohnian, although *Globigerina bulloides*, *G. pachyderma*, and *Globorotalia scitula* are present. During the time represented by these rocks species of planktonic Foraminifera were not as numerous at Newport Bay as in tropical areas where the standard planktonic reference sections were defined. Thus correlation to these areas is not yet established.

GORDON J. F. MACDONALD, Institute of Geophysics and Planetary Geophysics, University of California, Los Angeles, California

DEEP STRUCTURE OF CONTINENTS

Observations of heat flow and gravity suggest that continental structure extends to depths of the order of 500 km. The preliminary studies of surface waves tentatively confirm the existence of regional differences between continental and oceanic mantle. The distribution of earthquake foci along continental borders and the concentration of deep-focus earthquakes at the borders similarly imply differences in thermal structures extending to depths of the order of a few hundred kilometers. The deep structure of continents places heavy restrictions on any theory of continental drift. A relative motion of the continents must involve the mantle to depths of several hundred kilometers; it is no longer possible to imagine thin continental blocks "sailing" over a fluid mantle.

NEIL J. MALONEY AND JOHN V. BYRNE, Department of Oceanography, Oregon State University, Corvallis, Oregon

OFFSHORE OREGON: SOME NOTES ON PETROGRAPHY AND GEOLOGIC HISTORY

Miocene and younger sedimentary rocks crop out on the continental shelf and slope off the central coast of Oregon. The predominant lithology is diatomaceous siltstone which contains different quantities of glass shards, Radiolaria, Foraminifera, sponge spicules, and glauconite. Glauconite sandstone was collected from the northern part of Heceta Bank. Angular, poorly sorted, volcanic sandstones were obtained in one sample from Heceta Bank and from several samples taken near the base of the continental slope.

Foraminifera contained in the rocks exposed on the continental shelf suggest that the rocks were deposited in water of bathyal depth. Thus, since late Tertiary time, rocks on this part of the continental shelf have been uplifted possibly as much as 5,000 ft.

The lithology and the faunal content of the rocks suggest that deposition during late Tertiary time occurred either on the continental slope or in one or more isolated basins somewhat removed from the continent. Subsidence contemporaneous with deposition resulted in thick accumulations of Tertiary sedimentary rocks. Late Tertiary and Quaternary tectonism resulted in the uplift and deformation of the Tertiary rocks in the area of the present continental shelf. Erosion and subsequent burial of portions of the Tertiary section occurred during late Quaternary fluctuations of sea-level.

BRUCE D. MARTIN, Office of the Oceanographer, Dept. of the Navy, Washington D.C.

MONTEREY SUBMARINE CANYON, CALIFORNIA: GENESIS AND RELATIONSHIP TO CONTINENTAL GEOLOGY

New data from marine dredgings off Monterey, California, correlated with wells and outcrops on land, indicate that the Pleistocene Monterey and Soquel Canyons, and the middle Miocene (?) Carmel Canyon, are intimately related to the continental geologic history.

Late Cretaceous (?), middle Miocene, and Pleistocene structure controls canyon trends whereas the induration and distribution of post-lower Miocene sedimentary rocks and the Cretaceous granodiorites control the canyon-shape parameters. Carmel Canyon was the principal canyon until the mid-Pleistocene orogeny caused physiographic and structural changes. Zones of low induration and(or) weakness along fault trends and along contacts between sedimentary and igneous rocks permitted the canyons to be more easily eroded.

Late late Miocene, Pliocene, and early Pleistocene drainage from the Great Valley debouched at Monterey Bay via Elkhorn Slough which lies at the head of Monterey Canyon. All canyon heads were cut or modified subaerially by rivers to a depth of 300 ft. below present sea-level during eustatic sea-level changes. Canyon erosion below 300 ft. was by submarine processes, as the geologic record on land indicates no great uplift of the ocean floor.

Monterey Canyon and Elkhorn Slough lie directly above a buried middle Miocene canyon—the Pajaro Gorge. The older canyon is not ancestral to Monterey Canyon, but cause-and-effect relationships are noted.

RICHARD H. MERRIAM, University of Southern California, Los Angeles, California

Source of Palm Spring Sediments, Imperial Valley, California

Sands of the Palm Spring Formation are similar to those of the Colorado delta and those deposited in Lake Mead. All are very well sorted, and have similar median diameters and mineral composition. Cretaceous Foraminifera (reworked) which are widespread in the Palm Spring occur in the delta sands. Various primary structures characteristic of the Palm Spring are present in delta sediments. Both groups of sediments contain important amounts of volcanic and carbonate rock fragments and potash feldspar whereas plagioclase, hornblende, and augite are minor. The source indicated by this assemblage is the Great Basin-Colorado Plateau area rather than the Peninsular Range. The latter area probably supplied some coarse arkosic sands and gravels interfingering in the west with the fine sands, silts, and clays but it is probable that most of the Palm Spring Formation is Pleistocene delta sediment.

NEIL A. MOORE, Rayflex Exploration Company

Electro-Sonic Profiler

The Rayflex *Electro-Sonic Profiler* was developed for petroleum exploration in 1961. The general objectives of its development were to provide marine seismic information in greater clarity and detail than previous methods at modest costs. Initially a tool for shallow depths, the *Electro-Sonic Profiler* has through use and further engineering become capable of revealing detail at production levels. In addition, its application to deep-water oceanography has advanced the study of the oceanic province by many years. Present use of the *Electro-Sonic Profiler* has shown numerous types of geological events in near text book quality.

Compositing and playback techniques have expanded capabilities towards the deep "look-see." Interpretation problems are minimized through use of special recording techniques. Numerous marine profiles demonstrate the flexibility and usefulness of the method.

FRANK S. PARKER, Consultant, Pasadena, California

Geologic Setting of Beverly Hills and Las Cienegas Fields

Exploration and development during the last decade, primarily by slant drilling from only a few drill sites, have revealed several previously unknown or only partly suspected complexities of structure and stratigraphy beneath the Pleistocene or Recent cover along the northern flank of the Los Angeles basin between Western Avenue and the city limits of Santa Monica. Very little well information has been released for publication or even into restricted industry channels. Permission however has been granted to the author by the various operators in the area to present this general paper.

Tight folds, which are in places overturned toward the south, and high angle thrust faults are characteristic. These features are aligned east-west and transect the Beverly-Newport lineament, suggesting that the latter feature is either over-ridden, swings sharply westward north of Inglewood field, or dies out before reaching Cheviot Hills.

Pronounced unconformities are present at the base of Wissler's Zone 4 of the upper Repetto (Pliocene), within the upper Miocene at the top of the "E" (Nodular shale) and probably elsewhere, and between the "E" and "F" zones. There is also onlap of the beds of Delmontian age onto various older beds. Difficulties of paleontological correlation have been further confounded by "salting" of older forms into younger beds. The southeastern portion of the area has a thinned section of Pliocene and Miocene overlapping a granodiorite high.

Defining pool as a continuous, pressure-connected body of oil and gas, there are at least five new pools in the Beverly Hills-Cheviot Hills field, one in the Salt Lake field, and four or more in the Las Cienegas field.

Production figures for the separate pools are not given, but the new pools of Beverly Hills-Cheviot Hills have produced about 18 million barrels of oil and 76 million MCF of gas, and Las Cienegas about 4 million barrels and $3\frac{1}{2}$ million MCF of gas. The production from the new pool in the Salt Lake field is about $\frac{3}{4}$ million barrels. At the time of preparation of this paper, development was continuing with three rigs active in the Beverly Hills-Cheviot Hills area and one active at the third drill site in Las Cienegas. Exploratory core holes were being drilled from time to time in and near the area.

The complexity of the area and the difficulty of exploration by slant drilling suggest that there may be several undiscovered oil accumulations of considerable magnitude in the area. The presence of saturated but tight oil sandstone in a wildcat at the extreme northwestern corner of this area is not to be discounted.

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San Andreas Fault Cross-Sections—Interim Report on A.A.P.G. Committee for Cross-Sections (Sub-Committee for A.A.P.G. Committee for Study of Lateral Faulting in California)

The Committee for the Study of Lateral Faulting in California was established in June, 1961, by the executive committee of the Pacific Section of the A.A.P.G. with Richard F. Walters, chairman. Purposes of the Committee were: (1) to compile available data relative to lateral faulting in California, (2) to publicize results of such compilations, (3) to stimulate additional basic research of critical problems and areas, and (4) to sponsor field trips providing first-hand views of important areas.

At the first meeting in Los Angeles on October 2, 1961, specific responsibilities were accepted by individuals for the immediate objectives of the Committee: (1) to prepare an annotated bibliography covering lateral faulting in California, (2) to commence a survey of available material and interested contributors, (3) to concentrate on accumulating data relative to the San Andreas fault, and (4) to commence construction of a pair of matched cross-sections along the San Andreas fault.

The Committee will not publish or support direct interpretive positions on direction and amount of displacement, take sides on theories, or limit studies to faults which are only lateral in displacement—the Committee will remain strictly objective.

Four San Andreas fault cross-sections of a probable 14 are completed. Each cross-section shows the eastern and western sides of the fault in geographically opposite, intervals.

Volunteers are urged to help. There are many important faults for further study.