responding to particular frequencies or dips on the section, one can remove such frequencies or dips from the reconstructed image. This is the basis for a new technique of optical filtering which United Geophysical Corporation has designated as LaserScan.

With this optical processing technique, the first step is an examination of the spectrum of the data. This technique lends itself well to the analysis and evaluation of the information on the seismic record sections being processed. Such a study commonly suggests optimum positions for filtering settings. Examples are given of this, and of the effects of some of the suggested filtering.

A number of seismic record sections are shown before and after filtering. The various examples show the enhancement of reflection data previously confused or concealed by the undesired events which are filtered out during the optical processing. Unwanted events are rejected by taking advantage of the differences between their dips (move out) and (or) frequencies and those of the desired reflections. Examples are discussed in which LaserScan techniques have been applied:

Reject multiple reflections which override or obscure genuine reflections dipping in different directions.
Remove diffractions and (or) reflected refractions.
Attenuate high velocity noise events.
Eliminate high frequency interference. LaserScan is very effective as a frequency filter because of the sharp cut-off slopes obtained.

Because hundreds of information channels can be processed in a single photographic operation, optical filtering has proved to be an efficient and economical method of frequency and velocity filtering.

MAYNE, HARRY W., Petty Geophysical Engineering Co.

COMMON REFLECTION POINT TECHNIQUES IN HIGHLY EXPLORED AREAS

Experience in some highly explored areas has demonstrated the need for enhancement of reflection record quality and attenuation of multiple reflections and other disturbances. The overall objective is to improve the signal-to-noise ratio.

A summary of the Common Reflection Point (CRP) Horizontal Data Stacking Techniques is given and the general application and advantages of the method are described.

Specific areas are chosen for typical field comparisons between conventional and stacked traverses to illustrate the improvement with CRP.

McGEE, DAVID C., San Diego State College

UPPER CRETACEOUS (CAMPANIAN) FORAMINIFERIDA FROM PUNTA BAJA, BAJA CALIFORNIA

The oldest post-batholithic fossils recognized in northwestern Baja California occur in an intricately faulted mudstone-sandstone-conglomerate section exposed at Punta Baja, near El Rosario. Foraminifers, mostly agglutinated species, occur through a part of the section which consists of 101 ft. of mudstone. That part of the section also contains the characteristic Campanian ammonoid, *Metaplacenticeras pacificum* (Smith). Representatives of the genera *Epistomina* and *Bulimina* (spinose forms) with the microfossil assemblages suggest an outer sublittoral or, more likely, bathyal environment of deposition for the mudstone.

McMURRY, H. V., The New Jersey Zinc Co.

OPTIMUM USE OF GEOPHYSICAL TOOLS IN EXPLORATION FOR BASE METAL ORES

The procedures generally used in prospecting for sulfide ore bodies are discussed. It is shown that entirely different circumstances govern the search for massive sulfide ore bodies compared with those involved in prospecting for disseminated sulfide deposits.

Massive sulfide deposits are excellent electrical conductors which commonly yield strong anomalies during rapid reconnaissance electromagnetic survey procedures. The difficulty in detecting them is that there are hundreds of barren non-sulfide geological conductors for every sulfide mass. For this reason the biggest problem in prospecting for massive sulfide ore bodies generally is that of devising means of screening large numbers of equally promising targets to find those few which are most likely to be rich in sulfides. Facts are presented to show that the screening processes can be carried out rapidly, thoroughly, and economically by intensive use of the gravity meter and the portable refraction seismograph.

The induced polarization method is the only geophysical procedure which responds to buried, disseminated, metallic mineral deposits. It is, therefore, widely used in prospecting for buried porphyry copper ore bodies. The feasibility of and need for extensive calculations of the induced polarization responses of geological bodies of simple geometrical form is explained. Examples are presented which show how work of this kind has been valuable in evaluating the merits of the induced polarization method, in the planning of induced polarization surveys, and in the interpretation of field data.

NETTLETON, L. L., Gravity Meter Exploration Co., Geophysical Associates International

SURFACE SHIP GRAVITY METER OPERATIONS OFF PACIFIC COAST

A survey of approximately 3,000 miles of traverse off the Pacific coast of Oregon and Washington was carried out in the summer of 1964. The instrumentation was the LaCoste and Romberg mobile gravity meter using the suspended system and horizontal accelerometers for Browne corrections. The work was controlled by occasional observations with an underwater gravity meter on bottom. Precision of results can be evaluated by comparison with these observations and by gravity differences at intersecting traverses. The paper will describe the operation, present a sample traverse and map area, and will include an evaluation of the precision of the observations.

OBRADOVICH, JOHN D., U. S. Geological Survey, Denver

AGE OF MARINE PLEISTOCENE OF CALIFORNIA

Isotopic ages determined on glauconite from the Lomita Marl Member of the San Pedro Formation indicate that the marine Pliocene-Pleistocene boundary, as recognized in California by Woodring and others, is at least 3 million years old.

PARKER, FRANK S., consultant

SUMMARY GEOLOGY OF OFFSHORE OIL PRODUCING AND POTENTIAL AREAS OF PACIFIC COAST

The area is bounded by the shoreline, the 100-fathom line, and the Mexican and Canadian borders, but these boundaries are transgressed by Tertiary basins and structures. Scanty, localized data from diving and bottom sampling have been published. The area is largely a plain of Recent deposition concealing significant rocks by "overburden." Oil companies map in overburden areas by core drilling and seismograph as effectively as in alluviated areas onshore. Limits are placed on penetration of exploratory coring by the agency in control, except on lessees on their leases. Companies' activities and expenditures permit some "geology by inference."

Early development was by extension of onshore production. Laws hampered exploratory drilling in the absence of "drainage." By stretching the drainage concept, there was exploration, albeit unrewarding, of offshore folds traced up-plunge seaward, particularly in the Santa Barbara region. Belmont and West Newport Offshore were the only really new features of commercial value discovered before liberalization of State law in 1955. Subsequently, drilling has disproved two attractive structures in the Los Angeles basin but has discovered four oil and five gas fields in the band of folds and fault slices along the Santa Barbara coast. Are there other prospects in this band, in the Ventura basin Pliocene west of Rincon, or in the Miocene and Sespe west of Montalvo? Will Santa Monica Bay produce where not crossed by shallow basement and will features in the Los Angeles basin on south to San Diego be attractive prospects? The answers to many of these questions are already locked in company files, and surely many are favorable.

North of Point Conception, geology by bottom samples and "inference" points up the following areas:

1) Santa Maria and Pismo basin extensions;
2) Tertiary basin between the Farallon granite ridge and the San Andreas;
3) San Andreas rift zone and land west-northwest of Point Arena;
4) Adjoining the basement rock area near the Klamath River;
5) Between Cape Blanco and the Olympic uplift where Pliocene and Miocene is established by samples and cores and structures by seismic surveys.

Test wells have been already drilled off northern California and others will be drilled off Oregon next summer.

PETERSON, GARY L., San Diego State College

### Inter- and Intra-Sequence Faunal Distribution Patterns in the Sacramento Valley Cretaceous

The Cretaceous stratal succession of the Sacramento Valley, California, includes 5 unconformity-bounded sequences designated, in ascending order, Sequences A through E (Peterson, 1964). All are present on the western side of Sacramento Valley. Northward, in the Ono area, Sequences A through D crop out, but at nearby Horsetown only B and D are present. The Redding succession includes Sequences D and E, but at all other exposures on the eastern side of Sacramento Valley, only E is present. Each sequence is almost entirely clastic and wedge-shaped, with the thickest portion toward the west and the thinnest toward the east. Each sequence oversteps the underlying stratal units toward the east where, except for C, each rests on rocks of the Nevadan complex.

Each sequence contains an essentially discrete assemblage of larger marine invertebrates (dominantly Mollusca), having in common only a few species with those either subjacent or suprajacent. Within each sequence, faunas are further distributed so that almost all megafossils occur in the eastern and basal portions; the western portions thus contain few megafossils except near the bases of A and D. The *Buchia crassicollis* fauna and the *Hertleinites aguila* and *Shasticrioceras poninte* zones occur in Sequence A of Neocomian age. Sequence B, of late Aptian and Albian age, contains the *Gabbioceras wintunium*, *Acanthohopiites gardneri*, *A. reesidei*, *Leconteites lecontei*, *Beudanticeras hulenense*, *Oxytropidoceras packardi*, and *Mortoniceras hulenanum* zones. Sequence C, of Cenomanian age, contains an unnamed fauna. Sequence D, of Turonian age, contains the *Glycymeris pacificus* fauna, and Sequence E, of Senonian age, contains the *Glycymeris veatchii* fauna. The bases of A, B, and D (and possibly all) are temporally variant and transgressive from west to east.

Apparently these 5 sequences, together with their distribution and thickness relations, discrete faunas, intrasequence faunal distribution patterns, and age relations, are the physical and biostratigraphic manifestations of 5 successive transgressive-regressive episodes and probably are related to diastrophism generated toward the east.

POYNOR, WILLIAM D., Richfield Oil Corp.

### Relationship of Big Pine, San Guillermo, and Ozena Faults, Northwestern Ventura County, California

The Big Pine, San Guillermo, and Ozena faults are interpreted to have experienced significant strike-slip movement. The San Guillermo and Ozena faults are northwest-trending, southwest-dipping, high-angle reverse faults that once formed a continuous trace. This trace has been offset left-laterally about $8\frac{1}{2}$ mi. by post-middle Pliocene movement on the ENE-trending, essentially vertical Big Pine fault (a possibility suggested by Hill and Dibblee, 1953). Prior to being offset, the continuous San Guillermo-Ozena fault experienced at least $3\frac{1}{2}$ miles of right (?)-lateral movement in late Tertiary time.

The case for the San Guillermo-Ozena fault correlation is based on the following criteria.

(a) Both the San Guillermo and Ozena faults have the same general trend, are high-angle reverse faults, and juxtapose the same general stratigraphic sequences near their junctions with the Big Pine fault: SSW-dipping lower Eocene marine strata on the hanging wall against Miocene-Pliocene continental strata on the footwall.

(b) Two additional correlative geologic features, a unique fault and a facies contact, intersect the Big Pine fault, and their offsets are compatible with the San Guillermo-Ozena fault correlation. Southwest of each fault in its respective locale are (1) a paralleling auxiliary fault containing a rhyolite intrusive found only in and around the auxiliary fault and (2) a facies contact within the Eocene section where the Juncal Formation is overlain by the Matilija (?) Formation.

(c) Projected upward, the facies contact and the San Guillermo and Ozena faults intersect, forming a line which pierces the upward projection of the Big Pine fault in each locale. A calculated net slip of 8.5 miles in a direction that pitches 6° southwest along the Big Pine fault has raised relatively the south block, yielding a 4,700-foot dip-slip component. This explains minor stratigraphic differences around each fault.

(d) Subsurface data show at least $3\frac{1}{2}$ miles of lateral displacement along the Ozena fault and require the existence of an offset portion. The San Guillermo fault is the only logical correlative.