RICHARD E. CASEY, Radiolarians and paleoceanographic interpretations
CALVIN H. STEVENS, Stratigraphy and structure of middle Paleozoic section, Independence quadrangle, Inyo Mountains, California
WELDON W. RAU, Geology of Wynoochee Valley quadrangle of southwest Washington

THURSDAY EVENING, MARCH 28
SEPM DINNER MEETING
MERRILL HAAS, Frontiers in micropaleontology

FRIDAY AFTERNOON, MARCH 29
SEPM
ZACH M. ARNOLD, Variation and isomorphism in uniparental species of Foraminifera
JAMES A. WILCOXON, Distribution of calcareous nannoplankton from middle Tertiary Cipero Formation of Trinidad, W.I.
RONALD SCHMIDT, Origin of *Pseudohastigerina* in Paleocene and lower Eocene strata of California
R. H. CAMPBELL, Middle Miocene sedimentary breccia in Malibu Bowl thrust sheet, central Santa Monica Mountains, California
CALVIN H. STEVENS AND EDWARD A. JOHNSON, Movement along faults in central Inyo Mountains, eastern California
CHARLES V. FULMER, Stratigraphy and correlation of typical Blakeley and Blakeley Harbor Formations of Washington

THURSDAY AFTERNOON, MARCH 28
SEG
GILBERT THOMAS, Structural interpretation of computer processed geofracture data
JAMES D. MORGAN, T. H. HOLLINGSWORTH, AND MONROE ASHWORTH, Effects of stacking misaligned CRP traces
STANLEY L. LIPPINCOTT, JR., Explosives for exploration industry
WILLIAM J. O'NEILL, Support operations, vessels and aircraft, from owner's point of view
W. H. LUEHRMANN, Offshore exploration techniques
A. STOUPNITZKY, Nonexplosive energy sources

FRIDAY AFTERNOON, MARCH 29
SEG
R. B. KISTLER, J. C. PAULSEN, AND L. L. THOMAS, Slope stability monitoring at Boron
M. D. CARTER, Velocity investigations using dynamic correlations
JOHN F. BRADSHAW, TV filter DECON before and after STACK and effect of noise on DECON
STEVE BAUER, New computer-oriented technique for interpreting EM anomalies
EDWARD F. HAYE, Photogeology and geophysics
C. M. EDWARDS, Geophysical instrumentation for marine reconnaissance surveys

## ABSTRACTS OF PAPERS

ARNOLD, M. ZACH, University of California, Berkeley, Calif.

### VARIATION AND ISOMORPHISM IN UNIPARENTAL SPECIES OF FORAMINIFERA

Their *leitmotiv* set by the surprisingly variable *Allogromia laticollaris,* such uniparentally reproducing Foraminifera as *Cornuspira lajollaensis, Calcituba polymorpha, Spiroloculina hyalina, Rosalina columbiensis,* and *Trichohyalus aguayoi* appear in laboratory populations to possess a variation potential fully equivalent to that of the biologically studied biparental species of Foraminifera and one that is appreciably greater than the geologically oriented taxonomy of the group generally would indicate.

A striking example of isomorphism between an enigmatic Mediterranean allogromiid and a typical embryonic miliolidean suggests an alternate route by which the Miliolidea might have evolved. The free-living milioline stage of the otherwise sessile ophthalmidiid *Calcituba polymorpha* is in some specimens so similar to variants of both *Spiroloculina hyalina* and *Nubecularia lucifuga* that identification in the genealogically vacuous (at the parent-offspring level of refinement) limbo of the fossil record is almost impossible and doubts are raised about some miliolidean phylogenetic interpretations.

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### PLANKTONIC FORAMINIFERA AS INDICES OF PALEOCEANOGRAPHY

Each major oceanic water mass today is characterized by its own peculiar planktonic foraminiferal indices. These indices may be totally different groups of species, differently coiled populations of the same species, differences in abundance, differences in form, or some combination of these criteria. Furthermore, selective elimination of planktonic species occurs toward inshore areas, especially toward deltas. It is also known that forms with a calcite crust covering the normal wall of the test develop this crust in bathyal depths, providing in this way a useful index to depth of deposition.

Using some of the above criteria it is now known that cold-water planktonic faunas (*Globigerina pachyderma sinistral populations*), identified with summer surface water temperatures of less than about 5°C, expanded into the temperate areas during colder periods of the Pleistocene, during the middle Pliocene, and during a part of the late Miocene. In contrast, the warmer intervals of the early Pliocene, the late Pliocene, the Pleistocene, and the present are identified by the warmer water types of planktonic faunas (*G. pachyderma dextral populations*) indicating summer surface water temperatures of about 15° to 18°C, or possibly slightly higher. Eustatic changes in sea level, associated with these cold and warm paleoclimatic alternations in the Pleistocene, brought marked regressive-transgressive cycles in shallow-marine deposits; similar cycles are indicated for the Pliocene and the later Miocene. Thus, in the absence of complications due to variable rates of sedimentation and tectonism, shallow-water depositional sites may reflect a late Miocene nonmarine phase or an unconformity, an early Pliocene marine phase, a middle Pliocene nonmarine phase or an unconformity, a late Pliocene marine phase, and a major regression at the base of the Pleistocene.

Other criteria can be used to show former oceanic connections with marine basins by abundance patterns of planktonic Foraminifera. These patterns also may suggest current patterns of the past. For example, the Miocene planktonic foraminiferal facies of the San Joaquin Valley indicate that the major marine connection was across the San Andreas fault zone at the southwestern edge of the valley and that the primary marine current was counterclockwise around the southern end of the basin.

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NEW COMPUTER-ORIENTED TECHNIQUE FOR INTERPRETING EM ANOMALIES

A geophysicist may improve his interpretation of EM (electromagnetic field) data by following four steps. (1) Noise and near-surface contributions are identified and subtracted from data by a high-speed digital computer. (2) A three-dimensional sketch of an ore deposit is interpreted by the geophysicist from characteristic data variations. (3) The data are then compared with fields previously calculated by a computer for model conductors. (4) The closest model is modified to fit the sketch and is further modified by a computer to duplicate the data most closely, thereby giving a detailed three-dimensional picture of the ore deposit.

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TV FILTER DECON BEFORE AND AFTER STACK AND EFFECT OF NOISE ON DECON

With the advent of digital processing, many new tools have been made available to the geophysicist. One of the most publicized of these is the deconvolution process, which is available in many proprietory forms, but which is designed essentially to remove repetitive events from the input signal and produce a "whitened" spectrum. The ability of the process to carry out its desired function may be hampered seriously by the presence of additive noise. It may also be affected by the sequence in which the deconvolution is carried out (*i.e.*, before or after stacking).

The writer examines the effect of additive noise on the deconvolution process, the effect of the order in which the process is carried out, and the visual signal enhancement by filtering after the deconvolution.

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MIDDLE MIOCENE SEDIMENTARY BRECCIA IN MALIBU BOWL THRUST SHEET, CENTRAL SANTA MONICA MOUNTAINS, CALIFORNIA

A sedimentary breccia included in the middle Miocene strata of the upper plate of the Malibu Bowl detachment fault provides important evidence concerning the source area of the plate. The breccia contains large clasts derived from identifiable older strata, particularly the Vaqueros Formation (lower Miocene) and the Sespe Formation (upper Eocene to lower Miocene). This breccia was first described in 1958 by R. C. Newton in an unpublished M.A. thesis at the University of California, Los Angeles; he mapped its distribution and recognized its probable landslide origin.

The breccia overlies marine shale of middle Miocene age and is overlain by submarine fragmental basalt or andesite, also of middle Miocene age. There is no evidence of subaerial erosion at the contacts. The breccia was deposited continuously across an area of 1.5 to 2 sq mi; it is locally as thick as 350 ft. In addition to the clasts of Sespe and Vaqueros sandstone, the breccia contains clasts of volcanic rock and shale that probably were derived from earlier middle Miocene deposits. The clasts generally are not mixed; those of Sespe predominate in one area, Vaqueros in another, and volcanics in yet another. The matrix in some places is coarse sand (apparently reworked from Sespe and Vaqueros sandstone), but in many areas altered basalt(?) predominates. The local volcanic matrix indicates that some volcanism was contemporaneous with the formation of the breccia.

The breccia very probably represents a landslide or series of landslides that originated on a steep slope, slid into an adjacent marine basin, came to rest on middle Miocene sediments, and was buried by later middle Miocene volcanic and sedimentary deposits. Although the Sespe and Vaqueros Formations now are exposed in the central Santa Monica Mountains, they probably were covered by early middle Miocene sedimentary and volcanic strata at the time the breccia was deposited. The nearest area where the Sespe and Vaqueros Formations are known to have been exposed at the approximate time of breccia deposition is about 10 mi north in the Simi Hills, suggesting the direction and general order of magnitude of the displacement on the Malibu Bowl fault.

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SEDIMENTATION RATES ON CONTINENTAL TERRACE OFF COLUMBIA RIVER

Rates of sedimentation were calculated for the floor of Astoria Canyon and the adjacent continental slope based on layers datable by $C^{14}$, the occurrence of volcanic glass from the Mount Mazama eruption (approximately 6,600 yr B.P.), and an increase in the ratio of radiolarians to planktonic foraminifers (approximately 12,000 yr B.P.).

Deposition rates calculated from the first occurrence of Mazama ash to the modern surface are highest (78 cm/1,000 yr) on the floor near the head of the canyon (water depth 100 fm), and lower (53 cm/1,000 yr) in two piston cores nearer the canyon mouth (water depths 1,000 and 700 fm). In the 700-fm core the ash is present at a depth of 350 cm. A $C^{14}$ age of 5,620 ± 145 yr B.P. for sediment at a depth of 205 cm in the same core shows a change in deposition rate from 145 cm/1,000 yr in the lower 145 cm to 37 cm/1,000 yr in the upper 205 cm—a change probably caused by the great influx of Mazama ash.

Slower deposition occurred on the adjacent continental slope. Rates based on the faunal change range from 36 cm/1,000 yr on the upper slope to $< 10$ cm/1,000 yr at the base of the slope. Rates calculated using all three dating methods on a single core from the lower slope are (1) $C^{14}$, 12 cm/1,000 yr; (2) radiolarian-foraminifer change, 15 cm/1,000 yr; and (3) Mazama ash, 19 cm/1,000 yr. The uniformity of the lithology also indicates a slower rate of deposition on the slope than on the canyon floor.

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