

Drilling Company, Inc., and the demonstration of various types of geophysical equipment and field methods. Included in the geophysical demonstrations were the La Coste and Romberg underwater gravimeter,

the Varian magnetometer, United Geophysical's Dynaseis, and a discussion on G.S.I.'s digital recording equipment.

## ABSTRACTS OF PAPERS

Bakersfield, California, April 1-2, 1965

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### LUNAR EXPLORATION

A great deal of knowledge about the Moon already has been obtained from earth-based laboratory studies and telescopic observations. NASA's spacecraft investigations of the Moon were initiated by the Ranger spacecraft, designed to furnish close-up pictures of the lunar surface. Ranger will be followed by the Lunar Orbiter and the Surveyor. A successful Lunar Orbiter will furnish, at 3-meter resolution, photo coverage roughly equivalent to a one-mile strip from San Francisco to Boston, whereas the Surveyor is planned to soft-land on the Moon and to furnish information on the physical and chemical properties of the lunar surface, as well as to send back seismic information. These unmanned probes will be followed by the manned Apollo landings. Apollo exploration, though significant, is limited by the mobility of the astronauts and the short stay-time on the lunar surface. Hence, plans are being formulated for post-Apollo missions outlining longer stay-times and more versatile scientific equipment. All of the planned science program is based on the experience and knowledge gained in the geological, geophysical, and geochemical exploration of the Earth. In order to accomplish this program, NASA is heavily dependent on those scientists versed in practical Earth exploration.

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### POST-MIOCENE FAUNAS OF NORTHWESTERN BAJA CALIFORNIA AND ADJACENT ALTA CALIFORNIA

Clearly defined and persistent coastal terraces characterize the Pacific slope topography of northern Baja California. The post-Miocene stratal record, generally expressed as thin terrace cappings of shallow marine deposits, occurs on the lowest 2 or 3 terraces at elevations of approximately 200 m. or less. Thicker stratigraphic sections, including slightly deeper marine deposits, occur just north of the international boundary in the San Diego embayment and, presumably, offshore. Terrace deposits, as well as Late Cretaceous and younger strata into which the terraces were cut, appear to be undisturbed or exhibit only minor and local deformation.

Numerous littoral and inner sub-littoral communities can be recognized in post-Miocene faunules of the terrace deposits. Those on the oldest (highest) terraces are repeated, with modifications, on younger (lower) terraces. Discrepant associations of species and genera, with latitude and bathymetric ranges which are not known to overlap in the modern eastern Pacific, characterize the older post-Miocene faunules. Occurrences of species and genera associated in the younger faunules are more nearly compatible with extant associations along the adjacent coast.

Critical evaluations of field and taxonomic relationships suggest that depositional contamination and misleading comparison are responsible for seemingly discrepant fossil associations. Other anomalies may reflect post-Miocene distributional shifts imposed by factors other than those of the physical environment.

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### ECOLOGY OF SAN FRANCISCO BAY

Comparison and contrast of the environmental conditions in San Francisco Bay and Suisun Bay show the ecology of both bays to be dominated by tidal currents. In Suisun Bay the (1) water velocity, (2) salinity variations, (3) turbidity, (4) median diameter of sedimentary particles, (5) aeration of the water, and (6) proportion of channels versus tidal flats are greater than in San Francisco Bay.

Because of the greater variability of conditions in Suisun Bay, the foraminiferal fauna is less diversified, because there are only few genera able to tolerate great differences of most ecologic factors. Suisun Bay is characterized by a meager arenaceous fauna accompanied by a fairly diversified diatom flora. In contrast, the San Francisco Bay fauna is composed of a calcareous assemblage typical of shallow marine embayments.

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### BIOLOGICAL OBSERVATIONS ON SOME MEDITERRANEAN FORAMINIFERA AND RELATED PROTOZOANS

A study of laboratory populations of *Nubecularia lucifuga* DeFrance, in addition to confirming the main aspects of the asexual phase of the cycle observed by LeCalvez, has disclosed a sexual phase as well, whereas an examination of the species' variation potential in cultures and a comparison of cultural with natural populations suggest that, in the light of a marked correlation between the form of the test and that of the substratum to which the living organism is attached, the Jurassic form, *N. triloculina* ten Dam, should be considered conspecific with *N. lucifuga* (Eocene to Recent).

The occurrence of large numbers of paired tests of *Gromia oviformis* in subtidal waters of southern France confirms the original observation of this phenomenon (Valkanov, 1938); a cytological examination of the sexual generation, including newly discovered fertilization, zygote formation, and the subsequent transformation of distinctive fusiform zygotes into equally distinctive radiate "embryos," indicate further differences between this foraminiferoid sarcodine and such a simple isomorphic foraminifer as *Allogromia laticollaris*.

Culture observations on species of *Cibicides*, *Planorbulina*, and agglutinating forms resembling *Webbina* and *Crithionina*—all from the same natural population—emphasize the pressing need for a rigorous application of isolation culture techniques to the study of the life cycle of *Cibicides lobatulus* before Nyholm's striking conclusions can be confirmed or refuted.