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## CRUSTAL STRUCTURE IN REGIONS BORDERING PACIFIC OCEAN

Tectonic patterns of various circum-Pacific regions have many remarkable similarities and some puzzling differences. Consistent patterns of vulcanism and seismicity are well known, and recent geologic and geochronologic studies indicate surprisingly similar geologic histories of geosynclinal accumulation and plutonism in many regions, particularly along the Pacific margin of the Americas. Similarly, dominant strike-slip faulting parallel with the oceanic margins is being found as a consistent pattern in an increasing number of circum-Pacific areas, although the two areas where documentation is best, California and southern New Zealand, are definitely atypical in other important respects, such as the absence of abundant vulcanism and deep-focus earthquakes. Active strike-slip faulting is primarily right-handed in the Americas from Alaska through Chile but applicability of this sense of displacement to the Asiatic margin is a subject of controversy. Available geologic evidence from this region does not agree with seismological studies of earthquake first motions, and reconciliation of conclusions from the two approaches remains a major problem in the understanding of circum-Pacific tectonics.

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## VARIATION IN LABORATORY POPULATIONS OF TWO GEOGRAPHICAL SUBSPECIES OF AN APOGAMIC MILIOLID FORAMINIFER

The range of variation exhibited by individuals in clonal populations of a minute apogamic miliolid from the subtidal waters of La Jolla, California, overlaps to a confusing degree that of individuals from mass cultures of one from the intertidal waters of Panama City, Florida. Although they thus appear to belong to the same species, the two groups must be assigned to different subspecies because of differences in cultural requirements and subtle differences in test proportions, the latter observable when large laboratory populations are compared.

The most common of the morphological anomalies exhibited by this polymorphic miliolid are (1) the production of chambers aberrant either in shape or in arrangement and (2) the fusion of the tests of two individuals.

The degree of rotation between successive chambers, including the embryonic or prolocular apparatus, is highly variable. In striking disaccord with the general belief that such basic differences in chamber arrangement reflect and are invariably correlated with an alternation between sexual and asexual generations in the life cycle, a single brood of young, asexually produced by an isolated parent, may develop spiroloculine (=biloculine), quinqueloculine and, more rarely, triloculine tests. From a study of the living animal, then, has come confirmation of the major aspects of predictions about initial polymorphism in miliolids made decades ago by Munier-Chalmas and Schlumberger. Uncoiling may occur at any stage in the individual's ontogeny, suggesting a need for the re-evaluation of those phylogenetic conclusions that presuppose it to be of phyloephebic or phylogerontic character.

Fusion of tests may occur between individuals of disparate age or size. Post-conjugal chambers are added either as two relatively independent series, producing a test that is obviously doubled, or as a single series that superficially masks fusion. Test fusion appears to be fortuitous, not a part of the species' reproductive behavior.

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## FORECAST OF EXPLORATION AND DEVELOPMENT OF SALT-DOME STRUCTURES OF LOUISIANA CONTINENTAL SHELF

Drilling exploration of structures of the Louisiana Continental Shelf has progressed to such an extent that it appears that a reasonable prediction can be made of the number of the various types of structures that will eventually be found when development of this area has reached a stage comparable with that now existing for the onshore Miocene area of South Louisiana.

Based on a study of the land Miocene area, it is estimated that a total of 540 offshore structures will be found out to water depths of 600 feet, of which 216 will be productive of gas, 124 productive of oil, and 200 productive of both oil and gas. It is estimated that, of this total of 540 structures, 81 are piercement salt domes with the major reserves trapped against the domal core, and 459 are deep-seated features which, though related to deep salt intrusion, have their major oil and gas reserves in reservoirs above the salt core.

The area covered by the average deep-seated salt dome feature is approximately 9 square miles in the land Miocene area, as compared with approximately 19 square miles of structural area encompassed by the average piercement salt dome. The average gas-productive structure is substantially smaller than the average structure productive of oil, or of oil and gas. The same relationships can be anticipated offshore. It also appears reasonable to anticipate that approximately 20 per cent of the total of 24,552 square miles of offshore water bottoms underlain by potentially productive Miocene and younger sediments will be proved to be occupied by structures, restrictive parts of which will be productive of oil or gas.

It is estimated that 288 structures are present in water depths of less than 100 feet, of which 200 undrilled but potentially productive structures still remain to be found. It should be remembered that many of these structures will be proved non-commercial with development drilling. In the essentially unexplored water depths from 100 feet to 600 feet, it is estimated that 252 structures potentially productive of oil or gas will be found eventually, only one of which has been drilled to July, 1961.

The presence of a type of structure not common to the land Miocene area of Louisiana but associated with salt uplift and intrusion is described, and the possibility of additional occurrences of this type of prolific structure elsewhere offshore is discussed.