sions proposed recently by Bovee and Jahn designate axopodia to separate sarcodines at a subclass level. Yet these are only one of several types of pseudopodia seen in planktonic Foraminifera.

Living Globigerinidae collected off the southern California coast were observed in agnotobiotic cultures for periods up to three months. Healthy globigerinids exhibit a gradual change in the morphology and function of their pseudopodia which is related to the development and secondary calcification of the whole organism. The pseudopodia differ considerably from those of benthonic Foraminifera, except in the bidirectional protoplasmic movement.

Newly formed pseudopodia are short, radiate, anastomosing, and motile, emanating from the sarcode through the test pores. Development of an internal axial core greatly lengthens individual pseudopodia, thereby increasing exposed protoplasmic surface, and providing support for flotation of the organism. The initial axial core is extremely flexible (probably entirely proteinaceous), resulting in tenuous pseudopodia which anastomose distally on contact with one another. Such pseudopodia are readily regenerated following loss by an actively metabolizing young foraminifer.

During development, the pseudopodia increase slightly in width and become brittle as calcification hardens the inner core. At this stage, pseudopodia may be broken by handling, rather than tangled as in young specimens. Anastomosing occurs only in a few specimens by means of slender, temporary connections near the pseudopodial tips. There the protoplasm and granular contents commonly flow undisturbed beyond the tapering end of the solidified core to form an actively motile, retractable probe.

The pseudopodial granular contents range from numerous large, angular particles in new pseudopodia, to relatively few regular and flattened shapes after calcified cores have developed. Calcification increases pseudopodial core diameter while decreasing pore-opening diameter. This restricts the flow of protoplasm along the pseudopodia, and limits the size and shape of transported particles. Finally, as the axial cores become thicker and heavier, globigerinid pseudopodia no longer anastomose. The cores, originating in protoplasm, are trapped by their expansion in the gradually closing pores to form the "spines" referred to in the literature.

The pseudopodia of planktonic Foraminifera thus originate as specialized rhizopodia, which develop into axopodia as growth of the organism proceeds. With such a pseudopodial continuum occurring within one species, classification based on the pseudopodial differences outlined by Bovee and Jahn would cut across specific life cycles. Accordingly, the proposed taxonomy is considered inadequate with regard to the Foraminiferida.

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Injection Water Sources, Wilmington and East Wilmington Oil Fields

Although most of the Wilmington structure lies under or near the Pacific Ocean, water of the quality necessary for waterflooding has to be produced from near-surface deposits.

These deposits may be divided into two parts in the developed Wilmington area: the Gaspur zone, a Recent channel fill of the ancestral Los Angeles River, and the Pleistocene shallow-water deposits down to about 500 feet. These Pleistocene deposits include the "200-foot sand" and the "400-foot gravel" of the San Pedro Formation. All of these sands are salt-water invaded in this area. About 600,000 bbls./day of injection water currently are being produced from 45 wells completed primarily in the Gaspur or "400-foot gravel" zones. Water salinities range from about 1,000 ppm. chloride to approximately that of sea water. Because of the natural filtration of the beds, the oxygen and suspended solids contents are low, but the water has to be treated with bacteriacides prior to injection.

Ditch samples from eight exploratory core holes in the undeveloped East Wilmington field showed the water source beds to be missing in part of the area. Two of the four drilling islands probably will be located where the salt-water-bearing sands are missing. In order to insure an adequate injection-water supply, the islands may have to have an interconnecting water system that ties with additional source wells on Pier "J."

Near the eastern end of the Wilmington structure in the vicinity of the Humble-Texaco Belmont Island, the San Gabriel River flows through the "Alamitos Gap." The shallow river-channel deposits here are neither so deep nor so sharply defined as those of the Los Angeles River. Adequate salt-water-bearing sands are present in the lower San Pedro Formation, which is the equivalent of the Silverado zone on the west.

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Pacific Offshore Drilling and Completion Techniques

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Faunal Evidence of Miocene-to-Recent Paleoclimatology in Antarctic

Two independent lines of faunal evidence indicate intermittent if not continuous polar ice in Antarctica from Pliocene or latest Miocene to Recent, an interval of about 11 million years. First, the area of subarctic and Antarctic planktonic Foraminifera extended far into the temperate regions during the Pleistocene; changes of almost equal magnitude are now recorded for the middle Pliocene and the latest Miocene. Second, evaluation of data from deep-sea cores in the southern Indian Ocean and the Antarctic shows dominant Antarctic cold-water radiolarians spanning the interval from latest Miocene to Recent. These data are in agreement with the isotope data by Emiliani that abyssal waters of the Pacific Ocean were reduced to about 2°C. during the Pliocene, as conditioned by low surface temperatures in polar seas. Also, studies in Antarctica by Rutford, Craddock, and Bastien show possible tillites below volcanic rocks that have been dated radiometrically to be approximately latest Miocene or earliest Pliocene.

It is proposed that the upper limit of the Miocene in Antarctic deep-sea cores corresponds approximately

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