neoecology and from statistical analyses of palynological assemblages. The environmental factors generally sought are physiography, hydrography, temperature, moisture, and substrate. Their determination involves an analysis of fossil origin, preservation, identification, association, relative abundance, and successional occurrence. Palynological fossils in a deposit are commonly derived from more than one ecology and are transported to the place of burial by gravity, wind, water, or some organic vehicle. The lithofacies in which the fossils occur are indicative of the environment of preservation and, in many cases, of the physiographic-hydrographic relations. Identifications of palynomorphs can be made at the phyla level and are valid paleoecological indicators but, with narrower taxonomic recognition, the fossils become increasingly useful in environmental studies. Specific determinations and natural-affinity associations give the best paleoecological criteria for the recognition of distinct environments. Consistent association of certain palynomorph species may be indicative of certain ecological conditions, and their relative abundance can indicate the stage of regional or local environmental development. Relative abundance, however, must not be construed as indicating the absolute abundance of the parent plant or animal from which the palynomorphs were derived. The abundance of individual fossils observed may be governed by the number of spores, pollen, statoblasts, etc. produced by the parent organism, manner and distance of transport to the place of burial, type of preservation, diagenesis of the sediments, and techniques of recovery from the rock for study. Successional stages of palynological assemblages in a stratigraphic section are related to many factors and, where these are recognized, the successional stages can indicate environmental conditions not otherwise apparent.

Pleistocene paleoecological studies give clues to techniques that may be used in Tertiary and Upper Mesozoic investigations. This is especially true if the fossils have recognizable natural affinities. When dealing with Paleozoic and Lower Mesozoic palynomorphs there are problems of organic evolution. These make environmental determinations difficult, and more empirical ecological techniques are required than with the younger fossils. Although the resulting environmental conclusions are mainly hypothetical, this information has been found useful in biostratigraphic studies.

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### Stratigraphic Distribution of Diatom Floras in Type Monterey Formation and in "Sisquoc" Formation of Santa Maria District, California

The upper member of the typical Monterey Formation near Del Monte and Monterey, California, bears a distinctive diatom flora of at least 288 species. Most of these diatoms are bottom-dwelling forms; only a few are sessile. This flora is of Delmontian (late Miocene) age.

In the "Sisquoc" Formation along Harris Grade near Lompoc, Santa Maria District, three diatom floras may be distinguished: all are younger than the Delmontian flora of the upper typical Monterey, but only about 150 species occur. Pelagic forms are most numerous in the older and middle of these "Sisquoc" floras whereas bottom-dwellers, both free and attached, increase upward through the sequence, being most common in the youngest of the floras.

All four of these distinctive diatom floras have been found over an extensive area in the California Coast Ranges. They occur from Monterey in the north to Taft in south-central California and to Santa Barbara in the southwestern part of the state.

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### Palynology of Paleozoic Rocks of Libya

Marine sediments were deposited in western Libya during most of Paleozoic time. The resulting rock section consists of a thick sequence of detrital rocks, largely dark gray shales and sandstones, ranging in age from Cambrian to Permian. A high proportion of the fine-grained rocks in all of the Paleozoic systems contain spores, pollen, hystrichospheres, and (or) chitinozoans.

Various hystrichospheres occur in most of the marine Paleozoic rocks. Although some hystrichospheres are stratigraphically significant throughout the Paleozoic, they are particularly important in the Cambro-Ordovician section, where pollen and spores are absent. Chitinozoans are found most commonly in Silurian and Devonian strata.

The earliest occurrence in Libya of spores of vascular plants is in rocks of Early Silurian age. The Silurian microflora is dominated by smooth trilete spores. Spores constitute less than 10 per cent of the total palynological assemblage in the lower part of the Silurian, but generally comprise a larger proportion of the total assemblage in upper Silurian rocks; the remainder of the population is composed primarily of hystrichospheres.

An abundant and diverse microflora is encountered in Devonian rocks. This assemblage is characterized by trilete spores with a variety of sculpturing and ornamentation. Smooth, spinose, and reticulate spores are common, as are zonate and monosaccate spores. Trilete spores with radiating ridges are also found.

The Carboniferous microfloral assemblage is distinguished by spores with an equatorial flange, triangular zonate spores with distal spines, trilete reticulate spores, and monosaccate forms.

The frequent occurrence and excellent preservation of these palynological assemblages, commonly where other fossils are rare or absent, permit zonation and correlation of Paleozoic strata in Libya. These rocks also provide a source of material that can contribute to an over-all understanding of the stratigraphic ranges, evolution, and phylogeny of spores, pollen, and certain groups of microplankton during Paleozoic time.

Representative microfossil assemblages are illustrated together with range charts showing the stratigraphic distribution of the more common and diagnostic forms.