stone, calcareous mudstone, and dolomitic limestone. In the basin there is a thick subsurface section of earlier Tertiary sedimentary rock, whereas in the surface exposures the Etadunna is dissected in places by the fossiliferous Mampuwordu Sands (? Pliocene), which in turn are truncated by the unfossiliferous red beds of the Tirari Formation. Cutting deeply into the Tirari are the fluviatile fossiliferous Katipiri Sands (Pleistocene).

Ngapakaldi fauna. MOLLUSCA: gastropods. ANTHROPODA: ostracodes. OSTEICHTHYES: lung fish, teleosts. REPTILIA: chelonians—including a ? meiolanid, crocodileans, varanid lizards. AVES: pelicans, flamingos, ducks, cranes, thick-knees, and a gull or tern. MARSUPIALIA: two dasyurids, *Perikoala*, rat-kangaroo, a primitive kangaroo, thylacoleo-like animal and a primitive diprotodontid.

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Comparison of Three Cretaceous Spore-Pollen Assemblages from Maryland and England

Comparative studies of dispersed spores and pollen from the Upper Cretaceous Magothy Formation and the Lower Cretaceous Arundel Formation, both in Maryland, and the Lower Cretaceous Wealdian sequence in southern England reveal striking similarities and differences among the dominant species. The two Lower Cretaceous assemblages consist almost exclusively of fern spores and gymnosperm pollen. Of the thirteen most abundantly occurring fern spore species in the Arundel association, ten are conspecific with species in the Wealdian one. In spite of the wide geographic separation of the two assemblages, only four of the dominant species reported from the Wealdian were not observed in the Arundel microflora.

A much greater difference is evidenced in comparing the Upper and Lower Cretaceous assemblages from Maryland, each of which contains a distinctive and diagnostic microflora. Of the twenty-five most abundant fern spore and angiosperm pollen species (thirteen from the Arundel, twelve from the Magothy), only one is common to both. An even more obvious difference is the fact that no angiosperm pollen were observed in the Arundel. However, in the Magothy angiosperm pollen constitute approximately forty per cent of the dominant species. Furthermore, the Magothy assemblage, in general, is characterized by species whose morphology is more complex and more advanced than that shown by the forms in the Arundel.

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Dolomite in Modern Carbonate Sediments, Southern Florida

The western margin of Florida Bay contains extensive shallow-water banks of unconsolidated, fine carbonate mud. The banks are separated by narrow tide channels and rest on hard Pleistocene bedrock. The banks attain a maximum thickness of about 4½ feet. Radiocarbon dates show that they have been formed in the past 4,000 years. The carbonate mud is composed principally of aragonite, with lesser proportions of dolomite and both high- and low-magnesium calcite. The proportion of dolomite varies, ranging up to about 5 per cent by weight of the total carbonate. Other constituents are quartz and opaline sponge spicules, but these rarely form more than 1 or 2 per cent.

Dolomite crystals are euhedral rhombohedrons varying in size from less than 1 micron to approximately 60 microns. They commonly have dark internal rhombohedrons that appear to be intergrowths of dolomite and organic materials. Complex clusters of interpenetrating rhombohedrons are present, but are rare.

The occurrence of interpenetrating rhombohedrons and intergrowths of organic and carbonate material suggests that dolomite has been formed *in situ* in Florida Bay; however, radiocarbon dating shows that the dolomite is older than 35,000 years and must be detrital.

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Sedimentary Basins and Oil Developments in Indonesia

In spite of retarded developments of the oil potentials in Indonesia since World War II, the Indonesian Archipelago ranks as ninth in the list of world crude production. Aside from the known oil fields in Borneo (Kalimantan), Sumatra, Java, and West-Irian (New Guinea), great possibilities exist to further develop the oil potentials of the sedimentary basins of Indonesia provided that the Indonesian Government grants liberal terms and attractive conditions for existing and new concessions to private oil companies.

This summary of the stratigraphy, structure, and oil potentials of the Tertiary basins of Indonesia is based mainly on available literature (E. W. Beltz, H. M. Schuppli, G. F. Kaufmann, J. Weeda, J. H. L. Wennekers, and others) and to a smaller degree on personal experience.

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Sacramento and Northern San Joaquin Valley Gas Areas

The Sacramento and Northern San Joaquin Valleys are now a major dry gas province, there being about 65 dry gas fields from Fresno on the south to Redding in the north, a distance of approximately 300 miles. The Sacramento and Northern San Joaquin Valleys are a southeasterly plunging synclinorium bounded on the east by the Sierra Nevada and on the west by the Coast Ranges. This sedimentary trough is asymmetrical, the west flank steeper than the east. The stratigraphic section from Cretaceous through Recent represents a composite thickness of approximately 50,000 feet. Because of tilting and subsequent truncation, the stratigraphic section of the Sacramento Valley becomes successively younger in a southerly direction. Stratigraphic traps formed by the truncation of the southerly plunging section are economically significant. The configuration of the resultant edge lines takes parabolic form with its apex at the north. Three unique detritus-filled erosional gorges transect the Sacramento Valley within the subsurface.

The synclinorium is broken by several northeasterly trending subsurface anomalies: the Red Bluff arch, the Marysville-Colusa arch, the Sacramento hinge-line, and the Stockton fault which structurally separates the Sacramento Valley from the San Joaquin Valley. The Marysville Buttes, Dunningan Hills, Kirby, and Potrero Hills are several prominent topographic features closely associated with gas accumulation.

In general, the Sacramento Valley gas production is separated on the basis of stratigraphy into two parts by the Sacramento hinge-line. The Rio Vista basin, south of the hinge-line, contains a thick Miocene-Eocene section deposited in a saucer-shape basin unconformably overlying Upper Cretaceous sediments. Production in the Rio Vista basin is predominantly from "blanket" type Eocene sands on structural anomalies. North of the Sacramento hinge-line, the majority of the gas production, which is firmly established over this broad area, is stratigraphically entrapped in erratic lenticular Upper Cretaceous sands.

It is anticipated that extensive Upper Cretaceous production present north of the Sacramento hinge-line will be found in the Rio Vista basin and the Northern San Joaquin Valley. The economic depth limit for testing the Cretaceous will be effectively lowered as the intrinsic value of gas increases.

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SUBMICRONIC STRUCTURE OF FOSSIL COCCOLITHOPHORIDS

Electron photomicrographs of replicated surfaces of fossil Coccolithophorids reveal a wealth of minute structural detail. The complex nature of large coccoliths has been suspected from features which can be seen in a light microscope. However, most of the minute structures are visible only in the electron microscope.

Discoliths consist of about 100 radially arranged peripherally branching platelets, each about 1/5 micron wide. Rhabdoliths are extremely complex. The "basal plate" is in reality made up of about 50 wedge-shape platelets arranged in an imbricate fashion. The stem also appears to be made of thin imbricate platelets. *Coccolithites gammation* possesses a complex circular ridge surrounding the central pore. About nine widely spaced shallow grooves, which may represent sutures, are present on the distal surface of this species. The margin is finely dentate, the individual denticles being only about 1/40 micron across. Broken edges of pentaliths of *Braarudosphaera* show an apparent laminar structure; however, no traces of fine structure have yet been observed on the surface of the pentaliths.

Discoasterids appear to be much more coarsely constructed than coccoliths, confirming observations made with the light microscope.

Analysis of submicronic structure will be of major importance in establishing a genetic classification of the Coccolithophorids and related nannoplankton.

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PALYNOLOGY AND TIME-STRATIGRAPHIC DETERMINATIONS

The determination of time horizons is difficult because of the comparatively slight amount of information collected to date; because many palynomorph-bearing sediments are devoid of other fossils which may permit accurate dating; and because many lithologic strata are known to transgress time.

Complications to accurate dating involve recognition of following facts.

1. There are no finite boundaries based on evolution of plants alone. Unless an unconformity is present all horizons involve more or less gradual change.
2. Sediments may be carried into a basin from different directions, resulting in a mixing of suites of palynomorphs from dissimilar floral provinces.
3. River transport may carry a suite of fossils different from those by air transport from the same floral province as well as from a different province.
4. Circulation (coriolus or other currents) can re-orient and partially re-distribute fossils after they have arrived within a basin of deposition.

At the present time, the general boundaries (world-wide) such as the Mio-Oligocene, Pennsylvanian-Permian, and Mississippian-Devonian are recognized. Absolute determination has yet to be made, in most instances. Such boundaries are largely theoretical and have to be established and extended as each new fossil province is studied. However, time lines, within an individual depositional basin, can be established palynologically, with reliability and confidence. If palynomorphs are present in sediments of a basin, time-stratigraphic determinations can be made and correlations established.

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RECENT PETROLEUM DEVELOPMENTS IN OREGON AND WASHINGTON

There are five exploration basins in Oregon and Washington, two west and three east of the Cascade Mountains. Exploration has been cyclic; much of the exploration during the high period of the last cycle (1955–1957) was concentrated in the eastern basins.

During 1961, exploration emphasis swung to the offshore parts of the western basins where five companies conducted marine geophysical operations in Washington and Oregon, and a sixth in Canadian waters adjacent to Washington; in addition, offshore aeromagnetic surveys were conducted.

Onshore exploration consisted of seismic operations on Whidbey Island in Washington, and a gravity survey in the Willamette Valley of Oregon. Eleven dry, new-field wildcats totalling 45,000 feet, all located in the Western Columbia Basin of Washington, were drilled during 1961.

During 1961, legislation was passed in Oregon which provides for the leasing of offshore State lands.

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PROGRESS REPORT ON LATE TERTIARY AND QUATERNARY OSTRACOD FAUNAS OF CARIBBEAN

The lower Miocene ostracod fauna of the Caribbean area (the Gulf Coast, Central America, northern South America, the Antilles, and the Bahamas can be divided into four units: Gulf Coast, the "*ashermani*"-fauna (*Hulingsina*, *Actinocythereis*, *Protocytheretta*); Central Caribbean, the "*antillea*"-fauna (*Loxoconcha antillea*, *Hemicythere antillea*, *Costa* spp.); northern South American, the "*navis*"-fauna (*Cativella*, *Caudites*, *Basslerites*, *Pellucistoma*), and the more wide-spread "*deformis*"-fauna (*Aurila*, *Hermanites*, *Jugosocythereis*). These are all shallow-water assemblages. The "*ashermani*"-fauna spread to the south during Miocene time whereas the "*antillea*"-and "*navis*"-fauna moved northward to effect a mixing of the faunas in the Cuban and Guatemalan latitudes. The "*ashermani*"-fauna did not extend far south of these, and in the Quaternary withdrew northward. The "southern" faunas spread farther north, with the "*antillea*" element reaching Florida in the upper Miocene, and later withdrawing. The "*navis*"-fauna extended to the Carolinas, and at present dominates the entire region.

Relative movements of these faunas are governed by many factors, including currents, temperature, water-depth, salinity, and bottom sediment among others,