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LOWER PALEOZOIC PALYNOMORPH PROVINCES AND PALEOCLIMATE

Lower Paleozoic palynomorphs show a large morphologic diversity and are, generally, extremely abundant in unmetamorphosed marine sediments, yet the stratigraphic ranges and regional distribution of most taxa still are poorly known. Only now are data becoming available to permit the determination of the distribution of palynomorphs in the Silurian System and, to a much smaller extent, in the Upper Ordovician and Lower Devonian as well. An embryonic palynostratigraphy is being constructed for the Silurian. Its zones are based on (1) the appearance of miospores and on their increasing morphologic complexity, and (2) the ranges of selected acritarch and chitinozoan taxa. Megafossil evidence, mainly from graptolites, fixes these ranges. The palynostratigraphic system, crude as it may be, appears to be valid for the areas bordering the Atlantic Ocean.

Several contrasting, "worldwide," acritarch biofacies existed in the regions bordering the Atlantic, in Arctic Canada, and in Siberia during the Silurian. From the megafossil evidence these biofacies are judged to be contemporaneous; they are regularly and predictably time-transgressive. On a regional scale the facies are not significantly correlative with such local differences in sedimentary realm as are expressed in changes in lithology, but because lineations based on compositional differences in acritarch spectra seem to be roughly parallel with lithotope boundaries, a causal relation between them is suspected.

On a Wegenerian palinspastic reconstruction of Atlantic Pangea, the parallelism of biofacies lineations, lithotopes, and perhaps even paleomagnetic latitudes is apparent. This parallelism is interpreted as reflecting regional differences of paleotemperature. For example, Silurian acritarch biofacies boundaries would be paleoisotherm-parallel, and therefore paleolatitude-parallel. Arguments are: (1) on Atlantic Pangea there was an epicontinental sea with a minimum width of at least 45°. In such a sea the latitudinal temperature gradient must have been quite pronounced; (2) biofacies regionally are continuous and have a simple and regular geometry; (3) lithotopes and biofacies are parallel and their boundaries follow small circles; (4) regional biofacies are independent from such short-living factors as islands, troughs, and local lithology changes; (5) biofacies form a cross-continental chronologic and regional homotactic arrangement; and (6) the biofacies show a time-transgression which follows the polar trajectory as extrapolated from Devonian and Ordovician pole positions.

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EXPLORATION AND DEVELOPMENT OF PETROLEUM RESOURCES, 1970–1975

The annual growth rate in domestic and free-world demand for petroleum from now until 1975 can be estimated at 5 and 7.5% respectively, resulting in 19 million and 57 million bbl/day total demand in 1975.

However, the areas which will supply this demand, especially those in the United States, can hardly be determined because of the bewildering variety of political, legal, and environmental factors—as contrasted to purely economic ones—which will be of critical influence. Therefore it is difficult to forecast definitely the areas and the amounts and costs of exploration and development, as well as prices and earnings.

One thing is certain, however, there will be a growing shortage of domestic crude and an increasing dependence on foreign supplies. Both the cost and dependability of the latter are questionable in view of political considerations and the actions of OPEC.

Any interruption of our foreign energy supplies would have a dramatic effect on our economy and security and would show the dangerous results of the lack of a coherent and positive domestic energy policy.

There are very few discovered but undeveloped oil reserves in the United States except on the North Slope, and those probably cannot be made available until 1976. Though the recent NPC-AAPG study indicates almost 200 billion bbl of expectable recoverable reserves, any large increase in exploratory effort to find them cannot have any great effect on our crude deficit before 1975 because of the necessary lead times. It is obvious, however, that steps should be taken immediately to encourage or to cause such an increase so that the period of danger to our economy and security will be as brief as possible.

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JAVA SEA PLATFORM AND MADURA BASIN, CENTRAL INDONESIA

The Pertamina-Cities Service, Ashland, Monsanto, Robina contract area covers Madura Strait, parts of the Java and Bali Seas, and the islands therein—about 57,700 sq mi. The Java Sea sector is part of a geologic platform, the remainder covers the Madura basin.

The Java Sea platform is the southeastern part of the "Sunda shelf" and occupies the stable region between Borneo and East Java. It consists of a basement complex of pre-Tertiary sedimentary, metamorphic, and igneous rocks overlain by varied thicknesses of Tertiary strata. Recurring Tertiary stresses created several prominent downwarps, shatter zones, and broad uplifts. Local folds tend to be associated with fault zones. Transgressive early Tertiary sediments filled the bottoms of the troughs, and were involved in strong tectonic activity. Subsequent sedimentation was more widespread and limestone deposits became important, especially in the southern and eastern parts of the platform. Extensive accumulations of younger Tertiary regressive strata suffered diminishing deformation. "Biohermlike" anomalies of several ages are abundant on the platform in the central part of the area and less common in the eastern half.

The Madura basin is the deeper, open-ended, offshore extension of the East Java basin which bounds the Java Sea platform along its southern margin. Several lines of compressional folds are present on the northern flank and localized areas of older folding adjoin the north coast of Java. Madura Island, an anticlinorium, and several islands on trend with it are upfaulted or upwarped parts of the northern flank of the Madura basin.

Geophysical surveys include 25,000 mi of seismic profile. Twelve exploratory wells were drilled on the platform part of this contract area and 8 wells were drilled in the contract area on the north. Numerous early-day tests were drilled on Madura Island; a recent well in the offshore part of the Madura basin failed to reach its primary objectives. Oil and gas shows have