anchor man on the exploration team, to be knowledgeable only in his own specialty. Conversely, he should recognize that he can not be all things to all people. It is his personal challenge, as well as that of the increasing number of specialists with whom he comes in contact, to make skillful use of team effort.

Modern oil exploration has become a process in which no two situations are alike. The diversity of plays demands the close cooperation of the geologist, geophysicist, and researcher with landmen, economists, and producing specialists in establishing optimum programs.

Overlaid on these responsibilities is the need for greater awareness of the political, educational, public, and community relations, considerations which have come to have an increasing importance in the conduct of exploration team activities. Such influences frequently affect strategy, tools, timing, and logistics, as well as land and legal procedures.

Still another area of responsibility for the team member lies in the development of improved communications. The obligation to share geological or geophysical data collected at all points within an organization's sphere of operations is an immediate necessity. Geological experience gained in one corner of the world may result in unsuspected benefit to operations in an entirely separate area.

Building and maintaining a team with the necessary skills and imagination capable of meeting and moving beyond contemporary requirements have thrust some new and specific responsibilities on the industry itself.

Intense competition and a soft price structure in foreign oil markets have sharpened the need for unprecedented efficiency in Free World oil circles. The oil explorer is no longer the glamor-boy of the industry, aloof from the economics of marketing and manufacturing. He must accept the role of a team member for his own survival in an era of vastly increased world-wide competition.

COUPER, R. A., Bataafse Internationale Petroleum Mij., N. V., The Hague

SPORE-POLLEN CORRELATION OF CRETACEOUS ROCKS OF NORTHERN AND SOUTHERN HEMISPHERES

This paper summarizes published and unpublished palynological data from Upper Jurassic and Cretaceous sediments of northwest Europe, Russia, North and Central America, the Middle East, North and West Africa, South America, Australia, and New Zealand. Many publications could be considered only in a very general way or had to be disregarded because of the inadequate illustrations and descriptions of species and nomenclatural confusion or because of the complete lack of stratigraphic data.

Numerous very distinctive forms of spores and pollen grains, some of which can be assigned with confidence to living families of plants, make their first appearance in the fossil record during Upper Jurassic and Cretaceous time. They are accompanied in the marine sediments by the incoming of equally distinctive forms of microplankton. Based mainly on the incoming of such forms of spores, pollen, and microplankton, many authors have erected varying numbers of palynological subdivisions for use purely in local correlation in their respective areas. Some, but unfortunately few, by comparison with spores, pollen, and microplankton from sections independently dated by other fossils such as ammonites or foraminifera, have attempted to correlate local palynological subdivisions with the standard biostratigraphic units of the Cretaceous.

A compilation of results from published works, together with unpublished results from Royal Dutch/Shell Group palynologists, suggests the following generalized sequence of spore and pollen floras and their approximate correlation with the standard biostratigraphic units.

Upper Cretaceous.—Floras with increasing numbers of species of dicotyledonous pollen grains. Tendency toward typical Northern and Southern Hemisphere floras is apparent in the Lower Senonian and is clearly marked by the Upper Senonian. In most areas considered, a broad 3-fold palynological subdivision is apparent, which is correlated generally with the Cenomanian-Turonian, Lower Senonian, and Upper Senonian.

Aptian-Albian.—First appearance of generally small and more or less sculptureless tricolpate dicotyledonous pollen grains in both Hemispheres. Last appearance in most areas of the Northern Hemisphere of such typical Jurassic-Lower Cretaceous forms as *Classopollis torosus, Cayionipollenites pallidus, Pilosisporites trichopapillosus.*

Hauterivian - Barremian. — Northern Hemisphere floras generally characterized by co-occurrence of Jurassic and older Cretaceous forms of spores and pollen together with *Ephedra*-like pollen and rare monosulcate pollen grains with clearly differentiated exine (*Clavatipollenites*).

Not sufficient data from Southern Hemisphere for comparison.

Valanginian.—In both Northern and Southern Hemispheres generally characterized by abundant specimens of *Cicatricosisporites dorogensis* and related forms together with abundant typical Jurassic gymnosperm and pteridosperm pollen. Clearly separated from Jurassic in Northern Hemisphere by first appearance of a number of forms including *Appendicisporites.*

The paleontological and stratigraphic evidence used in the correlation of local palynological subdivisions with the biostratigraphic units within the areas considered, is summarized in the form of range charts, and some of the more distinctive species of spores and pollen are illustrated by photomicrographs.

CROSS, AUREAL T., Michigan State University, East Lansing, Mich.

PLANT MICROFOSSILS AND GEOLOGY

The role of palynology in the exploration for oil is essentially comparable with that of any other branch of paleontology. Advantages and limitations of sporomorphs, algae, miscellaneous protistans of uncertain affinity, and other similar-sized microfossils utilized in palynology as stratigraphic and paleoecologic indicators are briefly reviewed. The economic value of this relatively modern scientific field to the petroleum industry may be increased and hastened by avoiding some of the pitfalls which befell micropaleontology in its earlier years of application. Information should be developed simultaneously on the biology, ecology, and stratigraphy of these organisms.

Palynologists now being trained should be encouraged to develop their knowledge of both geologic and biologic fundamentals. Research should be sponsored in industry research laboratories and in private or university laboratories—research which includes studies of the distribution and preservation of sporomorphs in modern sediments; relative significance of living assemblages to other types of organisms; development of methods and programs for mechanical classification of these microfossils and analysis of data; improvement of techniques for separating spores and similar fossils from