ASSIGNMENT ON MICROPALEONTOLOGY AND PALEOECOLOGY

Submitted to

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Stratigraphical and paleoenvironmental application of spores and pollens

Biostratigraphy - correlation of rock sections. This aspect of palynology is the most important economically. Proper identification of indicative palynomorphs could lead to the discovery of oil, coal, and gas deposits. In fact, fossilized pollen was first discovered in a coal thin section. Because pollen and spores have the tendency of being dragged along with migrating petroleum through porous rocks - they are good indicators that petroleum isn't too far away. The small sizes of palynomorphs are ideal for drill core samples. The coloration and type of palynomorphs represents the thermal maturity and hydrocarbon potential of the area.

Biostratigraphy and geochronology. Geologists use palynological studies in biostratigraphy to correlate strata and determine the relative age of a given bed, horizon, formation or stratigraphical sequence.

Because the distribution of acritarchs, chitinozoans, dinoflagellate cysts, pollen and spores provides evidence of stratigraphical correlation through biostratigraphy and palaeoenvironmental reconstruction, one common and lucrative application of palynology is in oil and gas exploration.

The use of pollen data in association with megafossil information has had a profound influence on the interpretation of paleophytogeographic patterns throughout the world. Such studies are especially valuable when they incorporate both extant and fossil data and are founded on well-defined geographic regions of the world. Other investigations have utilized paleoecological data to show that the early flowering plants were herbs or small trees living in unstable habitats during the Cretaceous.

Certain climatic parameters can also be defined by the occurrence of certain palynomorphs, because various plants respond to minor environmental fluctuations. Tracing the appearance and disappearance of various palynomorphs vertically in the geologic column provides a method of tracking certain types of climatic shifts. Pollen analysis is a branch of palynology in which the relative proportions of pollen and spores are mapped vertically and horizontally; these proportions are then used to reconstruct the paleoenvironment by comparison with modern proportions of the same or closely related taxa.. Palynomorphs or microfossils are preserved from every time period of geologic history and in many types of depositional environments, so they are a valuable source of information with which to characterize changes in paleoecosystems at different scales.

Significance of pollens and spores in petroleum and sedimentary geology

Petroleum geology

The art in the application of palynology is a classic as it described the role of palynology as it was practically applied in the exploration for oil. It was essentially comparable to that of any other branch of paleontology. Advantages and limitations of spores, pollen, algae, miscellaneous protistans of uncertain or known affinity and other similar sized microfossils utilized in palynology as stratigraphic and paleoecologic indicators arc 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 plagued micropaleontology in its earlier years of application. Information should be developed simultaneously on the biology, ecology and stratigraphy of these organisms.

In the oil industry, palynology is a stratigraphic tool especially use- ful in the study of rocks deposited in continental, coastal, and shallow-marine settings. Palynological analyses are used mainly for chronostratigraphic correlations, paleoenvironmental studies, and the evaluation of potential source rocks. The integration of paly- nology with other geological disciplines, such as sedimentology geophysics, geochemistry, and petrophysics, is needed for geological modeling and petroleum system studies, which in turn are essential for planning and developing better exploration strategies and for optimizing reser- voir exploitation. Good examples of the benefit that palynology has provided to the oil industry through time are given by Hopping (1967) and McGregor et al. (1996).

The recent development of new geological con- cepts and methods, such as sequence stratigraphic analysis and high-resolution three-dimensional (3-D) seismic technology, has caused significant changes in stratigraphic work. In palynology, and in general in biostratigraphy, the classical qualitative or semiquan- titative studies based on selected marker taxa have been enhanced with modern quantitative methods that use the whole palynological assemblage (includ- ing particulate organic matter), high-resolution sam- pling, and multivariate statistical methods (examples are presented in Jansonius and McGregor [1996] and Jones and Simmons [1999]). To refer to this new approach, Armentrout (1996) used the term ”high-resolution sequence biostratigraphy” (HRSB). Biostratigraphy is no longer viewed as a service, as it was in the past, but as a part of integrated team- work projects. The integration of HRSB with other disciplines to develop integrated geological teams has determined the alignment of biostratigraphy with the attainment of business goals, which is called by Payne et al. (1999) ”high-impact biostratigraphy” (HIB).

Sedimentary geology

As pollen and spores are produced in large numbers and dispersed over large areas by wind and water, their fossils are recoverable in statistically significant assemblages in a wide variety of sedimentary rocks. Moreover, because pollen and spores are highly resistant to decay and physical alteration, they can be studied in much the same way as the components of living plants. Identification of pollen and spore microfossils has greatly aided delineation of the geographical distribution of many plant groups from early Cambrian time (some 541 million years ago) to the present.

Important, too, is the fact that the evolutionary sequence of organisms based on the large fossil remains of plants in sedimentary rocks is recorded by the sequence of plant microfossils as well. Such microfossils are thus useful in determining geologic age and are especially important in sediments devoid of large fossils. Because of their abundance and minute size, microfossils can be extracted from small samples of rock secured in drilling operations.