

custrine. Fluvial cycles consist of basal channels, channel-filling sandstone, and silty claystone floodplain deposits capped by soil(?) horizons. "Deep" lacustrine cycles are alternations of oil shale and thin carbonate rock. Complex nearshore cycles contain a basal terrigenous sequence, grading upward from mudstone to sandstone, and an upper carbonate sequence of oömicrite and oösparite capped by discontinuous algal mats and stromatolites. Cycles in other paleogeographic settings are modifications or combinations of these three basic types. Through correlations of groups of cycles, fluctuations in the extent of Lake Uinta and resultant changes in local base level are interpreted to have produced the cycles.

Walther's Law, which relates lateral facies changes to similar vertical sequences, cannot be applied to the Parachute Creek if only lithofacies are considered. For example, fluvial disconformities are equivalent to terrigenous lacustrine rocks, but none of the cycles contains both. Thus, Walther's Law must be modified to consider events and history, rather than lithofacies. Then the fluvial disconformities and terrigenous lacustrine rocks are seen to represent a single event, a fall in base level, and should not occur in vertical sequence.

This modification of Walther's Law does not violate its original intent. Rather, the applicability of this useful principle is broadened by removing the general requirement of regionally extensive lithofacies. Furthermore, attention is focused on history and causes, rather than on products.

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BOTTOM SAMPLING OF GEORGIA ESTUARIES WITH NEL SPADE CORER¹

This is a progress report of a recently begun study to investigate in detail the bottom sediments of the Georgia estuaries and continental shelf. The potential significance of this project is enhanced greatly by the use of the NEL spade corer as the principal sampling device. This corer is capable of taking large, oriented, and undisturbed samples from unconsolidated substrates.

Hans-Eric Reineck, director of the Senckenberg Institute, invented the original box-corer. This was modified subsequently by Bouma and Marshall, and more recently it has been changed further by personnel of the Naval Electronics Laboratory of San Diego. The corer has a surface area of 10 by 12 in. and can penetrate to a depth of 24 in. A self-locking compass designed by Rosfelder and Marshall of Scripps Oceanographic Institution records the orientation of the core at the instant of sampling.

Physical and biogenic sedimentary structures which are of principal interest to this study are being examined by stereo X-ray radiography and preserved as epoxy peels. Wave- and current-formed structures preserved in the sediments are being mapped and compared with patterns of current flow; biogenic structures represented by burrows and bioturbate textures are being examined and recorded for their environmental significance; and sediment grain size and composition are being determined.

In addition to obtaining fundamental information on the conditions of sedimentation of the Georgia shelf

and estuaries today, this study is producing information which permits direct comparisons with clastic facies of the Pleistocene strata of Georgia.

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TRACE FOSSILS AS CRITERIA FOR RECOGNIZING SHORELINES IN STRATIGRAPHIC RECORD²

Biogenic sedimentary structures offer a new and exciting approach to the interpretation of ancient sedimentary environments. Although trace fossils have been studied extensively by European geologists since early in this century, it is only in recent years that they have received much more than passing mention in North America. The increased interest in tracks, trails, burrows, and borings is due primarily to the environmental or facies approach to the study of sedimentary rocks. Whereas, in the past, attention has been directed toward descriptive studies of rock units, the present paleoecologic approach demands a genetic interpretation of the sedimentary record.

Appreciation of biogenic sedimentary structures as facies indicators has been influenced significantly by the emphasis on studies of physical sedimentary structures which in the past two decades have introduced many new keys to paleoenvironment interpretation. Additional impetus to the utilization of trace fossils has come from detailed studies of modern sediments which illustrate clearly the important relations that exist between the animals and sediments in a particular environment.

In the study of ancient and present-day nearshore sedimentary environments, the facies significance of biogenic sedimentary structures can be demonstrated readily. Striking similarities exist between nearshore clastic facies of Holocene and Pleistocene sediments of the Georgia coast and Upper Cretaceous shorelines of the western interior. Such similarities dramatically point out the value of trace fossils in environmental interpretation. These comparisons exist not only on the regional stratigraphic level but also between and within specific facies. Field studies which utilize trace fossils in conjunction with physical sedimentary structures, lateral and vertical changes in the sedimentary sequence, and geometry of the rock body offer new opportunities in the search for stratigraphic accumulations of oil and gas.

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SIGNIFICANCE OF PROVINCIALISM IN RICHMOND (UPPER ORDOVICIAN) CORRELATIONS

Richmondian strata have been recognized in large areas of North America. Study of brachiopod faunas provides a basis for evaluating Richmondian correlations and the extent to which provincialism characterizes separate but supposedly time-equivalent sedimentary basins.

A comparison of the brachiopod faunas of the standard Richmond section with the nearby Maquoketa Shale shows a marked dissimilarity between the two. Of 14 diagnostic species common to the type Richmond (Ohio Valley), only three are found in the Maquoketa sections in Iowa. Of 13 diagnostic species common to the Maquoketa, only two are found in the

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