devoid of landslide structures. Regional variation in stratigraphic position of the base of the landslide facies establishes the fact that the foot of the paleoslope migrated north-northwestwardly through time.

In strata of the landslide facies, directional-current structures show transport from south to north whereas rocks of the floor facies display evidence of paleocurrents moving from east to west, suggesting that gravity-driven paleocurrents were deflected by velocity loss from northwardly to westwardly flow at the foot of the paleoslope. Distinctive siltstones were deposited by the deflected currents against the foot of the paleoslope.

The landslide facies is characterized by landslide deposits, reddish and greenish colors, subgraywackes, conglomerates, good fissility, fragmental fossils, ripple marks, and load-structures whereas the floor facies is defined by brown and gray colors, graywackes, poor fissility, sole marks, and trace fossils.

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INTRODUCTION TO SYMPOSIUM ON GEOPHYSICAL AND GEOLOGICAL PROPERTIES OF THE CRUST AND MANTLE

New petroleum is found with ideas.

The explorationist must think in terms of scale and context. This symposium focuses attention on some very large scale features of both the upper mantle and crust. Deep-seated inhomogeneities and regional discontinuities periodically will leave their imprint on the upper crustal rocks on land and under the sea—perhaps even in the deepest ocean basins. By recognizing these major features and trying to understand their behavior, we will develop the context into which smaller-scale features must be fitted. By drilling these features we will find the petroleum of tomorrow. It is, therefore, timely that we lay the groundwork needed to develop these ideas that will lead to our discoveries of the coming decade.

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THE CAMBRIAN FRONTIER

Precambrian fossils are no longer to be considered oddities of questionable scientific or practical value. New discoveries, new techniques, and the impact of radiometric dating on Precambrian stratigraphy make it possible to set out for the first time the sequence of fossils through Early, Middle, and Late Precambrian time. They fall into four major classes: microfossils (appearing first), stromatolites (including index fossils of economic importance), megafossils (rich faunas in Late Precambrian, with at least 25 taxa representing 6 phyla of soft-bodied organisms at one locality in Australia), and trace fossils (possibly the earliest remains of animals). These occurrences can be related to the history of the biosphere and to modern studies of biochemical evolution. Placed in proper relation to the geotectonic framework of sedimentation they support the view that the search for oil should be extended beyond the Cambrian frontier into at least Late Precambrian sedimentary basins. Considerations of the definition of the base of the Cambrian and of events at that time also support this view.

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ENVIRONMENTAL GEOMETRY: ITS EFFECT ON AND INTERACTION WITH SEDIMENTATION

Environmental geometry is defined as the three-dimensional shape of a locus of sedimentation as delineated by its bathymetry below a base level. Most depositional loci can be considered as open systems that exist within the framework of a larger system. Their geometry is thus nested within a hierarchy of geometric shapes, the largest of which is delineated by oceanic boundaries. Within any locus of deposition at any level in the nest of loci, the distribution, and often the rate of application of energy are functions of (1) the geometry of the locus and (2) the relative position of that locus in the geometrical hierarchy. Therefore, the characteristics of sediments within a locus of known bathymetry can often be predicted from environmental geometry alone. However, the relative importance of environmental geometry as a parameter which produces sedimentary patterns depends upon the rate of deposition at any one hierarchical level and is most effective at low to medium rates of sedimentation. Since the geometry of the depositional loci at all levels of the nest is interdependent, influences on sedimentary patterns exist between all levels but are most effective between adjacent levels. Multiple non-linear regression provides, in environmental studies, a powerful tool that permits the analysis of the inter-level geometric effects on sedimentation. Examples are presented from estuaries, bays, lagoons, and the continental shelf.

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THE STRATIGRAPHY OF THE AMSDEN FORMATION OF WYOMING

The Amsden Formation was studied in 1) western Wyoming, 2) the Wind River Mountains, and 3) the Big Horn Mountains area. Thirteen sections were measured in detail and representative samples collected for petrographic analysis.

Based upon the range of percentage of clastic quartz and clasticity, the Amsden Formation is divisible, in ascending order, into: *Subunit 1*—the Darwin Sandstone and, where present, the overlying siltstone/shale; *Subunit 2*—a quartz-poor, predominantly carbonate sequence; *Subunit 3*—many thin, quartz-poor, cyclic pairs of carbonate/non-carbonate beds; and *Subunit 4*—many thin, quartz-rich, cyclic pairs of carbonate/non-carbonate beds.

The greater amount of clastic quartz in the Wind River Mountains compared with areas to the north and west suggests a source area south of the Wind River Mountains. The clasticity and percentage of clastic quartz, in conjunction with lithologic curves, indicate that shallow water environments persisted in the area of the Wind River and northern Big Horn Mountains, whereas the central and southern Big Horns and western Wyoming areas were deeper water environments. *Subunits 1* and *2* represent a general transgression, and *Subunits 3* and *4* a general regression. The presence of many diastems and clastic/carbonate pairs of cyclic sediments in the Wind River Mountains and northern Big Horn Mountains sections and their absence in the deeper water environments suggest many minor oscillations in sea level during both the transgressive and regressive phases.

GORSLINE, D. S., VERNON, J. W., and SCHIFFMAN, A., Department of Geology, University of Southern California, Los Angeles, California

PROCESSES OF SAND TRANSPORT IN THE INNER MARGINS OF THE CONTINENTAL SHELF