photographs taken from orbital altitudes. Sufficient relatively high-quality space photography is available to permit evaluation of selected areas offering a broad spectrum of structural complexities, rock types, and geographic locations. An important aspect of hyperaltitude photography is the synoptic overview of large areas without regard to natural and artificial boundaries. This type of view will prove quite valuable in regional geologic studies and the planning of exploratory programs. Many difficult geologic problems in one area may easily be solved by comparison with another area where the critical relations are exposed. Certain electronic image enhancement techniques may prove to be a valuable aid in the interpretation process, especially for the ERTS imagery. The ERTS program scheduled for 1972 will furnish imagery with a ground resolution of 400–600 ft. The Skylab program in 1973 will provide the geologist with excellent color photography with 30–60-ft resolution of large areas between the 50th parallels. Space photography should yield important data which will result in a much better understanding of such things as major tectonism, continental drift, nearshore deposition, and comparative geology on a global scale.

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TRANSPORT OF OCEAN SEDIMENTS BY DEBRIS FLOW

Debris flow, a gravity-transport mechanism commonly observed on land, may be a significant agent of high-density mass transport of sediment in the oceans. Debris flow is distinguished from other mass-transport agents by the mechanism of support of granular solids in the flow. Support is provided mainly by the strength of the debris, but also by buoyant forces. Strength is derived from the fluid phase of the debris (clay minerals plus water), which acts as a plastico-viscous material. Suspension of granular solids by this mechanism does not depend on flow conditions and occurs if the debris is moving very slowly or even not at all. Movement of a debris flow depends on a critical thickness of the debris as well as the internal-friction angle. The slope angle required for debris flow typically is less than the 18–37° required for normal grain flows or avalanching. Thus, debris flow may carry large amounts of sediment in suspension while moving sluggishly down a gentle slope. The amount of clay, relative to granular solids, necessary completely to support sand-size material is on the order of 10% or less. Thus, sandy debris-flow deposits may be texturally similar to current-deposited sands.

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SIGNIFICANCE OF THIN CARBONATES IN INTERPRETING DEPOSITIONAL ENVIRONMENTS OF THICK CLASTIC SEQUENCES

When interpreting depositional environments of dominantly clastic sequences, thin carbonates, if present, often are overlooked or given short shrift. Detailed study of the carbonates, however, can be instrumental in environmental interpretations of enclosing clastics. This is particularly true if the clastic units lack fossils or environmentally significant sedimentary structures. This hypothesis is supported by 2 examples from Pennsylvanian and Permian strata of southeastern Wyoming.

The Permian Goose Egg Formation consists of thick, red siltstone and mudstone with interbedded thin, widespread carbonates. The clastic units have been interpreted by various workers as deep-water marine, shallow marine, deltaic, specialized marine, or continental deposits. Petrographic examination of the carbonates suggests that they were deposited in shallow subtidal, intertidal, and supratidal environments. The facies mosaic exhibited by the carbonates suggests that enclosing siltstone and mudstone were deposited in nonmarine environments.

Festoon cross-stratified sandstone which characterizes the Casper Formation (Pennsylvanian-Permian) in the extreme southern Laramie basin has been interpreted as marine, subaerial, or fluvial in origin. Carbonate beds in the Casper Formation are thin, lenticular lithosomes of limited geographic extent. Petrologic studies of these limestones suggest that they were deposited in small lakes or ponds which periodically were emergent. The inferred environment of carbonate deposition supports a subaerial dune environment for the festoon cross-stratified clastics.

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EXPLORATION AND DEVELOPMENT OF NATURAL GAS, 1970–1975

The energy crisis in the United States has been making headlines for more than 2 years. Most energy materials are expected to be in short supply, but the shortage of natural gas is recognized as being most critical. Liquefied natural gas and coal gas will supply a part of the demand but most of the new gas required must result from domestic drilling. An all out effort must be made to discover and develop the 1,178 trillion cu ft of gas estimated by the Potential Gas Committee to remain undiscovered in the United States. Cost of finding and developing this new gas might well be in the same range as the estimated cost of LNG and coal gas.

Compensation for today's higher risks and higher costs must be provided by incentives in the form of tax credits and higher wellhead prices. A graduated wildcat-well tax credit, similar to the now repealed investment tax credit, may be the way to encourage the drilling of the higher risk new-field wildcats required to discover the gas that the country will require during the next 2 decades.

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COPRECIPITATION OF STRONTIUM AND MAGNESIUM WITH HOLOCENE CAVE CALCITES, BARBADOS, WEST INDIES

Within stalactites from Barbados caves, progressively younger calcite conical growth layers and central canal void-filling calcites contain smaller amounts of Sr and Mg. The observed distribution of Sr and Mg in the stalactites is in agreement with a solution-reprecipitation model in which calcite-to-calcite transitions within a low-Mg calcite vadose zone yield amounts of Sr and Mg decreasing with time to vadose water seeping into ventilated cavern macropores. Within the overall trend of decreasing Sr and Mg content, vadose seepage and speleothem calcites may become locally enriched in Sr and Mg when (1) the groundwater temperature decreases, thus affecting the temperature dependence of the calcite-water distribution coefficients for Sr (0.14 ± 0.02 at 25°C) and Mg (0.062 ± 0.015 at 27°C), or (2) meteoric waters bypass the upper vadose zone to dissolve low-Mg calcites of higher Sr and Mg content in the