outlines of the former sulfate crystals; (6) relict inclusions of anhydrite, barite, or celestite; (7) enterolithic folds; (8) various kinds of chert, including length-slow chalcedony; (9) saddle-shaped dolomite crystals; (10) dedolomite; and (11) fluorite. The Dorag model was developed from study of the classical mid-Ordovician authigenic feldspar-bearing strata, where hypersalinity must have prevailed.

Research in modern sea-marginal pools of the Red Sea shows that dolomite forms only where gypsum and/or anhydrite is likewise present. Among submerged algal mats where gypsum is absent, the carbonate minerals are aragonite or high-magnesian calcite; by contrast, where gypsum is abundant in deeper parts of pools, or among submerged algal mats, dolomite is present. Likewise, in a pool-marginal salina, not only halite, gypsum, and anhydrite, but also dolomite, form a cement between constituent particles. The high salinities at which gypsum precipitates (up to $330 \times 10^3$ mg/L in the summer) and the observation that dolomite prefers sulfate association suggest that both minerals owe their origin to hypersaline brines.

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Distribution of Carbonate Cements in Quarternary Alluvial-Fan Deposits, Birch Creek Valley, East-Central Idaho—Diagenetic Model

Quaternary alluvial-fan deposits in Birch Creek Valley are poorly sorted carbonate gravels that have undergone diagenesis in the meteoric realm through the dissolution and precipitation of calcium carbonate. Three diagenetic zones are documented on the basis of cement morphologies and paragenesis: (1) near-surface vadose, (2) vadose, and (3) "vadose-phreatic."

Cements formed in the near-surface vadose zone result from both pedogenic and nonpedogenic processes. Pedogenic processes predominate within the upper meter of fan surfaces, whereas nonpedogenic processes cause case-hardening on steep, unvegetated outcrops. Pedogenic cementation proceeds in a series of four morphologic stages and is characterized by clotted micrite and fibrous sparry calcite, commonly with gravitational morphologies and intricate banding. Nonpedogenic cements are primarily micritic to finely crystalline with homogeneous or clotted textures; microdigitate cements are common on the undersides of clasts.

Dissolution and incipient cementation are typical in the vadose zone; cements are best developed beneath large clasts. Thin, banded, gravitational cement, grain-contact cement, rare syntaxial overgrowths, and the lack of clotted micrite are indicative of vadose cementation.

Well-cemented fanglomerate reflects progressive cementation in the "vadose-phreatic" zone, or in a zone of water-table fluctuation. Two generations of cement are generally apparent. Early micrite cement forms discontinuous to continuous rims and is followed by an isopachous sparry cement. Syntaxial overgrowths are relatively common on monocrystalline grains. The degree of cementation is variable and appears to be related to grain size, sorting, and packing geometries.

The distribution and nature of the cements suggest that cementation is initiated soon after deposition and proceeds simultaneously in each diagenetic zone.

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Computer-Assisted Structural Analysis

The structural geologist's conceptual interpretations must be in accord with available data and in geometric balance. Traditionally, he has manually generated cross sections (two-dimensional) and maps (three-dimensional). From these models, iterative measurements of line lengths, areas, and volumes provide boundary conditions for a most logical solution. Projection and display from one domain to the other can involve tedious and error-prone work in the transformation of data elements.

Computer HELPWARE, defined as "the sum total of hardware, software, data management and, most important, peopleware," can assist the geologist in the search for a "most reasonable" interpretation.

Data management, with standardized definitions, is an essential element in automatic generation of maps from cross sections and vice versa. Three fundamental types should suffice; line, random, and grid formats each with linkage to a header record describing the subset attributes.

Input user-options include dynamically changing "L-Axis" projections of plunge and azimuth. The "L-Axis" interpretations may be determined from statistical curvature analysis techniques (SCAT) of dip-vector data.

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Land-Surface Subsidence in Houston-Galveston Region, Texas

The pumping of large amounts of groundwater in the Houston-Galveston region, Texas, has resulted in water-level declines between 1943 and 1973 of as much as 61 m in wells completed in the Chicot aquifer and as much as 99 m in wells completed in the Evangeline aquifer. The maximum average annual rates of decline for those years were 2.0 m in the Chicot aquifer and 3.3 m in the Evangeline aquifer. From 1964 to 1973, the maximum average annual rates of decline were 3.0 m in the Chicot and 5.4 m in the Evangeline. The declines in artesian pressures have resulted in pronounced regional subsidence of the land surface.

The center of subsidence in the Houston-Galveston region is at Pasadena, Texas, where as much as 2.3 m of subsidence occurred between 1943 and 1973. More than 0.3 m of subsidence occurred at Pasadena between 1906 and 1943. The maximum amount of subsidence during 1964-73 was about 1.1 m.

In the southern part of Harris County, about 55% of the subsidence is a result of compaction in the Chicot aquifer. The area in which subsidence is 0.3 m or more has increased from about 906 sq km in 1954 to about 6,475 sq km in 1973. The annual cost of damage attributed to subsidence for 1969-74 was estimated, in a study by Texas A&M University, to be about $32,000,000 in 2,448 sq km of the area most affected by subsidence.

The pumping rate has been almost stable since 1967,