"lack of competition" real. Current examples are: (1) in the SEC, the constant effort to broaden the definition of a security and bring the attendant registration and disclosure requirements to bear on the most mundane joint ventures; (2) in the Congress and the SEC, the pressure to bring about accounting changes limiting independents' access to equity markets and encouraging sellouts and mergers; (3) in the IRS, grotesque definitions of joint ventures as partnerships, partnerships as corporations, and farmouts as income; (4) in the FERC, strained interpretations of gas contracts as "convenants running with the land" in order to introduce the principle of administrative confiscation of mineral rights without due process. The ponderous weight of the regulatory hand weighs most heavily on the independent geologist who has no legal or accounting staff.

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Engineering Geology in Deep Basin, Canada

No abstract available.

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Burial Dolomitization of Upper Devonian Miette Buildup, Alberta

Four discrete phases of dolomite are present within rocks which compose the south margin of the small, isolated Miette buildup. Detailed mapping, petrographic analysis, and chemical studies facilitate distinction of the following dolomite types: (1) an "early" phase of microcrystalline dolomite occurring as a diffuse matrix component of micrite limestones; (2) a pervasive phase of saccharoidal dolomite exhibiting a variety of features "inherited" from precursor limestones; the degree of dolomitization associated with this phase ranges from partial recrystallization of limestones from all depositional facies to complete dolomite mosaics which modify most primary textures and depositional features in the buildup margin; (3) a relatively minor phase of subhedral to anhedral microcrystalline to macrocrystalline dolomite confined to the buildup interior and associated with bitumen, clay, and iron residues along stylolites, and with characteristic green microcrystalline carbonate accumulations along solution surfaces; (4) a late phase of coarse, white dolomite associated with coarse calcite spar, which is related to brecciation of phase 2 dolomites of the buildup margin.

Paragenetic relations between the first three phases are best observed in partially dolomitized micritic limestones from the interior of the buildup. Vuggy porosity is associated with the pervasive dolomites of the buildup margin.

Petrographic observations, supported by geochemical and isotopic data, suggest different origins for these different phases of dolomite. Pervasive dolomitization postdates cementation and lithification of back-reef deposits; furthermore, there is little evidence of subaerial exposure, and evaporite-related solution features are absent. Alkaline, magnesium-rich fluids derived from adjacent and underlying basinal strata may have been responsible for the major phase of pervasive dolomitization.

Before dolomitization models can be applied to specific localities and to rocks displaying specific facies relations, careful petrographic, geochemical, and stratigraphic analyses are essential.

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Determination of Storm Overwash Periodicity from Stratigraphic Relations in Delaware Coastal Barriers

Atlantic coastal barriers of Delaware are characterized by relatively thick (>1 m) sandy washover units interbedded with thin silts and clays. The coarse-grained sediments represent overwash deposition during storm conditions, and are separated by lagoonal and marsh muds deposited during quiescent periods between storms. Washover deposits consist of fine-grained to coarse-grained, moderately sorted, negatively skewed sands. Internal sedimentary structures, consisting of lower units of small- and large-scale trough cross-bedded laminations and upper units of slightly landward-dipping parallel laminae, reflect the transition from lower to upper flow regime as storm intensity peaked. The fine-grained materials represent lagoonal and back-barrier marsh deposition, and consist of silts and clays containing characteristic faunal and floral components. The sand unit forms a sharp contact with underlying muds, whereas the upper boundary is a gradational sand-to-mud contact as back-barrier marsh deposition reestablished on the washover-fan surface. Thickness and lateral extent of washover deposits vary depending on magnitude of wave parameters and storm tide. Large fans may extend as far as 1 km landward, and exceed 1 m in thickness. Radiometric dating of organic material in marsh and lagoon deposits permits establishment of up to four major depositional events during the past 2,700 years. Back-barrier marsh mud sequences suggest a time of stability and low storm periodicity, whereas the greater part of the barrier washover sequences suggests a higher frequency of major storm overwash and upbuilding of the back barrier. Thus, storm-overwash periodicity may be the major determinant in establishment of lateral facies interrelations between coastal-barrier and lagoonal sequences in the stratigraphic record.

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Dinoflagellate Assemblages from Surface and Subsurface Nanushuk Group (Albian-Cenomanian), Northern Alaska

A multidisciplinary evaluation of potential hydrocarbon reservoirs in the Nanushuk Group (Albian-Cenomanian) of northern Alaska is being undertaken by the U.S. Geological Survey. The correlation of surface outcrops of the Nanushuk with subsurface units is based, in part, on marine dinoflagellate assemblages. Nanushuk dinoflagellates have been studied from four cored wells: Umiat Test Well 11, Simpson Core Test 25, Fish Creek Test Well 1, and Grandstand Test Well 1. Sam-

ples from numerous surface sections measured in considerable detail from localities throughout the east-west outcrop band of the Nanushuk are also being studied.

The results thus far are preliminary. Distinctive relations among assemblages are emerging, suggesting correlations from the surface to subsurface and delineating ages of middle Albian to early Cenomanian for the units studied. This palynologic work represents a pioneering effort in North Slope biostratigraphy. One interesting aspect of the overall Nanushuk Group project is that the same samples used for paleontology are also used for sedimentologic and other analyses, making possible multidisciplinary studies on a sample-to-sample basis.

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Diagenetic Alteration in Eocene Alluvial-Plain Deposits, Sierra Nevada Foothills, California

Cobbles in Eocene alluvial-plain deposits of California indicate that major changes have occurred in these first-cycle sediments. Migrating pore water has caused diagenetic alteration in the upper parts and authigenic iron sulfide growth in the lower parts of these braided-river gravels. Analysis of thin sections and X-ray diffraction patterns reveals that mica, amphibole, and feldspar in cobbles of various compositions are replaced predominantly by kaolinite. Original minerals found in fresh cores of some cobbles are replaced completely in altered rims by hematite and limonite. Sand samples from the upper parts of the gravels contain abundant quartz with kaolinite pseudomorphs of biotite and feldspar and hematite pseudomorphs of iron sulfide. The heavy-mineral suite consists of chemically stable minerals including zircon, ilmenite, tourmaline, and the alteration products anatase and leucoxene. Sand in the basal Eocene gravels contains abundant detrital iron-bearing silicates and authigenic sulfides. Cobbles in the lower unit show little evidence of alteration. Apparently, decomposition of trapped organic matter and pyritic slate clasts reduced the pH and Eh of the pore water percolating through the gravels, causing the hydrolysis of silicate minerals. Some constituent ions migrated in solution away from reaction sites, and iron was precipitated as sulfides as it reached saturation. At some later time, lowering of the water table permitted oxidation of the sulfides in the upper parts of the gravels. This interpretation suggests that the subtropical alluvial-plain environment is ideal for elimination of chemically unstable minerals and rock fragments from sediment being transported through the river system.

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Shell Borings in Upper Miocene–Pliocene Tamiami Formation, Collier County, Florida

Borings of common marine organisms such as algae, bivalves, polychaetes, and echinoids are potentially useful in sedimentologic and paleoecologic studies. A variety of spectacular shell borings is preserved in the upper Miocene–Pliocene Tamiami Formation exposed in Collier County, Florida. Paleontology of the richly fossiliferous Tamiami Limestone is difficult to study because leaching has selectively removed aragonitic shells. However, this selective shell removal has revealed excellently preserved shell borings as mud-filled molds. Characteristic, interconnecting, subspherical galleries of clionid sponges are the most common borings. The ichnogenus *Entobia* is applied to fossil borings similar to modern clionid sponges. Essentially all of the thick-shelled bivalves, as well as many of the thinner shelled species show evidence of sponge borings. Borings of two polychaete worms are also abundant in Tamiami fossils. Excavations similar to those produced by the genus *Polydora* are the most common, and the second appears unlike modern forms and is tentatively placed in the ichnogenus *Meandropolydora.* Most thick shells contain distinctive borings of two species of bivalves. These borings have a calcareous lining, and are similar in form to borings of the modern mytilid genus *Lithophaga.* The Tamiami Limestone has been described as of shallow-water origin, because of the contained oysters, pectens, and echinoderms. Information derived from the abundant shell borings is consistent with this interpretation, indicating a shallow, warm, low-energy environment.

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In-Situ Formation of Botryoidal Aragonite on Permian Seafloor

Botryoidal masses of (former) aragonite make up the core facies of some Lower Permian phylloid algal mounds in the Sacramento Mountains of New Mexico. These mounds were deposited along a shelf edge in shallow, gently current-swept environments. The aragonite appears to have been precipitated inorganically as in-situ seafloor growths, with individual vertical relief as much as 5.0 cm above the substrate. As such, they represent the first reported occurrence of marine aragonite formation at the sediment/water interface. The lateral and vertical coalescence of botryoids created a three-dimensional network of interbotryoid and internal cavities that were simultaneously filled with fossiliferous marine sediment and/or aragonite-fan cements. The volume of marine aragonite in these inorganic boundstones is as high as 85% in some samples.

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Petrology of Miocene Catahoula Formation, Central Texas Coastal Plain

In the central Texas coastal plain, the Catahoula Formation consists of a basal Chita Sandstone Member (fluvial-channel facies) and an overlying and/or laterally contiguous Onalaska Clay Member (flood-plain and levee facies). The basal unit of the Chita Sandstone is typically a channel deposit of ash-gray, conglomeratic, medium to coarse-grained sandstone in graded to poorly laminated beds containing silicified wood chips. Fining-upward sequences of moderately sorted sandstone units consist of (McBride classification): sublitharenite (42%), quartz-arenite (29%), subarkose (16%),