uplift, erosion, and subsidence. Evidence for this conclusion comes from regional geologic and tectonic mapping and the collection of samples of shallow-water deposits of Cenozoic age at depths exceeding 1–2 km that lie on surfaces cut across deformed and indurated Mesozoic deposits.

Although the writers recognize that the origin of submerged surfaces on continental margins that are underlain by lithified rocks cannot everywhere be ascribed to subsided erosional surfaces, this explanation appears to be more generally applicable than others that have been considered. The broader implications of this conclusion are: (1) postulated offshore landmasses, *e.g.*, Appalachia and Cascadia, may indeed have existed and foundered along former continental edges, (2) continental accretion may be interrupted by relatively long episodes of continental regression or wasting, and (3) the widespread evidence for marginal foundering suggests that a general mechanism of crustal thinning, possibly including "oceanization," is involved.

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EXPERIMENTAL DISSOLUTION OF CALCIUM, MAGNESIUM, AND STRONTIUM FROM HOLOCENE BIOGENIC CARBONATES: A MODEL OF DIAGENESIS

Laboratory experiments at ordinary temperatures and pressures for periods up to 240 days on Holocene biogenic carbonate sediments showed that fresh water and seawater dissolve aragonite and Mg-calcite.

The observed rates of dissolution of calcium, magnesium, and strontium indicate that these elements are incorporated in aragonite and magnesium calcite in more than one way (in lattice positions, in lattice interstices, or in inclusions). This suggests the presence of more than one mineral phase in the skeletal materials studied; these phases differ in response to solution and probably in chemical composition. The more soluble phase may influence initiation of dissolution of the material and initiation of calcite nucleation in the aragonite-to-calcite inversion process.

Calcium, magnesium, and strontium are dissolved in proportions different from those in the original solid, *i.e.*, incongruently. The experimentally established sequence of preference is, as a rule, Mg-Ca-Sr.

Factors found to determine direction and degree of incongruency in dissolution include mineralogy (number, kind, and relative abundance of phases present), physiologic effects operating during lifetime of the organism, and chemical composition and volume of waters effective in dissolution.

Incongruent dissolution determines presence, absence, and abundance of ions derived from solids in the diagenetic environment and, hence, ion availability for precipitation in cement and for inhibition or catalysis in inversion or cement precipitation. Magnesium and strontium contents in shell material have been used by others as temperature and salinity indicators in Holocene environments. The present study shows that because of incongruent dissolution these indicators are not dependable for paleoenvironmental analysis.

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PALEOCHANNELS

The width (w), depth (d), meander wavelength (l), gradient (s), shape (w/d), sinuosity (P) of stable alluvial river channels are dependent on the volume of water moving through the channel (Q_w, expressed as either mean annual or bankfull discharge or mean annual flood) and the type of sediment load conveyed through the channel (Q_s, expressed as either the ratio of bedload to total sediment load or the percentage of total sediment load that is sand size or larger):

$$Q_w \simeq \frac{w, d,}{s}$$

and

$$Q_s \simeq \frac{w, l, s}{P}.$$

Empirical equations developed from data collected along modern rivers permit calculation of the effects of changes of hydrologic regimen (Q_w, Q_s) on channel morphology. Conversely, these relations permit estimation of paleochannel gradient, meander wavelength, sinuosity, discharge, and type of sediment load from the dimensions of the paleochannel as exposed in cross section when the bed and banks of the paleochannel are composed of alluvium transported by the ancient river.

The recognition of paleochannels within valley-fill or other complex fluvial deposits is a major problem. Some criteria for the delineation of paleochannel cross-section shape and dimensions have been developed from studies of the shapes and sediment characteristics of Australian paleochannels.

Although major changes of river morphology during both historic and geologic times support the empirical relations, they, nevertheless, must be applied with caution because the effects of colonization of the land by primitive vegetation and the progressive evolution of vegetation have influenced markedly the paleohydrology of ancient drainage systems.

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DEEP DRILLING COST TRENDS

A yearly study by Petroleum Engineer Publishing Company tabulates the number of wells, locations, total well costs, and bit use, and notes trends toward deeper drilling in various oil-country areas such as the Delaware basin of west Texas.

Deep drilling (15,000 ft and deeper) has increased in recent years. The locality and success ratio of ultradeep drilling (20,000 ft and deeper) are reviewed, and the 1968 deep-drilling data, which are available early in 1969, are compared with 1965, 1966, and 1967 data.

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RELATION OF SUBMARINE CANYONS TO CONTINENTAL SLOPE

Except in areas of gentle inclination, the continental slopes are cut by numerous submarine canyons. There is ample evidence that these canyons are loci of active erosion and represent the chutes down which sediments are transported to build the great fans that have