carbonates, bears no relation to sedimentary facies; to the contrary, it is demonstrably joint-controlled. This evidence, together with the near absence of "dedolomite," indicates a late and sustained source of magnesium in excess of that expected from an evaporite-bearing assemblage.

Water samples from Keuper "salinas" (salt-producing evaporating pans) show that meteoric water descending through the Keuper evolves into a brine with Mg:Ca ratios locally 4:1, despite the abundance of gypsum and anhydrite. Samples of Keuper subjected to simple solution in the laboratory liberate Ca:Mg in the ratio of 3:2, which is probably sufficient for dolomitization under reasonable subsurface temperature-salinity conditions. X-ray analysis indicates chlorite as a source of the magnesium, the solubility of which probably reflects diagenetic fixing in the Keuper evaporite basin. The composition of Keuper water, aided prior to unloading by geothermal gradient, is thought to be responsible for Muschelkalk dolomitization.

FREY, ROBERT W., Dept. Geol., Univ. Georgia, Athens, GA 30601, and Marine Inst., Sapelo Island, GA 31327

PROGRESS IN ICHNOLOGY—STUDY OF ANIMAL SPOOR

Trace fossils—the tracks, trails, burrows, borings, and other spoor made by ancient organisms—are difficult to identify and classify phylogenetically but can be assigned relatively easily to various taxonomical, behavioral, and preservational categories. Analyses of these aspects of spoor can yield considerable information that is potentially very useful in geology.

The most significant contribution of spoor to date has been in paleoecology and environmental reconstructions, including recognition of local and regional-temporal facies changes and documentation of individual paleoecologic parameters. Spoor are potentially valuable indicators of bathymetry, currents, food supplies, aeration, rate of deposition, depositional history, and substrate stability; they also may be useful to some extent in establishing ancient temperature and salinity regimes.

The chief contribution of spoor to paleontology is partial resolution of "the problem of the incomplete fossil record." This includes, inasmuch as possible, the identity, behavioral patterns, and certain evolutionary trends among ancient organisms not otherwise represented in the fossil record. Reconstruction of diversity and trophic relations is important and generally feasible.

Trace-making animals are important sedimentologically because they destroy previous sedimentary structures and fabrics and produce new structures and fabrics. Spoor have certain potential even in biostratigraphy and local correlations. Many trace fossils are excellent geopetals.

Ichnology—the study of spoor—has developed slowly relative to other branches of geology, but the subdiscipline is now on the threshold of widespread acceptance and considerably increased application.

FULLER, JOHN G. C. M., AMOCO Canada Petr. Co., Ltd., Calgary, Alta.

THE GEOLOGICAL ATTITUDE

Geological ideas from the beginning have clustered on a succession of concerns which can be related generally to social and industrial pressures. Some concerns, in response to contemporary stimuli, swelled explosively into well-defined constellations of activity to which names such as "creation," "evolution," and "conservation" apply. Other culminations of geological activity, more limited in their reference, relate to changes in technical capability, and seem to last about a quarter of a century.

Always present in geological thought, there has existed an attitude of special relationship to the earth; the geologist is an intermediary between his culture and its physical substructure. The actions of geologists in our civilization have profoundly altered concepts of secular time, the church, man, and the balance of nature. In the last, social pressure must be near its peak.

GAGLIANO, SHERWOOD M., Coastal Studies Inst., Louisiana State Univ., Baton Rouge, LA 70803

BUILDING NEW MARSHES AND ESTUARIES IN COASTAL LOUISIANA THROUGH CONTROLLED SEDIMENTATION

Coastal Louisiana wetlands are a product of Mississippi River delta building that has occurred over a period of 3,000–5,000 years. The building processes were very nearly balanced. In modern times man's use of the area (flood control, navigation improvement, exploitation of petroleum and other minerals, road building, *etc.*) has seriously altered the natural balance. As a result, overbank flooding has been virtually eliminated and river flow is confined to channels discharging into the outer shelf area. Most transported sediment is now deposited in the deep Gulf of Mexico or along the continental shelf. Saltwater encroachment in the deltaic estuaries has been detrimental to fauna and flora. Even though considerable sediment deposition has resulted from the historic Atchafalaya River diversion and growth of subdeltas, comparative map studies indicate a net land loss rate of 16.5 sq mi/year during the last 25–30 years. Land loss is only one symptom of general environmental deterioration.

A dynamic management plan is necessary for better utilization of combined freshwater discharge–dissolved solid and transported sediment input of the Mississippi River. Controlled flow into estuaries will reduce salinity encroachment and supply needed nutrients. Large areas of new marshland and estuarine habitat can be built by controlled subdelta diversion. Studies of natural subdeltas indicate that these systems are amenable to environmental management; salinities and sediment deposition may be manipulated to enhance desired conditions.

GEBELEIN, CONRAD D., Dept. Earth and Space Sci., SUNY at Stony Brook, Stony Brook, NY 11790

SEDIMENTOLOGY AND ECOLOGY OF HOLOCENE CARBONATE FACIES MOSAIC, CAPE SABLE, FLORIDA

The Holocene carbonate sediments of Cape Sable, Florida, form a facies mosaic in which facies are controlled by frequency and duration of flooding. The 4 following zones occur:

1. Flooding 0–5% of the time (*supratidal*)—massive to crudely bedded sandstone or siltstone, abundant birdseye, low species diversity, high abundance of single species with uniform-sized individuals.

2. Flooding 5–25% of the time (*high intertidal*)—low domal and flat laminated algal stromatolites, desiccation cracks and flat laminated pebbles, low species diversity, low abundance of individuals, microscopic invertebrates only.

3. Flooding 25–90% of the time (*low intertidal*)—