are accepted as representing the same species, and Le Calvez and others have shown that several megalospheric generations can develop between microspheric generations. The megalospheric generation groups may not all develop the same size of proloculus. One species could be represented by microspheric forms as well as a wide range of megalospheric forms. Apparent differences which are related directly to prolocular diameter are not considered sufficient evidence for specific discrimination.

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Coprolites *versus* Fecal Pellets

Since the earliest descriptions by Lister (1678), animal fecal excrements have aroused the interest of scientists. Fossilized specimens, thought at one time to be fossil fir cones, gained special recognition following the first suggestion of their animal origin by Mantell (1822) and the coining of the term "coprolites" by Buckland (1829). Special recognition came about because coprolites provide data pertaining to the diet, the physiological nature of certain internal organs, and the ecological environment of the animals that deliver them.

A literature review of more than 400 publications on the subject has been prepared (Häntzschel, El-Baz, and Amstutz, in press). A study of the terminology applied in these reports indicates a lack of consistency. In matters of nomenclature, there are strong criteria which support the following:

1. The term "coprolites" is used correctly when reference is made to petrified fecal excrements. It is used incorrectly when it refers to dessicated, dried, or fresh fecal remains.
2. Coprolites should be restricted to fossilized fecal remains of vertebrates (between 1 mm and 20 cm). Invertebrate fecal remains (usually smaller than 1 mm) may be called fecal pellets, and where petrified, fossil fecal pellets.
3. Accumulation of petrified fecal excrements of birds may be referred to as guano deposit or fossil guano.
4. Coprolites and fossil fecal pellets should be used to describe specimens which are *known* to have originated as animal fecal excrements. Those concretionary fossil forms showing partial geometric or chemical similarity to them should be termed "pseudo-coprolites" and "pseudo-fossil fecal pellets," respectively.

Statistical studies of published information concerning coprolites, fossil fecal pellets, and related objects (enterolites, urolites, vomit balls, gastric concretions, vesinal and urinary calculii, *etc.*) proved to be rewarding. It was feasible to classify coprolites and fossil fecal pellets according to shape, size, color, and composition. Statistical counts of the distribution, animal of origin, enclosing sediments, and geologic age of known occurrences also were carried out.

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Recent Carbonate Sedimentation and Diagenesis in Walker Cay-Grand Cays Area, Little Bahama Bank

The Walker Cay-Grand Cays area is on the northwestern part of the Little Bahama Bank, 130 nautical mi northeast of Miami, Florida. This study was made to provide detailed data on the sediment changes that occur within a small, complex, shelf-edge carbonate area.

On a typical traverse seaward across the area, the environments observed are: (1) shallow bank with muddy calcarenite; (2) oölite bars; (3) islands of lithified Pleistocene calcarenite, (4) patch reefs with a *Gorgonacea, Montastrea, Agaricia, Diplora* assemblage; (5) the fringing reef, largely "dead" and algal encrusted, except for scattered growth of *Acropora* and *Millepora;* (6) a deeper, forereef zone of live *Montastrea* with patches of coarse coralgal calcarenite; and (7) a rock platform with little sediment cover, lying at a depth of about 65 ft and sloping gradually seaward until it reaches a depth of 85–125 ft where it intersects the very steep continental slope.

On traverses across these environments, 135 bottom samples were collected. The sand-size fractions of the samples were impregnated with polyester resin and thin-sectioned. The data resulting from point counts of these thin sections were analyzed by *R* and *Q* mode factor analysis. In the *Q*-mode analysis, 5 factors accounted for 96 percent of the variation in the data. Mapping of these factors led to a relatively simple pattern of sedimentation: a broad area of skeletal sand composed of variable percentages of *Halimeda,* mollusks, foraminifers, and pellets, separated in protected areas by carbonate mud, around the reefs by coralgal sand, and in areas of strong tidal flow, by sand bars of superficial oölite.

Lithification of Recent carbonates occurs as: (1) beachrock; (2) subaerial crusts about 3 in. thick on beach ridges; (3) thin, well-indurated algal mats near the edge of a mangrove swamp; and (4) semilithified blocky submarine crusts on some oölite bars. Another diagenetic change in the sediment is "micritization" of the grains, particularly on some of the "older" stabilized oölite bars, where the oölitic coatings are being destroyed. This process, if continued, might lead to the misinterpretation of these deposits as pellet sands.

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Phylogeny and Ontogeny of Charophyta

The oldest known occurrence of the Charophyta is from the Devonian of eastern Europe. Devonian and Lower Mississippian rocks also contain the most diverse types of charophytes but their pre-Devonian ancestors are still unknown.

During the Devonian the dextrally spiralled forms of the Trochiliscaceae increased in size, the number of spiral units decreased, and calcium carbonate was first secreted in coronula cells. Some workers believe that the reticulate forms of the Sycidiaceae and vertically ribbed forms of the Chovanellaceae are related closely and represent utricula.

In the Middle Pennsylvanian through middle Permian are found the sinistrally spiralled forms with apical pores and hollow spirals of *Stomochara* Grambast.

Palaeochara Bell has six spirals and is the only post-Devonian form of that type with the exception of some modern types.

The upper Permian and Triassic contain forms not fundamentally unlike their Pennsylvanian ancestors. The apical pore, which was probably the germination point, was retained.

Beginning in Late Jurassic and continuing through the Recent, conditions were more favorable throughout the world for charophyte growth and many different forms evolved. The utricle coverings of the gyrogonite, apical rosettes, peripheral groves, thinned apical areas, basal structures, nodes, and variations in structure of the spiral units evolved as their abundance apparently increased and ecologic niches became more abundant and varied.

The ontogeny of the Tertiary forms also reflects this change. There is some enigma about the modern types because they are not as diverse as one might expect with the modern geologic setting of high continents and abundance of fresh- and brackish-water environments. Large collections containing many variations of growth stages are of greatest importance in the study of phylogenetic and ontogenetic characters. Because of this, selection of types commonly is misleading in taxonomic studies of the Charophyta.

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SESPE FORMATION—EXAMPLE OF ARID CLIMATE REDBED

Examination of sedimentological aspects of the Sespe Formation, a late Eocene to early Miocene redbed unit of southern California, indicates that the formation was deposited under generally arid conditions. Evidence for this interpretation includes: (1) presence of arid-climate sedimentary features; (2) absence of intense weathering products among the detrital mineral suite, including the feldspars, ferro-magnesium minerals, iron oxides, and clay minerals; and (3) presence of an evaporite mineralogical suite including gypsum, borate minerals, and "corrensite," and abnormal formation-water content.

Although at variance with earlier interpretations based on scanty faunal remains and the primary detrital model of redbed sedimentation, arid conditions of Sespe deposition can be reconciled readily into a consistent regional climatic picture.

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OPERATIONAL CLASSIFICATION OF UNCONFORMITIES

Differences in unconformities suggested by earlier classifications are more fancied than real. The criteria of scale, either areal or temporal, and concordance-discordance do not serve as practical bases for classification. Moreover, the aim of a nomenclature should be to answer the question which is, in the case of unconformities, "what is the evidence?", *not* "what is the kind?"

Examples demonstrate that evidences for unconformities are: (1) truncation of allochems and stylolites; (2) occurrence of encrusting organisms; (3) cement-supported detritus; (4) cement discontinuities; (5) megascopic erosional relief and bed truncation; and (6) truncation of faults and lithostratigraphic and biostratigraphic units on maps and cross sections.

These evidences fall into the following operational categories: I—*petrographic;* II—*macrographic;* and IIIa—*lithocartographic* and IIIb—*biocartographic unconformities.*

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BAY MARCHAND-TIMBALIER BAY-CALLIOU ISLAND SALT COMPLEX, LOUISIANA

This salt complex, more than 27 mi long and up to 13 mi wide, may be part of a much longer salt feature that extends both east and west. The mother salt bed of probably Late Triassic-Early Jurassic age is buried presently to depths of 40,000–50,000 ft, whereas the tops of the individual domes along the trend rise to depths only 2,000–3,000 ft below the surface.

Production to date on this three-field complex has been in excess of 700 million bbl of oil. Oil reserves are estimated to range from 750 million to 1 billion bbl. In addition, significant gas reserves are present.

Accumulations occur in Pleistocene sandstone as shallow as 1,000 ft to late Miocene sandstone deeper than 20,000 ft. A wide variety of traps is found, including superdomal arching shale and salt truncations, stratigraphic traps, and those associated with faults.

Production was discovered on this complex in 1930, and in 1966 about 75 million bbl was produced.

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PETROLEUM RESERVOIRS AMONG EVAPORITIC ROCKS OF WESTERN CANADA AND NORTHERN UNITED STATES

In the sedimentary basins of the Great Plains province of the United States and western Canada, large amounts of rock, broadly described as evaporitic, are either themselves petroleum-bearing or so situated in their geological association with petroleum that evaporite geology bears directly on the petroleum occurrence.

Two general evaporite facies suites can be distinguished: (1) coastal shoal/salt-flat suite, and (2) reef/salt-basin suite.

1. Desert-zone coastal salt-flats, now widely called *sabkhas* (*sebkas*), have the outstanding peculiarity of a geochemical regime which transforms carbonate mud and carbonate sand to microdolomite, and simultaneously generates sheets of nodular anhydrite above high tide level. The permeability changes thus effected make stratigraphic traps for oil. Fossil sabkhas among Mississippian strata of the Williston basin and the Late Devonian of the Western Canada basin hold large reserves of petroleum and sulfur.

2. Salt deposits are extensive in the Devonian, some in shallow-shelf ("megasabkha") positions and others in salt basins where the evaporites overlie a reef-bearing formation. The evaporites surround the reef masses though they are not in stratigraphic-facies relation with them. Large petroleum reserves exist in the reefs of one basin, though not in the largest one. The Devonian salt basin deposits have analogs in the Delaware and Zechstein basins.

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PHYSICAL AND CHEMICAL PROPERTIES OF MISSISSIPPI RIVER ALLUVIAL VALLEY AND DELTA CLAYS