matrix has been freed from the rock. After removing larger, unbroken fragments, this matrix should be washed over an 80 mesh (177 micron diameter) screen sieve to remove fine fraction dust. Larger mesh sizes can be used, but an 80 mesh sieve will catch even juvenile larger foraminifera. Identification of most LBF, in fact, requires that the smaller A-forms (megalospheres) be used. Identification of the larger B-forms (microspheres) is more difficult.

After the matrix is gently washed in the sieve, it must be dried. Depending on the size of the sample, it can be placed in an oven at 100° F for a couple of hours, or set over very low heat on a hot plate. If the LBF are preserved in a white or pale-yellow limestone (such as the Ocala or Suwannee limestones), the specimens may be bleach-white and difficult to distinguish from the rest of the sediment. In this case, the sample may be dipped in a shallow pan of diluted blue or green food dye before drying. When dry, the sample may be observed in a microfossil tray under a binocular dissecting microscope at a comfortable magnification. The stained LBF will be especially evident.

To identify individual specimens to the species level (and sometimes even the genus level) normally requires that the test be split in two, or that the surface layer of the test be carefully ground away to reveal the arrangement of the internal chambers. The following specimen preparation methods will apply for many fossil LBF found in Florida.

Nummulites. Preparation of nummulitids for study requires a simple, but unusual procedure. Nummulites have a natural, equatorial plane of weakness through the edge of the test, a region called the *marginal cord*. The marginal cord is a complex system of canals and furrows that contain pseudopods. Because of this plane of weakness in the shell, the specimen can be easily split across its equatorial plane by heating the test over an alcohol lamp flame until red-hot, then plunging the foram into a shallow dish of water. This causes the nummulite to split into two equal halves, both of which show the internal test chamber (see Figure 4B). Each half (or the one that best survives this violent technique) is mounted on a labeled microfossil slide (with white glue or gum tragacanth) for study. A cover slide over the microfossil slide will ensure safe storage.

Lepidocyclina. Preparation of specimens of *Lepidocyclina* and similar forms (*Pseudophragmina*, *Asterocyclina*) requires that the surface of at least one side of the individual specimen be ground away until the equatorial and embryonic chambers become fully visible. This can be difficult because, unless the specimens are exceptionally large, they cannot be manipulated without some aid to hold them during preparation. This may be done by mounting each individual specimen on a standard 1x3" biological glass slide using a small chip of Lakeside-70 resin on the slide, holding the slide over an alcohol lamp flame until the resin melts (10-15 seconds), then placing the foram on the drop of melted resin. The resin hardens in approximately 60 seconds. It is also possible to mount the LBF test on the tip of a *dop stick* using *dop wax* (a technique used by lapidary hobbyists when holding small stones for grinding and polishing), or to mount the specimen on top of a small, flat-head nail with epoxy resin.

The specimen is now ready for grinding to reveal the internal chambers. If mounted on a glass slide, the specimen is ground on a coarse-frosted glass plate, using a few drops of water and a bit of blue or green food dye (to enhance the visibility of the specimen). Regularly examine the specimen under a binocular microscope to ensure that the grinding has not gone beyond the equatorial plane (see Figure 4A). A more finely frosted glass plate may be used for fine polishing (I use a 120 silicon carbide grit to frost the coarse plate, and a 600 grit for the finer plate). If the specimens are mounted on a dop stick or nail, a small lap wheel may be used for grinding, and the mounted specimens can be stored in a square of foam or cardboard (as with insect collections). There are various other methods that have been described in the literature for the preparation of larger foraminifera. One must find the technique that best suits.

TAXONOMIC AND STRATIGRAPHIC LISTING
LARGER BENTHIC FORAMINIFERA OF FLORIDA

The classification of foraminifera continues to change as we learn more of the genetic similarities among extant taxa, their evolutionary relationships, and acquire yet more anatomical detail of the organism. For the purposes of this paper, I have used the higher classification (to genus level) of Loeblich and Tappan (1987), and have attempted to include all LBF taxa that have been mentioned in the literature as occurring in Florida from Cretaceous to Holocene age. It should be noted that the designation of some taxa as *larger* foraminifera, may be a bit arbitrary, in some cases. There are a wide variety of sizes. Also, it must be remembered that the association of large size with algal symbiosis is an inference. Some large modern species do not harbor symbionts, and some small ones do, so precise definitions are not always possible. Therefore, some judgment had to be made whether or not to include certain species in this list. Some problematic listings and undescribed species in the literature were omitted. As with any species list, the following will continue to change and improve as fossils are reexamined. In any case, all of the species listed below are benthic foraminifera, most are relatively large or have complex tests compared to other foraminifera, and most are primarily shallow water in occurrence.

Systematic Paleontology

Order Foraminiferida Eichwald, 1830

	FloridaGeologic Range[1]
Suborder Textulariina Delage & Herouard, 1896	
Family **Lituolidae** de Blainville, 1827	
Flabellammina brachylocula Tappan, 1941	mCretaceous
Flabellammina denisonensis Tappan, 1941	mCretaceous
Lituola subgoodlandensis (Vandepool, 1933)	mCretaceous
Family **Cyclamminidae** Marie, 1941	
Choffatella decipiens Schlumberger,1905	uJur?-l-mCret
Cyclammina watersi Appin & Jordan, 1945	mEocene
Pseudocyclammina hedbergi Maync, 1953	mCretaceous
Family **Cuneolinidae** Saidova, 1981	
Cuneolina walteri Cushman & Applin, 1947	uCretaceous
Family **Dicyclinidae** Loeblich & Tappan, 1964	
Dicyclina cf. *D. schlumbergeri* Munier-Chalmas, 1887	mCretaceous
Family **Coskinolinidae** Moullade, 1965	
Coleiconus zansi Robinson, 1993	mEocene
Coskinolina elegans (Cole, 1942)	mEocene
Family **Orbitolinidae** Martin, 1980	
Coskinolinoides texanus Keijzer, 1942	mCretaceous
Cushmania americana (Cushman, 1919)	mEocene
Dictyoconus floridanus (Cole, 1941)	mCretaceous
Fallotella cookei (Moberg, 1928)	mEoc-lOlig
Fallotella floridana (Cole, 1941)	mEoc-lOlig
Paracoskinolina sunnilandensis (Maync, 1955)	mCretaceous
Orbitolina minuta Douglas, 1960	mCretaceous

Orbitolina texana (Roemer, 1849)	mCretaceous
Family **Valvulamminidae** Loeblich & Tappan, 1986	
Arenagula floridana (Cole, 1942)	mEocene
Discorinopsis gunteri Cole, 1941	m-uEoc-lOlig
Valvulammina minuta Applin & Jordan, 1945	mEocene
Valvulammina nassauensis Applin & Jordan, 1945	Paleocene
Family **Valvulinidae** Berthelin, 1880	
Cribrobulimina cushmani Applin & Jordan, 1945	mEocene
Valvulina avonparkensis Applin & Jordan, 1945	mEocene
Valvulina floridana Cole, 1941	mEocene
Valvulina intermedia Applin & Jordan, 1945	mEocene
Valvulina martii Cushman & Bermudez, 1937	mEocene
Valvulina ocalana Cushman, 1926	uEocene
Valvulina oviedoiana d'Orbigny, 1839	Holocene
Family **Chrysalidinidae** Neagu, 1968	
Pseudochrysalidina floridana Cole, 1941	mEocene
Family **Involutinidae** Butschli, 1880	
Trocholina floridana Cushman and Applin, 1947	uCretaceous
Suborder Miliolina Delage & Herouard 1896	
Family **Fabulariidae** Ehrenberg, 1830	
Fabularia gunteri Applin & Jordan, 1945	mEocene
Fabularia vaughani Cole & Ponton, 1934	mEocene
Family **Rhapydioninidae** Keijzer, 1945	
Chubbina macgillavryi Robinson, 1968	uCretaceous
Family **Alveolinidae** Ehrenberg, 1839	
Borelis floridanus Cole, 1944	Pal-mEoc
Borelis gunteri Cole, 1941	Paleocene
Borelis pulchra (d'Orbigny, 1839)	Holocene
Family **Peneroplidae** Schultze, 1854	
Dendritina antillarum d'Orbigny, 1846	Holocene
Dendritina elegans d'Orbigny, 1846	Holocene
Laevipeneroplis bradyi (Cushman, 1930)	Holocene
Laevipeneroplis proteus (d'Orbigny, 1839)	?Plio-Holo
Laevipeneroplis elegans (d'Orbigny, 1839)	Holocene
Peneroplis pertusus (Forskal, 1775)	Holocene
Spirolina coryensis Cole, 1941	mEocene
Family **Soritidae** Ehrenberg, 1839	
Androsina lucasi Levy, 1977	Holocene
Amphisorus hemprichii Ehrenberg, 1839	?Mio-Holo
Archaias angulatus (Fichtel & Moll, 1798)	?Plio-Holo
Archais columbianensis Applin & Jordan, 1945	mEocene
Archaias withlacoochensis Puri, 1957	m-lEocene
Cycloputeolina discoidea (Flynt, 1971)	Holocene
Cyclorbiculina compressa (d'Orbigny, 1839)	Holocene
Keramosphaerina (?) sp. (= "*Oligostegina*" of Applin & Applin, 1967)	uCretaceous
Miarchaias floridanus (Conrad, 1846)	Miocene
Miosorites americanus (Cushman, 1918)	Mio-?Plio
Parasorites orbitolitoides (Hofker, 1930)	Holocene
Sorites marginalis (Lamarck, 1816)	?Mio-Holo
Sorites orbiculatus (Forskal, 1775)	Holocene
Suborder Rotaliina Delage & Herouard 1896	

Family **Planorbulinidae** Schwager, 1877	
Planorbulina acervalis (Brady, 1884)	Holocene
Family **Cymbaloporidae** Cushman, 1927	
Fabiana cassis (Oppenheim, 1896)	m-uEoc-lOlig
Gunteria floridana Cushman & Ponton, 1933	mEocene
Family **Victoriellidae** Chapman and Crespin, 1930	
Rupertina floridana Cushman, 1933	uEocene
Family **Acervulinidae** Schultze, 1854	
Discogypsina vesicularis A. Silvestri, 1937	Holocene
Sphaerogypsina globulus (Reuss, 1848)	m-uEoc-Olig
Family **Homotrematidae** Cushman, 1927	
Homotrema rubrum (Lamarck, 1816)	Holocene
Family **Asterigerinidae** d'Orbigny, 1839	
Asterigerina carinata d'Orbigny, 1839	Holocene
Asterigerina cedarkeysensis Cole, 1942	mEocene
Asterigerina primaria heligma Levin, 1957	mEocene
Asterigerina subacuta floridensis Applin & Applin, 1944	Oligocene
Asterigerina texana (Stadnichenko, 1927)	mEocene
Family **Amphisteginidae** Cushman, 1927	
Amphistegina alabamensis Applin & Jordan, 1945	uEocene
Amphistegina chipolensis Cushman & Ponton, 1932	lMiocene
Amphistegina floridana Cushman & Ponton, 1932	Miocene
Amphistegina gibossa d'Orbigny, 1839	Plio-Holo
Amphistegina nassauensis Applin & Jordan, 1945	mEocene
Amphistegina pinarensis cosdeni Applin & Applin, 1944	m-uEocene
Eoconuloides lopeztrigoi (D.K. Palmer, 1934)	mEocene
Family **Lepidocyclinidae** Scheffen, 1932	
Helicostegina gyralis Barker & Grimsdale, 1936	mEocene
Helicostegina paucispira (Barker & Grimsdale, 1936)	uEoc-lOlig
Lepidocyclina (Pliolepidina) cedarkeysensis Cole, 1942	mEocene
Lepidocyclina (Polylepidina) antillea Cushman, 1919	mEocene
Lepidocyclina (*Lepidocyclina*) *macdonaldi* Cushman, 1918	mEoc-?lOlig
Lepidocyclina (Lepidocyclina) mantelli (Morton, 1833)	lOligocene
Lepidocyclina (Lepidocyclina) mortoni Cushman, 1920	uEocene
Lepidocyclina (Lepidocyclina) ocalana Cushman, 1920	uEocene
Lepidocyclina (*Nephrolepidina*) *chaperi* Lemoine & R. Douville, 1904	uEoc-lOlig
Lepidocyclina (*Neprolepidina*) *yurnagunensis* Cushman, 1919	lOligocene
Lepidocyclina (*Eulepidina*) *undosa* Cushman, 1919	lOligocene
Family **Linderinidae** Loeblich & Tappan, 1984	
Linderina floridensis Cole, 1942	mEocene
Family **Orbitoididae** Schwager, 1876	
Orbitoides browni (Ellis, 1932)	uCretaceous
Torreina torrei D.K. Palmer, 1934	uCretaceous
Family **Lepidorbitoididae** Vaughan, 1933	
Lepidorbitoides floridensis Cole, 1942	uCretaceous
Sulcoperculina cosdeni (Applin & Jordan, 1945)	uCretaceous
Sulcoperculina dickersoni (D.K. Palmer, 1934)	uCretaceous
Family **Pseudorbitoididae** M.G. Rutten, 1935	
Asterorbis aquayoi (D.K. Palmer, 1934)	uCretaceous

Asterorbis rooki Vaughan & Cole, 1932	uCretaceous
Orbitocyclina minima (H. Douville, 1927)	uCretaceous
Pseudorbitoides trenchmanni H. Douville, 1922	uCretaceous
Sulcorbitoides pardoi Bornnimann, 1954	uCretaceous
Vaughanina cubensis D.K. Palmer, 1934	uCretaceous
Family **Rotaliidae** Ehrenberg, 1839	
Camagueyia perplexa Cole & Bermudez, 1944	mEocene
Lockhartia cushmani Applin & Jordan, 1945	mEocene
Lockhartia gyropapulosa Levin, 1957	mEocene
Lockhartia praealta Levin, 1957	mEocene
Neorotalia mexicana (Nuttall, 1928)	lOligocene
Rotalia avonparkensis Applin & Jordan, 1945	mEocene
Rotalia byramensis Cushman, 1922	lOligocene
Rotalia cushmani Applin & Jordan, 1945	uEocene
Rotalia trochidiformis (Lamarck, 1804)	mEocene
Smoutina cruysi Drooger, 1960	uCretaceous
Family **Miogypsinidae** Vaughan, 1928	
Miogypsina panamensis (Cushman, 1918)	uOligocene
Miogypsina antillea (Cushman, 1919)	uOligocene
Family **Nummulitidae** de Blainville, 1827	
Nummulites floridensis (Heilprin, 1885)	m-uEocene
Nummulites gravelli Cole, 1944	mEocene
Nummulites heilprini (Hantken, 1886)	uEocene
Nummulites mariannensis (Vaughan, 1928)	uEocene
Nummulites panamensis Cushman, 1918	lOligocene
Nummulites striatoreticulatus (?) L. Rutten, 1928	uEocene
Nummulites willcoxi Heilprin, 1882	uEocene
Heterostegina ocalana Cushman 1921	uEocene
Heterostegina antillea Cushman, 1919	uOlig-?lMio
Heterostegina antillarum d'Orbigny, 1839	Holocene
Family **Asterocyclinidae** Bronnimann, 1951	
Asterocyclina americana (Cushman, 1917)	uEocene
Asterocyclina chipolensis (Vaughan, 1928)	uEocene
Asterocyclina georgiana (Cushman, 1917)	uEocene
Asterocyclina mariannensis (Cushman, 1917)	uEocene
Asterocyclina monticellensis Cole & Ponton, 1934)	mEocene
Asterocyclina nassauensis (Cole, 1944)	uEocene
Asterocyclina vaughani (Cushman, 1917)	uEocene
Pseudophragmina bainbridgensis (Vaughan, 1928)	uEocene
Pseudophragmina cedarkeyensis Cole, 1944	mEocene
Pseudophragmina flintensis (Cushman, 1917)	uEocene
Pseudophragmina floridana (Cushman, 1917)	uEocene
Pseudophragmina stevensoni (Vaughan, 1929)	uPal-lEoc

[1] l = Lower, m = Middle, u = Upper, Jur = Jurassic, Cret = Cretaceous, Pal = Paleocene, Eoc = Eocene, Olig = Oligocene, Mio = Miocene, Plio = Pliocene, Holo = Holocene.

COMMENTS ON LARGER FORAMINIFERAL ASSEMBLAGES OF FLORIDA

During most of the Cretaceous Period, much of Florida was submerged beneath a shallow, lime-producing sea. In the middle of the Cretaceous, many larger foraminifera such as *Paracoskinolina sunnilandensis* and *Orbitolina texana* are associated with the oil-producing Sunniland Limestone of the southern portion of the peninsula. The Sunniland contains a rudist bivalve reef or shoal and other fossiliferous shallow water deposits. Other common middle Cretaceous LBF of Florida are *Coskinolinoides texanus* and *Orbitolina minuta*. In the upper Cretaceous, most LBF are found in the Lawson Limestone, a chalky to nodular limestone, with abundant calcareous algae, rudists, and other fossils indicating shoal water conditions. Common LBF in the Lawson include *Lepidorbitoides floridensis*, *Lepidorbitoides minima*, *Chubbina macgillavryi*, *Vaughanina cubensis* and many others.

In much of the Cenozoic of Florida, certain textulariid and miliolid LBF (such as *Fallotella*, *Discorinopsis*, and *Borelis*) inhabited backreef/lagoonal or otherwise very shallow waters. The common presence of calcareous green algae, sea grasses, and other unique sediments indicate extremely shallow water, from the shoreline to perhaps 10 m depth. This recurring association of LBF may be called the *Bank Assemblage*, referring to the shallow-water, flat-topped, limestone-producing plateau or *bank*, in which the LBF live (much like the present day Bahama Bank). Larger, flat coiled or discoid rotaliids (such as *Nummulites, Lepidocyclina*, and *Pseudophragmina*) typically inhabit forereef and deeper photic zone areas on the gently inclined continental shelf, with water depths reaching up to perhaps 50 m or more. This association may be called the *Shelf Assemblage*. These two assemblages have long been recognized in Florida and elsewhere. Although rarely this simple, it is usually an accurate first approximation to classify LBF assemblages as either a Bank Assemblage or a Shelf Assemblage. The Bank Assemblage appears to be dominant throughout most of the Paleocene to Middle Eocene, and during the Early Oligocene of the peninsula. The Shelf Assemblage is most evident in the Late Eocene, and in the Oligocene of northwestern Florida.

Relatively few larger foraminifera are known from the subsurface Paleocene strata of Florida, but environmental conditions for LBF were favorable. A large reef-like structure (Rebecca Shoals Dolomite) surrounded much of the peninsula. Two species of the alveolinid, *Borelis* (*B. floridanus* and *B. gunteri*), representing the Bank Assemblage, have been reported from the Cedar Keys Formation, a dolostone rich in evaporate minerals (viz., the salts gypsum and anhydrite). The presence of dolomite and salts indicates very shallow waters over the peninsula with restricted water circulation, perhaps in a broad lagoon behind the Rebecca Shoals reef. The asterocyclinid, *Pseudophragmina stevensoni*, representing the Shelf Assemblage, has been reported from the subsurface of Jackson and Nassau counties from the Salt Mountain Limestone, a formation more commonly known from Alabama, where it is a coral-algal-sponge reef (Bryan 1997a, b; 1991).

The Eocene of Florida was very much like the Paleocene, with shallow bank and slightly deeper shelf environments fluctuating over the peninsula. Larger foraminifera reflect these shifting sea levels. The Middle Eocene Oldsmar Limestone contains both Bank and Shelf Assemblages species, but has a dominant Shelf Assemblage near the top of the formation, including *Helicostegina gyralis* and *Pseudophragmina cedarkeyensis*. The lower part of the Middle Eocene Avon Park Formation (including the former "Lake City Limestone") appears to be a Shelf Assemblage, but the upper part of the Avon Park (representing the oldest exposed rocks in Florida) contains rare fossil sea grasses and Bank Assemblage species such as *Fallotella*. The lower part of the Ocala Limestone (formerly the Inglis Limestone) also has a good Bank Assemblage deposited in high energy, nearshore waters. It is almost certain that there were low islands across much of the peninsula during various times in the Cenozoic, and certainly during the Middle Eocene.

The upper part of the Ocala Limestone clearly contains a Shelf Assemblage, dominated by *Nummulites* and *Lepidocyclina,* usually preserved in muddy limestones. Pure coquinas of *Nummulites* are often found in the Ocala, and represent gravelly shoals or bars that formed in the shallow end of the Shelf environment. In slightly deeper shelf waters, *Lepidocyclina, Pseudophragmina* and *Asterocyclina* become more common. Only very small patch reefs are found in the Ocala, but there is evidence of a larger Eocene reef structure along the eastern margin of the peninsula. In the Early Oligocene, the Bank Assemblage returns to the Florida peninsula in the Suwannee

Limestone, with an assemblage that looks very much like a Middle Eocene fauna (*Fallotella*, *Discorinopsis*, and other species). Patch coral reefs were common, and much of the peninsula was an island (or islands)—affectionately called *Orange Island* by T.W. Vaughan in 1910. Across the Florida panhandle, a distinct Shelf Assemblage is present in the Marianna and Bridgeboro limestones, with abundant *Lepidocyclina mantelli, Lepidocyclina yurnagunensis*, and *Lepidocyclina undosa.* In the Late Oligocene, *Miogypsina* is found in some subsurface samples.

By the Miocene Epoch, the Florida peninsula was becoming progressively more exposed, as indicated by the abundant terrestrial mammals that appear in the record at this time. But fluctuating sea levels still created shallow marine environments. Larger foraminifera are present in the Miocene, but have a very different aspect than earlier assemblages. With the extinction of most nummulitids, lepidocyclinids, and other forms, Miocene LBF are much like modern forms. Common genera in the Chipola, Tampa, or Chattahoochee formations include *Archaias, Amphistegina*, and various soritids. Few LBF have been documented from the Pliocene. Pleistocene LBF appear to be essentially modern in aspect, but they have not been adequately studied. The modern LBF fauna is primarily associated with the Florida Reef Tract, and includes such common species as *Amphistegina lessoni, Androsina lucasi, Archaias angulatus*, *Cyclorbiculina compressa*, *Laevipeneroplis bradyi, Laevipeneroplis proteus,* and *Parasorites orbitolitoides*.

REFERENCES CITED

Bryan, J.R. 1991. A Paleocene coral-algal-sponge reef from southwestern Alabama and the ecology of Early Tertiary reefs. Lethaia 24:423-438.

Bryan, J.R. 1995. Life history and development of Oligocene larger benthic foraminifera: a test of the environmental control on heterochrony. Tulane Studies in Geology and Paleontology 27:101-118.

Bryan, J.R. 1997a. Introduction to the Salt Mountain Limestone. *In* Bryan, J.R., (ed.), The Salt Mountain Limestone of Alabama. Tulane Studies in Geology and Paleontology 30(1):1-20.

Bryan, J.R. 1997b. Larger foraminifera. *In* Bryan, J.R., (ed.), The Salt Mountain Limestone of Alabama. Tulane Studies in Geology and Paleontology 30(1):27-30.

Cole, W.S. 1952. Eocene and Oligocene larger foraminifera from the Panama Canal Zone and vicinity. U. S. Geological Survey Professional Paper 244, 41 p.

Cowen R. 1983. Algal symbiosis and its recognition in the fossil record. *In* Tevesz, M.J.S. and McCall, P.L., (eds.), Biotic Interactions in Recent and Fossil Benthic Communities. Plenum Press, New York, p. 431-478.

Douglass, R.C. 1960. The foraminiferal genus *Orbitolina* in North America. U. S. Geological Survey Professional Paper 333.

Drooger, C.W. 1983. Environmental gradients and evolutionary events in some larger foraminifera. Utrecht Micropaleontological Bulletin 30:255-271.

Dunbar, C.O. 1963. Trends of evolution in American fusulines. *In* von Koenigswald, G.H.R., Emeis, J.D., Buning, W.L., and Wagner, C.W., (eds.), Evolutionary Trends in Foraminifera. Elsevier Publishing Company, p. 25-44.

Grell, K.G. 1973. Protozoology. Springer-Verlag, Berlin.

Hallock, P. 1981. Production of carbonate sediments by selected large benthic foraminifera on two Pacific coral reefs. Journal of Sedimentary Petrology 51:467-474.

Hallock , P. 1982. Evolution and extinction in larger foraminifera. Proceedings of the Third North American Paleontological Convention, p. 221-225.

Hallock, P. 1985. Why are larger foraminifera large? Paleobiology 11:195-208.

Hallock, P. 2002. Symbiont-bearing foraminifera. *In* Sen Gupta, B., (ed.), 2002, Modern Foraminifera. Kluwer Academic Publishers, p. 123-139.

Hallock, P., Forward, L.B., and Hansen, H.J. 1986. Influence of environments on the test shape of *Amphistegina.* Journal of Foraminiferal Research 16:224-231.

Hallock, P. and Glenn, C. 1986. Larger foraminifera: A tool for paleoenvironmental analysis of Cenozoic carbonate depostional facies. Palaios 1:55-64.

Hottinger, L. 1977. Distribution of larger Peneroplidae, Borelis and Nummulitidae in the Gulf of Elat. Utrecht Micropaleontological Bulletin 15:35-110.

Hottinger, L. 1978. Comparative anatomy of elementary shell structures in selected larger foraminifera. *In* Hedley, R.H. and Adams, C.G., (eds.), Foraminifera, Volume 3. Academic Press, New York, p. 203-266.

Hottinger, L. 1982. Larger foraminifera, giant cells with a historical background. Naturwissenschaften 69:361-371.

Hottinger, L. 1983. Processes determining the distribution of larger foraminifera in space and time. *In* Meulenkamp, J.E., (ed.), Reconstruction of marine paleoenvironments, Utrecth Micropaleontological Bulletin 30:239-252.

Hottinger, L. 1986. Construction, structure, and function of foraminiferal shells. *In* Leadbeater, B. and Riding, R., (eds.), Biomineralization in Lower Plants and Animals. Systematic Association Special Volume 30. Clarendon, Oxford, p. 219-235.

Hottinger, L. 1997. Shallow benthic foraminiferal assemblages as signals for depth of their deposition and their limitations. Bulletin of the Geological Society of France 168(4):491-505.

Koba, M. 1978. Distribution and environment of Recent *Cycloclypeus*. Science Reports of the Tohuku University, series 7, 28:282-311.

Lee, J.J. and Anderson, O.R. 1991. Symbiosis in foraminifera. *In* Lee, J.J., and Anderson, O.R., (eds.), Biology of Foraminifera. Academic Press, London, 368 p., p. 157-220.

Lee, J.J. and Capriulo, G.M. 1990. The ecology of marine protozoa: An overview. *In* Capriulo, G.M., (ed.), Ecology of Marine Protozoa. Oxford University Press, p. 45.

Lee, J.J. and Hallock, P. 1987. Algal symbiosis as the driving force in the evolution of larger foraminifera. *In* Lee, J.J., and Fredrick, J.F., (eds.), Endocytobiology III, Annals New York Academy of Science, v. 503, p. 330-347.

Leutenegger, S. 1977. Reproductive cycles of large foraminifera and depth distribution of generations. Utrecht Micropaleontological Bulletin 15:27-34.

Leutenegger, S. 1984. Symbiosis in benthic foraminifera: Specificity and host adaptations. Journal of Foraminiferal Research 14:16-35.

Lipps, J.H. 1982. Biology/paleobiology of foraminifera. *In* Broadhead, T.W., (ed.), Foraminifera--Notes for a Short Course. University of Tennessee Department of Geological Sciences Studies in Geology 6, p. 1-21.

Loeblich, A. R., Jr. and Tappan, H. 1964. Sarcodina—Chiefly "Thecamoebians" and Foraminifera (2 volumes). *In* Moore, R. C., (ed.), Treatise on Invertebrate Paleontology, Part C, Protista 2. The Geological Society of America and The University of Kansas Press, Genera and Their Classification (2 Volumes). Van Nostrand Reinhold Company, New York.

Loeblich, A. R., Jr. and Tappan, H. 1987. Foraminiferal Genera and Their Classification (2 volumes). Van Nostrand Reinhold Company, New York.

Lutze, G.F. and Wefer, G. 1980. Habitat and asexual reproduction of *Cyclorbiculina compressa* (Orbigny), Soritidae. Journal of Foraminiferal Research 10:251-260.

Pavlovec, R. 1987. Svetovni record med foraminiferami. Proteus 49(5):167-169, Ljubljana.

Purton, L.M.A. and Brasier, M.D. 1999. Giant protist *Nummulites* and its Eocene environment: life span an habitat insights from $d^{18}O$ and $d^{13}C$ data from *Nummulites* and *Venericardia*, Hamshire basin, UK. Geology 27(8):711-714.

Ross, C. 1977. Calcium carbonate fixation by large reef-dwelling foraminifera. American Association of Petroleum Geologists Studies in Geology 4, p. 219-230.

Rottger, R., Fladung, M., Schmaljohann, R., Spindler, M., and Zacharias, H. 1986. A new hypothesis: The so-called megalospheric schizont of the larger foraminifer, *Heterostegina depressa* D'Orbigny, 1826, is a separate species. Journal of Foraminiferal Research 16:141-149.

Rottger, R., Kruger, R., and Derijk, S. 1990. Trimorphism in Foraminifera (Protozoa)—Verification of an old hypothesis. European Journal of Protistology 25:226-268.

ADDITIONAL REFERENCES

General works on Foraminifera and techniques in micropaleontology

Armstrong, H. and Brasier, M. 2004. Microfossils, Second Edition. Blackwell, 320 p.

Cushman, J. A. 1968. Foraminifera—Their Clasification and Economic Use. Fourth Edition. Harvard University Press, Cambridge, Massachusetts, 605 p.

Green, O.R. 2001. A Manual of Practical Laboratory and Field Techniques in Palaeobiology. Kluwer Academic Publishers, Netherlands, 538 p.

Haynes, J.R. 1981. Foraminifera. John Wiley & Sons, New York.

Kummel, B. and Raup, D., (eds.). 1965. Handbook of Paleontological Techniques. W.H. Freeman and Company, San Francisco, 852 p.

Lee, J.J. and Anderson, O.R., (eds.). 1991. Biology of Foraminifera. Academic Press, London, 368 p.

Murray, J.W. 1992. Ecology and paleoecology of benthic Foraminifera. John Wiley & Sons, New York, 391 p.

Sen Gupta, B., (ed.). 2002. Modern Foraminifera. Kluwer Academic Publishers, 371 p.

Some Works Regarding Larger Foraminifera of Florida

Adams, C.G. 1987. On the classification of the Lepidocyclinidae (Foraminiferida) with redescriptions of the unrelated Paleocene genera *Actinosiphon* and *Orbitosiphon*. Micropaleontology 33:289-317.

Akers, W.H. and Drooger, C. W. 1957. Miogypsinids, planktonic foraminifera, and Gulf Coast Oligocene-Miocene correlations. American Association of Petroleum Geologists Bulletin 41:656-678.

Applin, E.R. 1960. A tropical sea in central Georgia in Late Oligocene. U. S. Geological Survey Professional Paper 400-B, p. B207-B208.

Applin, E.R. and Jordan, L. 1945. Diagnostic foraminifera from subsurface formations of Florida. Journal of Paleontology 19(2): 129-148.

Applin, E.R. and Jordan, L. 1950. "*Lockhartia*" *cushmani* Applin and Jordan and notes on two previously described foraminifera from Tertiary rocks in Florida. Journal of Paleontology 24(4):474-478.

Barnett, R.S. 1973. Reinstatement of *Nummulites heilprini* Hantken, 1886. Gulf Coast Association of Geological Societies Transactions 23:414-421.

Bock, W.D., Lynts, G.M, Smith, S.L., Wright, R.C., Hay, W.W., and Jones, J.I. 1971. A symposium on Recent south Florida foraminifera. Miami Geological Society Memoir 1, Miami Geological Society, Miami, Florida, 245 p.

Bryan, J.R. 1993. Late Eocene and Early Oligocene Carbonate Facies and Paleoenvironments of the Eastern Gulf Coastal Plain. *In* Kish, SA, (ed.), Geologic Field Studies of the Coastal Plain in Alabama, Georgia, and Florida. Southeastern Geological Society Guidebook 33, p. 23-45.

Bryan, J.R. 1998. The Middle-Upper Eocene Transition on the Central Florida Platform: Stratigraphy and Paleontology of the Avon Park Formation and Ocala Limestone. Field guide for International Geological Correlation Program (IGCP) 393: Neritic Events at the Middle Upper Eocene

Boundary. Held in conjunction with *FORAMS '98* International Symposium on Foraminifera, Monterrey, Mexico, 4-11 July 1998.

Bryan, J.R. and Huddlestun, P.F. 1991. Correlation and age of the Bridgeboro Limestone, a coralgal limestone from southwestern Georgia. Journal of Paleontology 65:864-868.

Caudri, C.M.B. 1996. The larger foraminifera of Trinidad (West Indies). Eclogae Geologicae Helvetiae 89(3):1137-1309.

Cole, W.S. 1931. The Pliocene and Pleistocene foraminifera of Florida. Florida Geological Survey Bulletin 6.

Cole, W.S. 1934. Oligocene orbitoids from near Duncan Church, Washington County, Florida. Journal of Paleontology 8:21-28.

Cole, W.S. 1938. Stratigraphy and micropaleontologic of two deep wells in Florida. Florida Geological Survey Bulletin 16.

Cole, W.S. 1941. Stratigraphic and paleontologic studies of wells in Florida. Florida Geological Survey Bulletin 19.

Cole, W.S. 1942. Stratigraphic and paleontologic studies of wells in Florida—No. 2. Florida Geological Survey Bulletin 20.

Cole, W.S. 1944. Stratigraphic and paleontologic studies of wells in Florida—No. 3. Florida Geological Survey Bulletin 26.

Cole, W.S. 1945. Stratigraphic and paleontologic studies of wells in Florida—No. 4. Florida Geological Survey Bulletin 28.

Cole, W.S. 1956. The genera *Miscellanea* and *Pellatispirella*. Bulletins of American Paleontology 36(159):235-253.

Cole, W.S. 1957. Variation in American Oligocene species of *Lepidocyclina*. Bulletins of American Paleontology 38(166):31-44.

Cole, W.S. 1957. Late Oligocene larger foraminifera from Barro Colorado Island, Panama Canal Zone. Bulletins of American Paleontology 37(163):309-339.

Cole, W.S. 1958. Names and variation in certain American larger foraminifera, particularly the Discocylinids—No. 3. Bulletins of American Paleontology 38 (176):407-429.

Cole, W.S. 1958. Names and variation in certain American larger foraminifera, particularly the Camerinids—No. 2. Bulletins of American Paleontology 38 (173):261-285.

Cole, W.S. 1958. Names and variation in certain American larger foraminifera—No. 1. Bulletins of American Paleontology 38 (170):175-213.

Cole, W.S. 1959. Faunal associations and the stratigraphic position of certain American Paleocene and Eocene larger foraminifera. Bulletins of American Paleontology 39 (182):373-393.

Cole, W.S. 1960. The genus *Camerina*. Bulletins of American Paleontology 41(190):185-205.

Cole, W.S. 1964. American Mid-Tertiary miogypsinid foraminifera: Classification and zonation. Contributions of the Cushman Foundation for Foraminifera Research 15(4):138-150.

Cole, W.S. 1965. Structure and classification of some Recent and fossil Peneroplids. Bulletins of American Paleontology 49(219):1-37.

Cole, W.S. 1966. Additional comments on the foraminiferal genus *Camerina*. Bulletins of American Paleontology 50(228):225-265.

Cole, W.S. 1967. A review of American species of miogypsinids (larger foraminifera). Contributions of the Cushman Foundation for Foraminifera Research 18(3):99-117.

Cole, W.S. 1969. Names and variation in certain American larger foraminifera, particularly the Eocene Pseudophragminids—No. 4. Bulletins of American Paleontology 56(248): 1-55 p.

Cole, W.S. and Applin, E.R. 1964. Problems of the geographic and stratigraphic distribution of American Middle Eocene larger foraminifera. Bulletins of American Paleontology 47(212):1-48.

Cole, W.S. and Applin, E.R. 1970. Analysis of some American Upper Cretaceous larger foraminifera. Bulletins of American Paleontology 58(258):39-80.

Cole, W.S. and Ponton, G.M. 1932. The foraminifera of the Upper, Middle, and part of the Lower Miocene of Florida. Florida Geological Survey Bulletin 9.

Cole, W.S. and Ponton, G.M. 1934. New species of *Fabularia*, *Asterocyclina*, and *Lepidocyclina* from the Eocene of Florida. The American Midland Naturalist 15(2):138-147.

Cooke, C.W. and Cushman, J.A. 1917. Orbitoid foraminifera of the genus *Orthophragmina* from Georgia and Florida. U. S. Geological Survey Professional Paper 108-G.

Culver, S.J. and Buzas, M.A. 1982. Distribution of Recent benthic foraminifera in the Caribbean region. Smithsonian Contributions to Marine Science 14, Washington, D.C., 382 p.

Cushman, J.A. 1917. Orbitoid foraminifera of the Genus *Lepidocyclina* from Georgia and Florida. U. S. Geological Survey Professional Paper 108-G.

Cushman, J.A. 1920. The American species of *Orthophragmina* and *Lepidocyclina*. U. S. Geological Survey Professional Paper 125-D.

Cushman, J.A. 1921. American species of *Operculina* and *Heterostegina* and their faunal relations. U. S. Geological Survey Professional Paper 128-E.

Cushman, J.A. 1922. Shallow-water foraminifera of the Tortugas region. Carnegie Institute of Washington Publication 311(17):1-85.

Cushman, J.A. 1930. The foraminifera of the Atlantic Ocean, Part 7. Nonionidae, Camerinidae, Peneroplidae, and Alveolinidae. U.S. National Museum Bulletin 104, 79p.

Cushman, J.A. 1930. The foraminifera of the Choctawhatchee Formation of Florida. Florida Geological Survey Bulletin 4.

Cushman, J.A. and Ponton, G.M. 1932. The foraminifera of the Upper, Middle, and part of the Lower Miocene of Florida. Florida Geological Survey Bulletin 9.

Douglass, R.C. 1960. Revision of the family Orbitolinidae. Micropaleontology 6(3):249-270.

Frost, S.H. and Langenheim, R.L., Jr. 1974. Cenozoic Reef Biofacies, Northern Illinois University Press, 388 p.

Gravell, D.W. and Hanna, M.A. 1935. Larger foraminifera from the Moody's Branch Marl, Jackson Eocene, of Texas, Louisiana, and Mississippi. Journal of Paleontology 9:327-340.

Gravell, D.W. and Hanna, M.A. 1938. Subsurface Tertiary zones of correlation through Mississippi, Alabama, and Florida. Bulletin of the American Association of Petroleum Geologists 22:984-1013.

Hottinger, L., Halicz, E., and Reiss, Z. 1991. The foraminiferal genera *Pararotalia*, *Neorotalia*, and *Calcarina*: Taxonomic revision. Journal of Paleontology 65(1):18-33.

Hunter, M.E. 1976. Biostratigraphy. In: Mid-Tertiary carbonates, Citrus, Levy, Marion Counties, west central Florida. Southeastern Geological Society Field Trip Guidebook 18, p. 66-87.

Jordan, L. and Applin, E.R. 1952. *Choffatella* in the Gulf Coastal regions of the United States and descriptions of *Anchispirocyclina* n. gen. Contributions from the Cushman Foundation for Foraminiferal Research 3(1):1-5.

Levy, A. 1991. Peuplements actuels et thanatocenoses a Soritidae et Peneroplidae des Keys de Floride (USA). Oceanological Acta 14:515-524.

Lidz, B.H. and Rose, P.R. 1989. Diagnostic foraminiferal assemblages of Florida Bay and adjacent shallow waters: a comparison. Bulletin of Marine Science 44(1):399-418.

Moberg, M.W. 1928. New species of *Coskinolina* and *Dictyoconus*? from Florida. Nineteenth Annual Report of the Florida State Geological Survey, p. 166-175.

Moore, W.E. 1957. Ecology of Recent foraminifera in northern Florida Keys. American Association of Petroleum Geologists Bulletin 41:727-741.

Poag, C.W. 1981. Ecological Atlas of Benthic Foraminifera of the Gulf of Mexico. Hutchinson Ross Publishing Company, 175 p.

Puri, H.S. 1957. Stratigraphy and zonation of the Ocala Group. Florida Geological Survey Bulletin 38.

Robinson, E. and Wright, R.M. 1993. Jamaican Paleogene larger foraminifera. *In* Wright, R.M. and Robinson, E., (eds.), Biostratigraphy of Jamaica. Geological Society of America Memoir 182, p. 283-345.

Sachs, K.N., Jr. and Gordon, W.A. 1962. Stratigraphic distribution of Middle Tertiary larger foraminifera from southern Puerto Rico. Bulletins of American Paleontology 44(199)1-25.

Seiglie, G.A., Grove, K., and Rivera, J.A. 1977. Revision of some Caribbean Archaiasinae, new genera, species, and subspecies. Eclogae Geologicae Helvetiae 70:855-883.

Vaughan, T.W. 1928. New species of *Operculina* and *Discocyclina* from the Ocala Limestone. Nineteenth Annual Report of the Florida State Geological Survey, p. 155-165.

Vaughan, T.W. 1933. Studies of American species of the genus *Lepidocyclina*. Smithsonian Miscellaneous Collections 89(10):1-53.

Vaughan, T.W. 1945. American Paleocene and Eocene Larger Foraminifera. Geological Society of America Memoir 9, Part I, The Geological Society of America, Boulder, 175 p.

Vorhis, R.C. 1973. *Nummulites* and *Sulcoperculina* in the Americas, a stratigraphic and nomenclatorial review. Bulletin of the Georgia Academy of Science 31:161-182.