# Benthic foraminifers as tracers of deep water masses, global climate, and sea-level history

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Pioneering research on Cenozoic deep-water benthic foraminifers was limited to modern faunas recovered from the deep sea or from uplifted marine sections on land. These studies were largely taxonomic and regional in scope. The advent of the Deep Sea Drilling Project and subsequently the Ocean Drilling Program has greatly expanded our database by providing recovery of deep-water benthic foraminiferal faunas from around the globe. Study of these faunas has enabled researchers to trace deep water sources and circulation changes, associated global climate changes, and sea-level history.

Deep sea cores have provided critical material allowing micropaleontologists to identify three periods of increased taxonomic turnover and faunal abundance change in deep-water benthic foraminifers in the Cenozoic: 1) a dramatic extinction in the latest Paleocene triggered by an abrupt, transient warming related to a change in deep-water source regions, followed by an early Eocene period of rapid recolonization; 2) a faunal turnover in the late middle Eocene to earliest Oligocene linked to a cooling of deep water that marks the transition from the Paleocene "Greenhouse world" to the Oligocene "Icehouse world;" and 3) a late early to early middle Miocene faunal turnover event that may have been related to changes in deep-water sources and/or surface ocean productivity changes.

ODP has undertaken a campaign to address the effects of global sea-level change on the stratigraphic record on passive margins with different tectonic settings and geologic histories by drilling Neogene transects on the siliciclastic New Jersey margin (Legs 150, 150X, 174A, and 174AX) and on the carbonate NE Australian margin (Leg 133) and Bahamas Platform (Leg 166). Within these continental margin sequences, benthic foraminifers provide one of the most sensitive tracers for provenance studies and best indicators for paleoenvironmental changes. Onshore studies of the New Jersey Coastal Plain (Legs 150X and 174AX) used benthic foraminiferal biofacies changes to estimate relative sea-level changes, interpret systems tracts, and confirm the interpretations of stratal surfaces. Studies of slope settings off New Jersey used benthic foraminifers to: 1) similarly refine the exact placement of sequence boundaries; 2) estimate changes in downslope transport of sediments as a function of sea-level changes and margin evolution; and 3) reveal new insights into sequence architecture in a slope setting. Ongoing comparisons of continental margin benthic foraminifers from the NE Australian margin and the Bahamas Platform (Legs 133 and 166) promise similar insights into margin evolution and sea-level changes.

**Holotype drawing of the benthic foraminifer *Cibicidoides lamontdohertyi* Miller and Katz, designated from DSDP Site 119, Core 15-CC.**