vibration disturbs only the boundary layer of the sample where it contacts the box directly. The vibro-box sampler and its accompanying compressor are relatively inexpensive and may be operated from a small boat. Divers orient the sampler and handle the operation, but with a more sophisticated system this could be accomplished from the surface.

After the sample is collected, sand is removed with a trowel or small shovel until a smooth vertical face is exposed. The sample is dried for about 24 hours and then partly impregnated with polyester resin. The relief surface formed by differential penetration of the plastic shows sedimentary structures in great detail.

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ECONOMIC POTENTIAL OF CONTINENTAL RISE AND SLOPE

Little investigation of the continental slope and rise with respect to their oil potential has been made, mainly because their depths are much greater than presently is practicable for oil and gas exploitation, and partly because national jurisdictions have not been established. The continental slope overlies the general seaward limit of continental-crustal rocks, but these rocks are covered with sedimentary strata that have prograded beyond the original position of the continental slope. The sedimentary strata are chiefly Cenozoic and Mesozoic in age; they have a seaward dip, and they include few sandstone layers suitable for accumulation of oil and gas.

Sediments of the continental rise lap against the continental slope and contain many good acoustic reflecting horizons that are believed to be the surfaces of sand bodies deposited by turbidity currents. The strata between the reflectors are silt and clay that were deposited slowly from suspension; many of them have slumped from the continental slope where they were deposited originally beneath oxygen-poor water that permitted the accumulation of relatively high concentrations of organic matter. The interbedded position of organic-rich silt and clay (source beds) and of turbidite sand bodies (reservoir beds), which pinchout and are structurally deformed near the heads of the continental rises of the world, may constitute a geologic environment in which large oil and gas accumulations have developed. Exploratory drilling is needed before possible exploitation can be considered.

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EOCENE PLANKTONIC FORAMINIFERAL ZONATION OF NEW JERSEY ATLANTIC COASTAL PLAIN

Six planktonic foraminiferal zones, which can be correlated with Trinidad, are identified from the New Jersey Eocene. Modification of Bolli's zonation was necessitated by the presence of interpreted mid-latitude elements.

1. *Globorotalia subbotina-G. aequa* Assemblage Zone. Diagnostic species are *G. elongata G. pseudoscitula, Acarinina quetra,* and *Pseudohastigerina wilcoxensis.*

2. *Globorotalia formosa formosa* Assemblage Zone. This zone contains the most fully developed fauna and is characterized by *G. formosa gracilis* and transitional forms to *G. formosa formosa,* with advanced forms of *A. quetra* and *Globigerina prolata. Truncorotaloides rohri guaracaraensis* (non *Globigerninoides pseudodubia*) also appears in this zone.

3. *Subbotina inaequispira* Range Zone (approximately coeval with Bolli's *Globorotalia aragonensis* zone). *Pseudohastigerina sharkriverensis* and *Acarinina bullbrooki* first appear in the upper part.

4. *Pseudohastigerina sharkriverensis* Assemblage Zone is coeval with Bolli's *"Globorotalia" palmerae* zone.

5. *Subbotina frontosa* Assemblage Zone. The lowest appearance of the zone species identifies the base of the zone and the base of the middle Eocene. Also present are *Hantkenina aragonensis, H. dumblei, Globorotalia lehneri,* and *Truncorotaloides rohri rohri.*

6. *Turborotalia centralis* Assemblage Zone. The zone species and *Truncorotaloides topilensis* range through this zone to the top of the section studied.

High percentages of the genus *Acarinina* and low percentages of species of keeled *Globorotalia,* together with mid-latitude species, indicate that the seas off New Jersey were temperate during the Eocene. Similar faunal elements have been found in Spain, Austria, and the Caucasus. Seemingly these faunas characterize the temperate-subtropical boundary, and corresponds closely to the paleobotanical evidence.

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DEEP-WATER DRILLING: ATLANTIC BASIN

The Atlantic deep-water drilling campaign of *Glomar Challenger* has been an outstanding success. The extensive seismic reflector Horizon A has been sampled. It consists of a sequence of hard radiolarian cherts of late Mesozoic to early Cenozoic age; the presence of these beds supports the suggestion that an opening connected the Pacific with the Caribbean when extensive Eocene chert beds were formed in the Caribbean. Turbidites form an important part of the Atlantic basin deposits and lead to uncertainty in determining accumulation rates to unsampled sections. Where igneous rocks have been reached beneath sediments on the Mid-Atlantic Ridge, the ages of the oldest sediments are in general agreement with those predicted on the basis of correlation with magnetic anomaly patterns and the hypothesis of sea-floor spreading.

The Tithonian sediments from a site east of the Bahamas are underlain by a considerable unsampled sedimentary section, suggesting that deep-water, open-ocean conditions have existed here since at least Early Jurassic time.

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SHALLOW-WATER FACIES OF UPPER PENNSYLVANIAN HAYMOND FORMATION IN MARATHON BASIN, TEXAS

The Upper Pennsylvanian Haymond Formation crops out along the southeast, east, and northeast parts of the Marathon basin, Texas, and consists of two major units of thin- to thick-bedded, fine- to medium-grained sandstone separated by boulder beds. These rock types overlie and grade into the underlying deep-water turbidite sequence which is composed of interbedded fine- and very fine-grained sandstone and dark-gray shale.

The sandstones occur as *en échelon,* lenticular bodies which have partly erosional bases, and laterally interfingering, gradational upper boundaries. The sandstone beds are massive at the base, grading upward into a