of the basin. Larger platform reefs may be present throughout a belt north of, and parallel with, the pinnacles. The productive trend, presently 15 mi wide and 150 mi long, was found as a result of renewed drilling activity in this exploration frontier. The high incidence of locating reefs is due mainly to detailed seismic evaluation. Significantly larger reserves could be contained in the platform reefs, but where found to date in the northwestern part of the current play, they are composed of nonporous dolomite.

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BIOSTRATIGRAPHY AND HISTORY OF CIRCULATION OF NORTH ATLANTIC

Distinct latitudinal control of the distribution of marine microfaunas in the North Atlantic Ocean began in the early part of the Tertiary (Paleogene) and is related to the opening of the North Atlantic to the Arctic region about 60 m.y. ago when the present deep-water circulation pattern was probably initiated. At that time a boreal zoogeographic province was established in the Atlantic Ocean for the first time. Caribbean and Mediterranean benthonic foraminiferal faunas exhibit a marked degree of similarity during the early Tertiary. The gradual displacement of west-east current migration routes into higher latitudes and the compression of Spain against North Africa brought an end to this amphiatlantic distribution pattern about 15 m.y. ago. Initiation of glaciation about 3 m.y. ago had a marked effect on circulation in the North Atlantic and temperature may have been the primary factor responsible for the many extinctions in planktonic Foraminifera.

Sediment cores and bottom photographs provide evidence of measurable bottom circulation within the Western Boundary undercurrent in the western North Atlantic. This contour current has played a major role in controlling fine-grained sediment deposition since the early Tertiary. Data from recent deep drilling suggest that during middle Cretaceous to early to middle Tertiary times extensive unconformities occurred, and during the early Tertiary a sudden onslaught of deep circulation coupled with wholesale erosion and redeposition of deep-sea sediments may have occurred. Currents gradually diminished in strength during the late Tertiary and are now flowing at moderate velocities apparently sufficient to transport and deposit sediment with only local erosion.

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PHYSICAL CHEMISTRY OF CARBONATES IN OCEANS

The common carbonate minerals found in oceanic sediments are aragonite and high and low magnesium varieties of calcite. A large proportion of deep seawater is undersaturated with respect to all three. This conclusion is based on laboratory studies of the effects of temperature and pressure on carbonate equilibria in seawater combined with shipboard measurements of water properties as well as upon actual measurements of dissolution rates of calcium carbonate samples held at various depths. Undersaturation is caused by biologic production of CO_2 at shallower depths and by the effect of increased pressure at greater depths on the solubility of $CaCO_3$. The so-called "compensation depth" below which $CaCO_3$ disappears from deep sea sediments does not represent simply a downward change from supersaturated to undersaturated water. This is proved by the presence of undersaturated water above the compensation depth and by the fact that the compensation depth may be thousands of meters below the depth where $CaCO_3$ begins to disappear from the sediments; *i.e.*, there is a zone of disappearance and not a single sharply defined depth. The rate of dissolution of $CaCO_3$ in undersaturated seawater is slowed by dissolved Mg and by dissolved organic matter and this helps account for the lack of dissolution where it is expected to occur.

Surface seawater, in contrast to deep water, is generally supersaturated with respect to both calcite and aragonite. However, inorganic precipitation rarely occurs due to the inhibiting effects of Mg^{++} and organic matter as dissolved species and as surface coatings on mineral grains.

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SOURCES OF SEDIMENT IN WESTERN BASINS OF ATLANTIC OCEAN

The Mid-Atlantic Ridge divides the Atlantic Ocean into two isolated north-south troughs. The western basin is subjected to intensified north-south moving currents because of the Earth's rotation. In addition to the surface currents such as the Gulf Stream and the Falkland Current, deep western boundary currents are presently identifiable as the North Atlantic Deep Water and the Antarctic Bottom Water. These currents affect the source and distribution of sediments in the western Atlantic basin.

In the western North Atlantic basin, bottom transport from high latitude sources is clearly seen by the contour of such mineral indicators as quartz, amphibole, and diagnostic "mixed-layer" clay minerals. The transporting agent is the North Atlantic Deep Water. In the western South Atlantic basin, bottom transport via the Antarctic Bottom Water from high southern latitudes supplies a major part of the sediments in the Argentine basin. The sediments came from glacial sources in Antarctica and from South Pacific volcanogenic sources. These volcanogenic sediments are carried eastward by the Antarctic Circumpolar Current. This is indicated in part by the mineralogy, but more so by the distribution pattern of the S^{87}/S^{86} ratio in the detrital parts of the sediments. A diagnostic criterion for Antarctic glacial source relative to fluviatile sources from southern Argentina is seen in the surface texture of quartz grains.

On the basis of material-balance calculations, much of the detrital sediment in the western Atlantic basin can be ascribed to high-latitude, glacially originating sources close to the continental margin; bottom transport from the shelf and slope also will contribute significant sediment.

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EXPERIMENTAL STUDY OF HEAVY MINERAL SEGREGATION UNDER ALLUVIAL FLOW CONDITIONS

In order to understand local alluvial flow sorting processes of grains of different densities, studies were made of 4 bed configurations in a large recirculating flume. These bed configurations included flat beds,