Mountains where a zone of imbricated thrusts follows the southern margin of the eastward-trending Helena embayment of the Belt basin.

Movements along major thrusts north and south of this east-trending zone are nearly pure dip-slip. Movements within the zone are demonstrably oblique with nearly equal components of dextral and reverse slip. This suggests that the fault zone may be described as being one of tear-thrusting.

Accumulated net slip along the tear-thrust zone may be estimated by summing estimates of net slip along the individual faults which comprise the zone and by examining displaced isopach lines for rocks deposited prior to faulting. Summing net-slip estimates for individual faults along several sections though the fault zone indicates that the horizontal components of net slip is between 15 and 30 km. Right separation of isopach lines for a limestone member of the Kootenai Formation (Cretaceous) indicates a horizontal displacement which is somewhat larger (between 30 and 60 km). Displacements of this magnitude cannot be accounted for by folding and minor thrusting in the rocks north of the tear-thrust zone and strongly suggests one or more zones of detachment within the section above Archean basement rocks.

Estimates of net horizontal displacement along this fault zone can be very useful in interpreting anomalous isopach trends such as those seen in the Flathead Sandstone (Cambrian) and Maywood Formation (Devonian).

SCHMITT, JAMES G., Univ. Wyoming, Laramie, WY

Depositional Environment of Dry Hollow Member, Upper Cretaceous Frontier Formation, Southwestern Wyoming

The Dry Hollow Member of the Frontier Formation in southwestern Wyoming consists of alluvial deposits that accumulated along part of the western margin of the Western Interior Cretaceous seaway. Typically, the lower part of the Dry Hollow Member contains sandstone bodies 4 to 15 m thick that fine upward and possess basal conglomeratic lenses. These units are interpreted as channel deposits of meandering streams, with the conglomerates having formed as channel-lag deposits. Commonly, silicified wood, plant fragments, freshwater gastropods, and intraformational shale clasts are present in these deposits. Medium-scale trough cross-stratification is dominant and indicates a general west to east paleocurrent direction.

The upper part of the Dry Hollow Member is dominated by interbedded shales, coals, and thin (0.2 to 1 m) fine-grained sandstones. The shales contain abundant carbonaceous plant material, silicified wood, and lignitic layers. Root horizons are commonly preserved within large (0.3 to 1 m) concretions that formed in the shales. The interbedded fine-grained sandstones are typically small-scale trough cross-stratified and contain abundant plant material. These sandstones are interpreted as near-channel overbank deposits that accumulated during periods of stream flooding, while the shales and coals represent vertical accretion deposits of interchannel swamps and lowlands that accumulated farther from the stream channels.

Analysis of these deposits suggests that a wet, poorly-drained fluvial lowland dominated by meandering streams and coal swamps existed along the Western Interior Cretaceous seaway during deposition of the bulk of the Dry Hollow Member of the Frontier Formation.

SCHNITKER, DETMAR, Univ. Maine at Orono, Walpole, ME

Cenozoic Deep-Water Benthic Foraminifers

Cenozoic deep water deposits have yielded rich and diversified faunas of benthic formaminifers. From still limited data, it is clear than these faunas were depth stratified and that most species were cosmopolitan in distribution. The wide distribution and species richness, together with faunal turnover, which in places was very abrupt, points to great biostratigraphic potential. High turnovers delineate distinct Paleocene, Eocene, and Oligocene–early Miocene faunas. A gradual but profound wave of extinction and speciation occurred during the middle Miocene and by late Micene had created the modern deep water faunas.

Superimposed upon these evolutionary developments are strong changes in depth preference, particularly among those species that persist across the turnover periods. During the Paleocene-Eocene transition some species became restricted to the bathyal realm while others preferred the abyss. During the Eocene-Oligocene transition a net downward depth range extension of bathyal species occurred. During the late Miocene the periodic vertical migrations of bathyal and abyssal faunas that so strongly characterize the Quaternary began to appear. In the North Atlantic, such depth range excursions may extend over more than 1,500 m.

The evolutionary and bathymetric changes of benthic faunas are their response to the evolution of the deep water environment, particularly the establishment of the cold water sphere during the late Eocene, and the addition of the North Atlantic as a source of cold water during the middle Miocene. The late Cenozoic depth changes are indicative of periodic rearrangements of the deep ocean circulation in response to climatic change at the earth's surface.

SCHOFIELD, DONALD W., Consulting Geologist, Littleton, CO, RICHARD A. SLATER, Univ. Northern Colorado, Greeley, CO, and CHARLES V. G. PHIPPS, Univ. Sydney, Sydney, Australia

Surface Features and Geology of Selected Cores from Elizabeth Reef, Tasman Sea, Australia

Elizabeth reef is one of the southernmost coral reefs in the world. Located at approximately 30°S latitude in the Tasman Sea, this atoll is situated near the southern limit of environmental tolerance for reef formation. The atoll has a well-developed outer reef flat encrusted with calcareous red algae and a lagoon consisting of patch reefs, sand flats, and a central mesh reef complex. A relatively small number or coral species occur, and significant coral growth is restricted to the lagoon. Offshore there is a well-developed erosional spur and groove zone (0 to 8 m), a deeper buttress zone (9 to 30 m), and a carbonate sand flat (30 to 40 m) before the steep seaward drop-off. Detailed evaluation of eleven rotary cores from the Elizabeth reef flat indicates that a period of more active coral growth existed in the past. C^{14} age dates on scleractinian corals from the cores indicate a maximum age of about 7,000 years B.P. in the upper 3 to 4 m of the reef flat with maximum accumulation rates of approximately 90 cm per 1,000 years. The atoll has reached equilibrium with sea level, and it is now influenced more by erosion than growth.

SCHOWALTER, TIM T., Mosbacher and Pruet Oil Producers, Denver, CO

Prediction of Caprock Seal Capacity