compressive deformation and the second vertical, or nearly vertical tectonics, as the principal deformation mechanism. The main battleground involves the "Wyoming province" floored by Archean crystalline rocks. This province includes much of southwestern Montana, west of commonly recognized limits of Laramide foreland deformation and south of the Helena salient of the Cordilleran overthrust belt.

In this area, west-northwest of Yellowstone National Park, thrust faults and other structural features indicative of compressive deformation are widespread and have been mapped in the Snowcrest Range by M. R. Klepper and in the Greenhorn Range by J. B. Hadley. These two ranges expose the Snowcrest structural terrane: the complexly deformed steeper limb of the asymmetric Laramide Blacktail-Snowcrest massif. This massif, like the Madison-Gallatin "uplift" farther east, has been broken and stretched by Tertiary extension faults, principally subparallel and behind the major range-front thrusts and probably listric to these thrusts. Current geologic and gravity studies in the southwestern part of the Snowcrest structural terrane extend the zone of Laramide foreland thrust faulting into the southwest Montana reentrant of the overthrust belt. Here foreland thrust faulting is chiefly Late Cretaceous in age, and thrust faulting occurs along the Greenhorn lineament, a zone of crustal weakness active since Paleozoic time within the northwestern part of the Wyoming province. The presence of foreland thrust faulting has broad implications for oil and gas potential of the southwestern Montana and adjacent foreland.

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Illite/Smectite Diagenesis: Relation to Coal Rank in Tertiary Sediments of Pacific Northwest

Bentonite partings formed by alteration of air-fall tephra interbedded with coal in three Eocene coal basins (Tulameen, British Columbia; Chuckanut and Centralia, Washington) record the nature of arc volcanism and subsequent diagenesis and metamorphism. Euhedral feldspar phenocrysts, embayed quartz, and relict glass shards demonstrate volcanic provenance, whereas the absence of muscovite, microcline, and other nonvolcanic minerals indicates lack of epiclastic detritus. At Tulameen, abundant sanidine and biotite indicate rhyolitic tephra; at Centralia, plagioclase and absence of quartz and K-spar indicate dacite. Absence of K-spar from Chuckanut deposits may be due to its destruction by metamorphism, since quartz phenocrysts are present, suggesting rhyolite.

Alteration of glassy tephra to bentonite has taken place in two or three steps. (1) Leaching (weathering) in the swamp may have formed allophane or halloysite, but much glass remained unaltered. (2) Early diagenesis at temperatures below 60°C (suggested by vitrinite $R_o = 0.40\%$) formed, by reaction of non-phenocrystic components with pore fluids within individual partings, one of five assemblages depending on degree of prior leaching: zeolite-smectite-crystobalite, smectite-cristobalite, smectite, smectite-kaolinite, kaolinite. Na-smectite at Centralia inherited interlayer Na from original glass. Delicate vermicular kaolinite may also have formed during this stage. (3) Thermal metamorphism has transformed smectite in some Tulameen and all Chuckanut partings to regularly interlayered illite/smectite (I/S). At Tulameen ($R = 1$ ordered I/S with 55% I + kaolinite), the source of potassium for the reaction was solution of phenocrystic sanidine and mica; $R_o = 0.9\%$ suggests 130 to 200°C. The Chuckanut bentonites ($R = 1$ and $R = 3$ ordered with 65 to 90% I + chlorite) show $R_o = 3\%$ suggesting temperatures exceeded 300°C; some potassium may have been derived from outside the parting, and more complete illitization may have been inhibited by lack of potassium and by calcium released during albitization of plagioclase.

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Observations Concerning Benthic Foraminiferal Genus *Melonis*

For many years, the benthic foraminifer *Melonis pompilioides* has been used as an important deep-water index species indicating deposition in abyssal environments. However, uncertainties about the character and importance of its morphological features have caused problems in species identification, which in turn have produced paleobathymetric interpretations that differ from those based on seismic, sedimentary, and stratigraphic data. Incorrect identifications of *Melonis pompilioides* and the probably automatic assignment of an abyssal environment to sections containing this species have led to controversy and, at times, to serious questions regarding the reliability of this genus for paleoenvironmental interpretations.

An attempt has been made to rectify the problems of identification of *Melonis pompilioides* and related forms so that micropaleontologists can accurately and consistently identify specimens from the *Melonis* species complex and can recognize misidentifications by others. Characteristics such as pores, umbilical size, sutures, apertures, and height/width ratios were studied and evaluated.

Other studies have shown that depth of water may not be the single or dominant factor controlling the distribution of this species and that discretion should be used in establishing a paleoenvironmental determination.

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Ichnology of Trenton Group Between Montreal and Quebec City, Eastern Canada

Despite lateral thickness variations and lithostratigraphic complexities, a coherent depositional model can be recognized for carbonates of the upper Middle Ordovician Trenton Group between Montreal and Quebec City in the St. Lawrence lowland of eastern Canada. Between Montreal and Quebec City, the Group was deposited initially on a confined and irregular shallow shelf and latterly on a broader and essentially flatter shelf, whereas northeast the onshore-to-offshore profile was steeper and rapid submergence promoted the early development of deeper shelf and slope-and-basin sediments.

Within the area between Montreal and Quebec City, the Trenton Group contains an abundant but generally poorly preserved assemblage of biogenic structures, the majority of which can only be identified (sometimes only questionably, at a general level). These genera represent a variety of behavioral groups and include *Arenicolites?, Calycraterion?, Chondrites, Circulichnis, Cruziana?, Diplichnites?,* cf. *Furculosus, Helminthopsis, Isopodichnus, Oichnus, Palaeophycus, Plagiogmus?, Planolites, Rosselia, Scalarituba?, Teichichnus, Trichichnus, Trypanites,* and cf. *Zoophycos*, as well as unclassified pronged, looped, oblique, and vertical burrows.

The spatial and temporal distribution and abundance of these traces are examined in context of the environmental model and related depositional patterns. Because limestones show a great susceptibility to early and late diagenesis, trace fossils in skeletal