ANTLER OROGENY

Reading:
DNAG G-3, Chapter 3

MAIN TOPICS

- Structural Regions
- Passive Margin
- Antler Orogeny
- Subsequent Period

STRUCTURAL REGIONS

- Basement Province
- Phanerozoic Province

Basement Province

- Provenance and Trends
- Oblique Strike to Cordilleran System

Phanerozoic Province

- Foreland Fold Belt
- Transpressional Complex
- Coastal Belt

BASEMENT PROVINCE

- Constitutes Western Edge of Craton
- Located West of > 1,7 Ga Crust
  - Juvenile Crust Added to Continent
- Structural Discontinuity
  - Basement and Cordilleran System

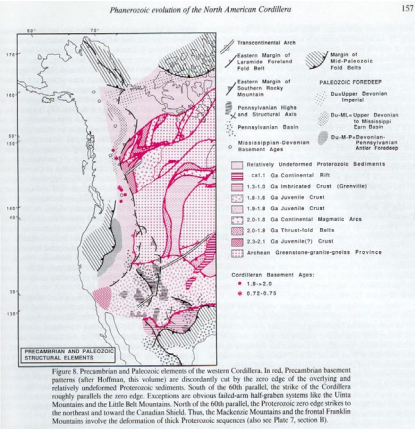
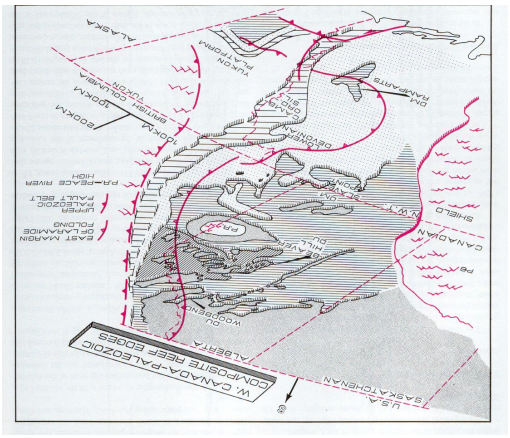


Figure 8. Precambrian and Paleozoic elements of the western Cordillera. In red, Precambrian basement patterns (after Hoffman, this volume) are discordantly cut by the zero edge of the overlying and relatively undeformed Proterozoic sediments. South of the 60th parallel, the strike of the Cordillera roughly parallels the zero edge. Exceptions are obvious failed-arm half-graben systems like the Uinta Mountains and the Little Belt Mountains. North of the 60th parallel, the Proterozoic zero edge strikes to the northeast and toward the Canadian Shield. Thus, the Mackenzie Mountains and the frontal Franklin Mountains involve the deformation of thick Proterozoic sequences (also see Plate 7, section B).



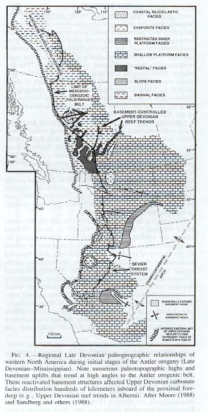


FIG. 4.—Regional Late Devonian paleogeographic relationships of western North America during initial stages of the Antler orogeny (Late Devonian–Mississippian). Note that major paleogeographic highs and basement uplifts show trend at high angles to the Antler orogenic belt. These reactivated basement structures affected Upper Devonian carbonate facies distribution hundreds of kilometers inboard of the proximal fore-deep (e.g., Upper Devonian reef trends in Alberta). After Moore (1988) and Sandberg and others (1988).

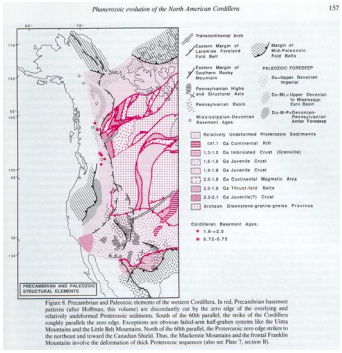


Figure 8. Precambrian and Paleozoic elements of the western Cordillera. In red, Precambrian basement patterns (after Hoffman, this volume) are discordantly cut by the zero edge of the overlying and relatively undeformed Proterozoic sediments. South of the 60th parallel, the strike of the Cordillera roughly parallels the zero edge. Exceptions are obvious failed-arm half-graben systems like the Uinta Mountains and the Little Belt Mountains. North of the 60th parallel, the Proterozoic zero-edge strikes to the northeast and toward the Canadian Shield. Thus, the Mackenzie Mountains and the frontal Franklin Mountains involve the deformation of thick Proterozoic sequences (also see Plate 7, section B).

PHANEROZOIC PROVINCE

- Foreland Fold Belt
- Transpressional Complex

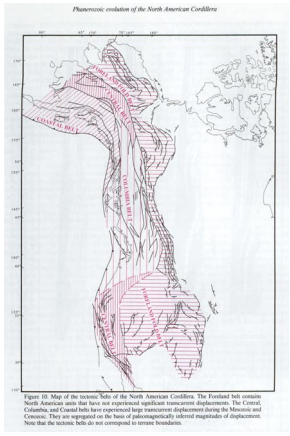
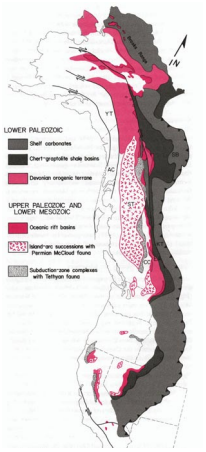
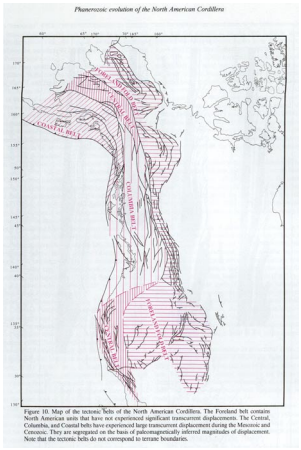


Figure 10. Map of the tectonic belts of the North American Cordillera. The Foreland belt contains North American units that have not experienced significant transcurrent displacements. The Central, Columbia, and Coastal belts have experienced large transcurrent displacement during the Mesozoic and Cenozoic. They are segregated on the basis of paleomagnetically inferred magnitudes of displacement. Note that the tectonic belts do not correspond to terrane boundaries.

FORELAND FOLD BELT

- Consists of Folded and Thrust Rocks
- Deposited on N.A. Craton
- Adjacent to Slope and Rise
- "Miogeosyncline Sequence"





Southern Cordillera

Colorado Plateau

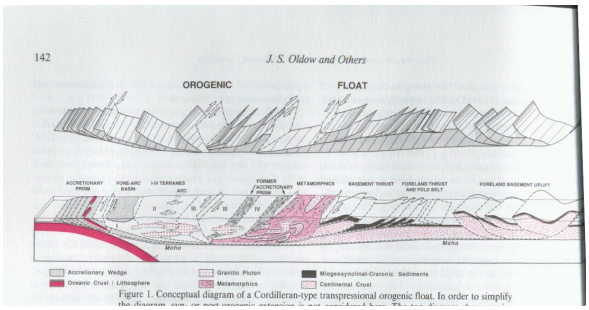
Rocky Mountains

Northern Cordillera

- Sevier Fold Belt
- Major Decollement Developed in Mesozoic
- Repeated Deformation in Multiple Episodes
- Weakly Metamorphic to Not Effected

TRANSPRESSIONAL COMPLEX

- Series of Allochthonous Terranes
- Translated Northward Varying Degrees
- Oblique Obduction
  - Transpression = Tectonic Regime That Combines Variable Compression (or Tension) with Strong Strike-slip Translation

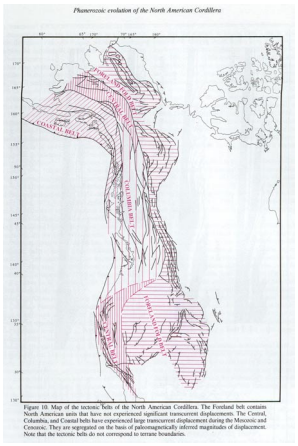


Several Sub-belts

- Central Belt
- Columbia Belt
- Coastal Belt

CENTRAL BELT

- Sierra Nevada & Klamath Mts.
- Eastern Oregon & Coastal California
- Accretionary Terrane
  - Ocean Floor, Ophiolite, Volcanic Arc Systems, Superficial Sediments, Mélange



North America Affinities

Based on:

- Paleomagnetic Data
- Paleogeographic Data

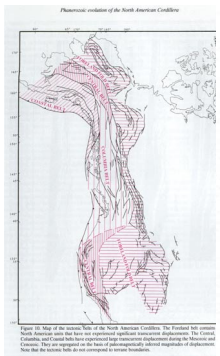
COLUMBIA BELT

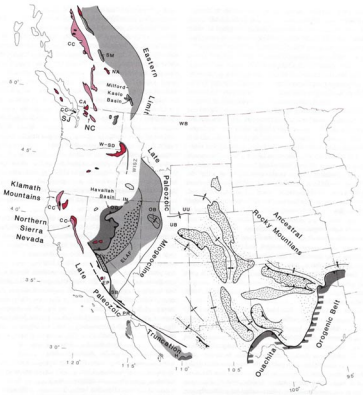
- Amalgam of Many Exotic Terrains
- Complex Arc System
- Translated Northward
  - Variable displacements
  - Several 100's to 1000's Km

COASTAL BELT

Extends from Central Alaska to NW British Colombia

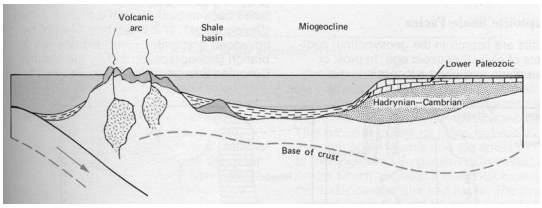
- Wrangillia Terrain
- Alexander Terrain
- Most have Outboard Sources
- Very Long Traveled
  - Some May Be from Other Side of Pacific!





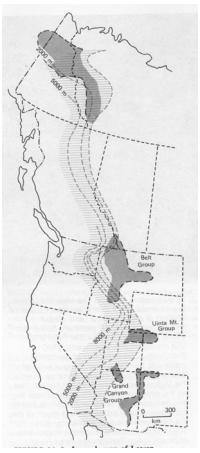
PASSIVE MARGIN HISTORY

- Precambrian
- Cambrian to Devonian
  - Passive Margin Sedimentation



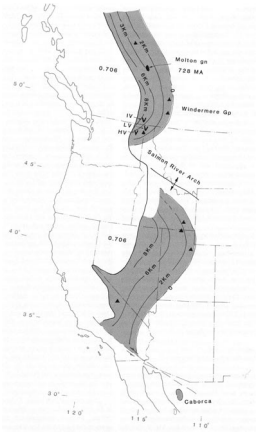
MID & UPPER PROTEROZOIC

- < 1.7 Ga Age
- Thick Section of Red Bed Clastics
- Marine to Non-marine Origin
- Belt and Purcell Supergroups
- Tectonic Environment Unclear



LATE PROTEROZOIC RIFTING

- Renewed Rifting 780-730 Ma
  - Along Whole Length of Canadian Cordillera
- Deposition of Windemere Supergroup
  - 780-570 Ma Rift Phase Clastics



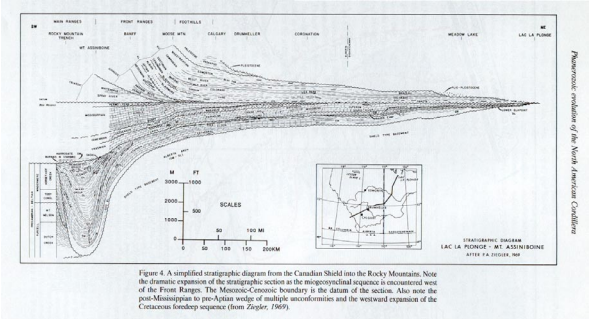


Figure 4. A simplified stratigraphic diagram from the Canadian Shield into the Rocky Mountains. Note the dramatic expansion of the stratigraphic section as the miogeosynclinal sequence is encountered west of the Front Ranges. The Mesozoic-Cenozoic boundary is the datum of the section. Also note the post-Mississippian to pre-Aptian wedge of multiple unconformities and the westward expansion of the Cretaceous foredeep sequence (from *Ziegler, 1969*).

Cambrian/Silurian Carbonates

- Passive Margin Deposits
- Local Thick Deposits
- Broad Zone of Sedimentation
  - Extends from Well Upon the Craton Out to Shelf Edge