Chapter 14: Review

• Invasion of land by plants
  – Vascularization
  – Spore-bearing lycopsids
  – Seed plants

• Invasion of land by animals
  – Amphibian-like tetrapods evolved from lobe-finned fish
<table>
<thead>
<tr>
<th>Era</th>
<th>Periods</th>
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- **Cenozoic**
  - Cretaceous
  - Jurassic
  - Triassic
  - Permian
  - Carboniferous
  - Devonian
  - Silurian
  - Ordovician
  - Cambrian

- **Cretaceous**
  - Jawless Fishes
  - Placoderms
  - Sharks and their Relatives
  - Acanthodians
  - Ray-Fin Fishes
  - Lobe-Fin Fishes
  - Tetrapods
Outline for today

• Acadian orogeny (eastern Euramerica)
• Strome–tabulate reefs of the Great Lakes region
• late-Devonian mass extinction
• Antler orogeny (western Euramerica)
Acadian orogeny—eastern Euramerica

- **Acadian orogeny** was caused by collision of Laurentia with Baltica and Avalonia—it produced a larger landmass, **Euramerica**
- Orogeny began in *middle Silurian* and progressed through *late Silurian*
- **Second major phase** of mountain-building in Appalachian region
- **Acadian highlands** became the source for thick Devonian *Catskill clastic wedge*
Silurian

Silurian (435 - 425 Ma)

- Siberia
- Laurentia
- Baltica
- Avalonia
- Gondwanaland
Early Devonian
Late Devonian

Siberia

Catskill clastic wedge: alluvial fan sediments

Gondwanaland
Acadian orogeny—eastern Euramerica
Remember this?
Acadian orogeny—eastern Euramerica
Acadian orogeny—eastern Euramerica

- Silurian structural deformation followed by Devonian clastic deposition:
  - World’s most famous *angular unconformity* at Siccar Point, Scotland
  - Recognized by James Hutton (1788)
Reefs of the Great Lakes region

- **Epicontinental seas** covered interior regions of Euramerica during Middle Paleozoic time

- **Strome-tabulate barrier reefs** developed at the margins of basins in the *Great Lakes region*

- **Isolated reefs** developed elsewhere in Indiana, Illinois, Wisconsin, Iowa
Strome-tabulate community
Reefs of the Great Lakes region

Middle Silurian
Reefs of the Great Lakes region

By **late Silurian** time, Michigan Basin reefs had built up to sea level, which isolated the basin and led to evaporite deposition.
Late-Devonian mass extinction

• **40% decline** in generic diversity among marine organisms

• **Shallow-water** and **tropical** forms were **hardest hit**
  – Strome-tabulate community (elimination of stromes)
  – Planktonic acritarchs
  – Placoderm fishes

• **Cool-water biotas** were essentially **unaffected**
Late-Devonian mass extinction
Late-Devonian mass extinction

- **Continental glaciers** existed in Gondwanaland during Late Devonian
  - *Global cooling caused by spread of land plants and weathering of silicates? [drawdown of CO$_2$]*

- Glaciation was accompanied by a **gradual drop in sea level**
Late-Devonian mass extinction

$\delta^{18}O$ evidence for global cooling near the end of Devonian time
Antler orogeny—western Euramerica

- **Island arc** existed offshore western Euramerica during most of Silurian and Devonian time — “*Klamath island arc*”

- **Closure of basin** between island arc and mainland occurred in *middle Devonian through early Mississippian time*

- 1st episode of mountain building in western Cordilleran region
  - Klamath ophiolite complex in California, thrusting in Nevada
Antler orogeny—western Euramerica

Growth of western Euramerica through continental accretion
Antler orogeny
Silurian
Early Devonian

- Siberia
- Klamath Island Arc
- Euramerica
- Gondwanaland

Early Devonian (405 - 395 Ma)
Late Devonian

- Siberia
- Antler Highlands
- Gondwanaland