Ch. 15: Late Paleozoic

- **Permian System** named by Roderick Murchison after Perm, Russia
- **Carboniferous System** named by Conybeare and Phillips in *England*
  - Pennsylvanian
  - Mississippian
Late Paleozoic marine life
crinoids

crinoidal limestone
“Crinoid meadows”
Fusulinid forams

- Aperture
- Septum
- Antetheca
- Wall or Spirotheca
- Tunnel
- Septal pore
- Septal fluting
- External furrow
- Proloculum
- Axis
Fusulinid evolutionary trends

$\sim 10^6$ – fold size increase in 20 myr
Land plants
**Lepidodendron**
(lycopod spore plant)
Land plants

- **Sphenopsids:** segmented spore plants that also achieved *large sizes*
  - Modern sphenopsids include “horsetails”
Land plants

- **Most significant** event in evolution of Late Paleozoic land plants was appearance of gymnosperms
Land animals

- **Insects** had appeared in Devonian time
  - Wingless forms
- Insects underwent **evolutionary radiation** in Carboniferous time
  - *Primitive winged forms* (dragon flies)
  - Forms with *folding wings*
Late Paleozoic “hyperoxic” atmosphere might have enabled gigantism in many kinds of organisms.
75 cm wingspan

1.5 m long millipede
Terrestrial vertebrates

- **Amphibian-like tetrapods** appeared in Devonian time, then *dominated during Carboniferous and early Permian time*
  - **Carboniferous amphibians were large**; some up to 20 feet!
Eryops—the "prince" of Paleozoic amphibians
Terrestrial vertebrates

- Development of amniote egg gave rise to first reptiles in Pennsylvanian time
  - Unlike amphibians, reptiles do not need to return to water for reproduction and juvenile life stage
  - Reptiles soon acquired advanced jaw structure and differentiated teeth that allowed more efficient feeding
most reptiles (including dinosaurs and birds)

primitive amniotes

pelycosaurs, therapsids and mammals
Terrestrial vertebrates

• **Pelycosaurs**
  – Synapsid skull
  – advanced Permian reptiles, including *Dimetrodon*—the fin-backed reptile
  – **Ectothermic** (not capable of regulating body temperature); must absorb heat from surrounding environment
**Dimetrodon**—early Permian fin-backed reptile (pelycosaur)
Terrestrial vertebrates

• **Therapsids** (= “protomammals”) evolved from pelycosaurs, and probably were endothermic
  – Diversified into 20 *families* in late Permian
  – Synapsid skull
  – Possessed *mammal-like limb structure*
  – May have possessed *hair*
  – *Capable of occupying colder climates?*??
Late Permian therapsid
(mammal-like reptile)
therapsids in the flesh
Origin of the therapsids