


Carboniferous and Permian periods



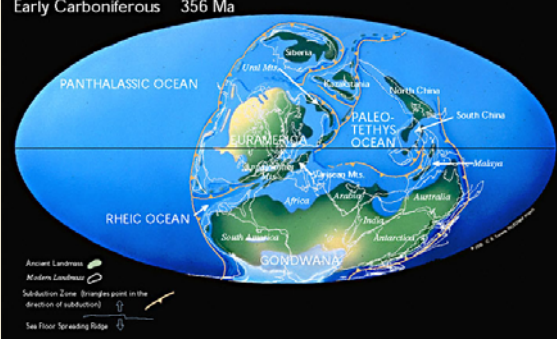
Carboniferous and Permian

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1
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Early Carboniferous 356 Ma

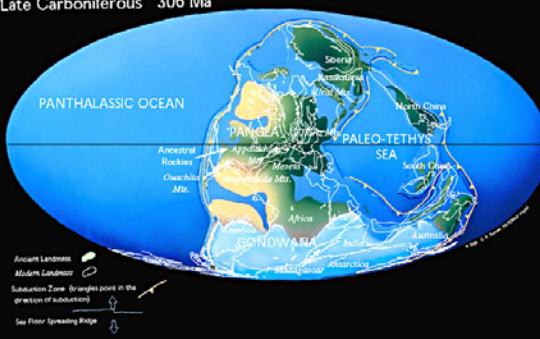


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2
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Late Carboniferous 306 Ma

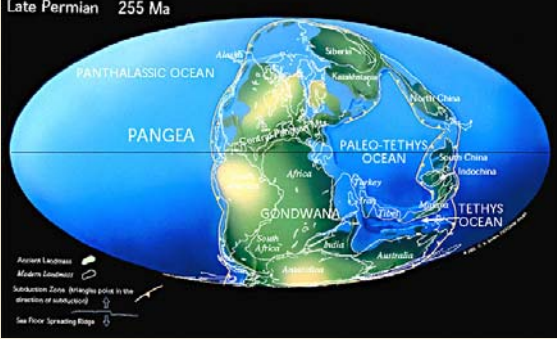


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3
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Late Permian 255 Ma

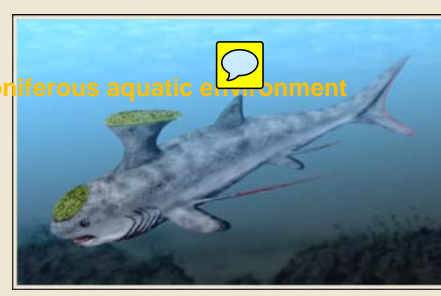


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4
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Carboniferous aquatic environment

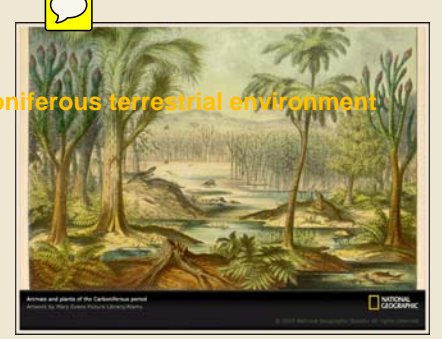


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5
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Carboniferous terrestrial environment



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6
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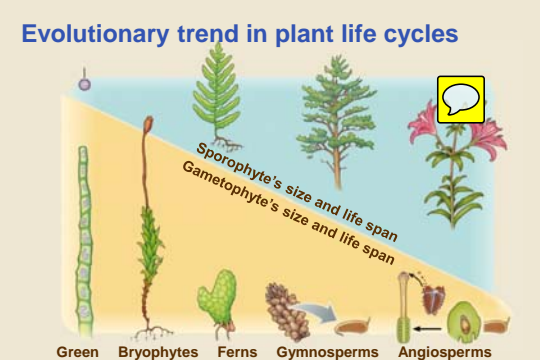
Carboniferous coal forests

- Club mosses
- Giant horse tails
- Tree ferns



7
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Evolutionary trend in plant life cycles

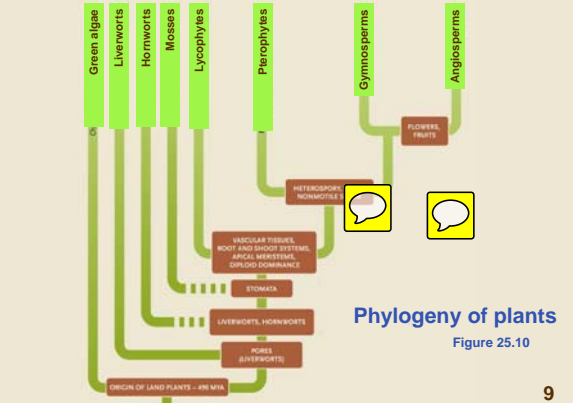


Sporophyte's size and life span
Gametophyte's size and life span

Green algae, Bryophytes, Ferns, Gymnosperms, Angiosperms

8
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Phylogeny of plants

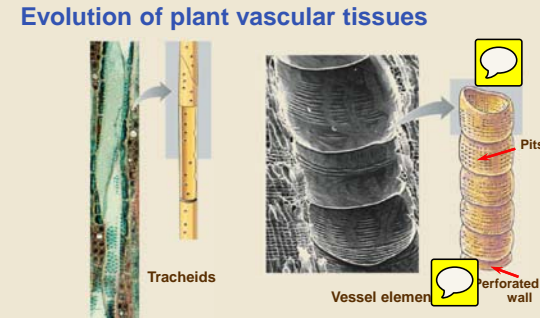


Green algae, Liverworts, Hornworts, Mosses, Lycophytes, Pterophytes, Gymnosperms, Angiosperms

Tracheids, Vessel elements, Pits, Perforated end wall

9
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Evolution of plant vascular tissues

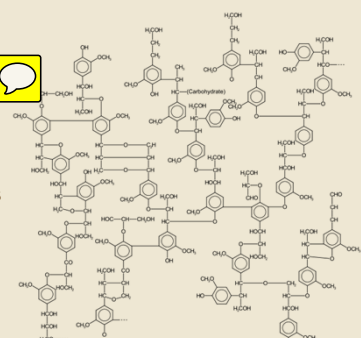


Tracheids, Vessel element, Pits, Perforated end wall

10
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Lignin

- Hydrophobic
- Indigestible
- Bacterial and fungal lignases
- Toxic



11
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Spores vs. seeds

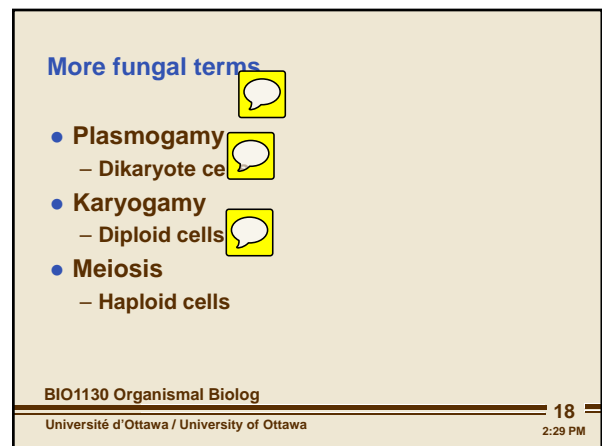
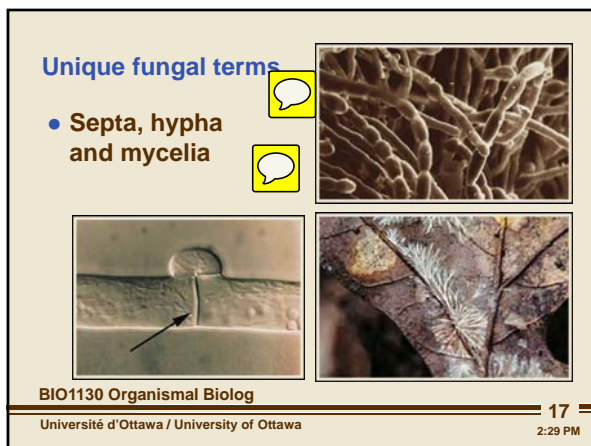
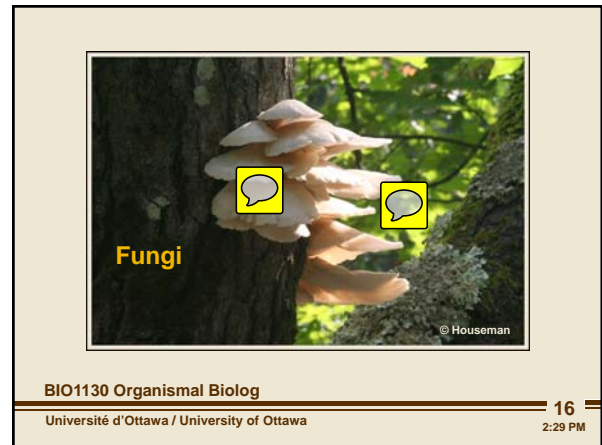
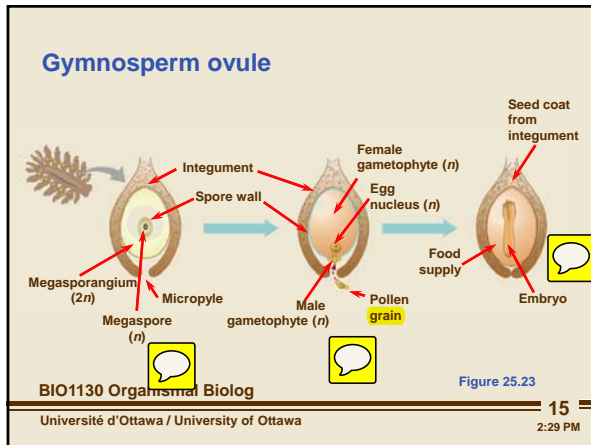
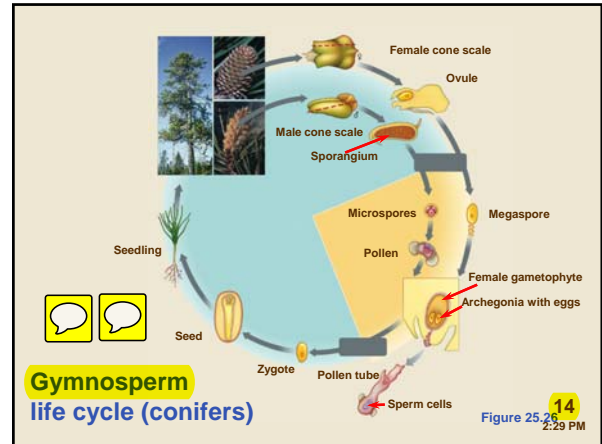
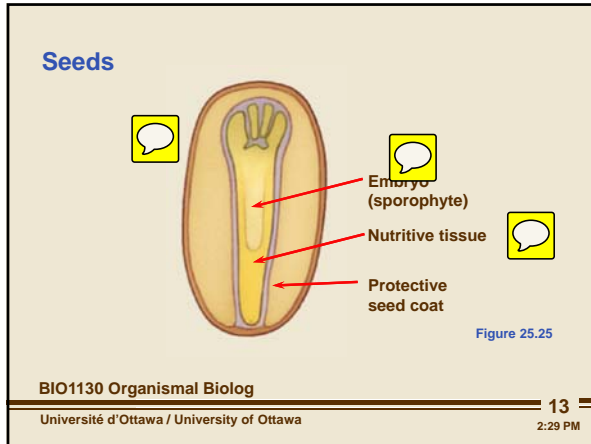
- Homosporous
- Heterosporous

Sporangia → spores → Bisexual gametophyte → sperm or eggs

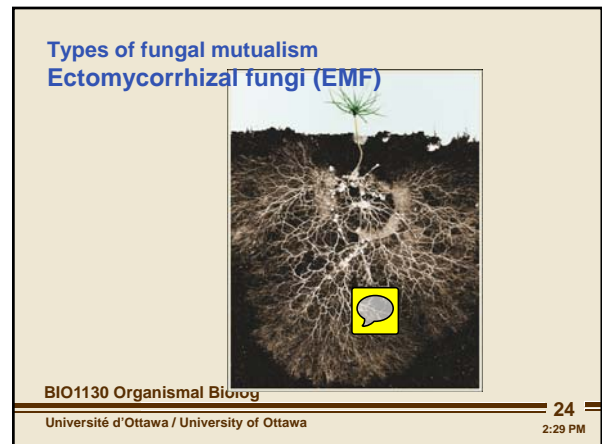
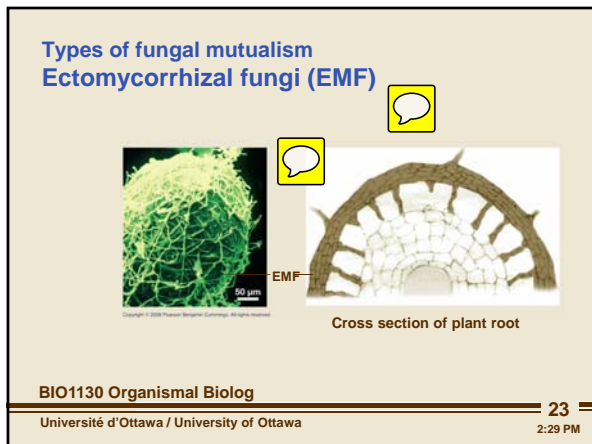
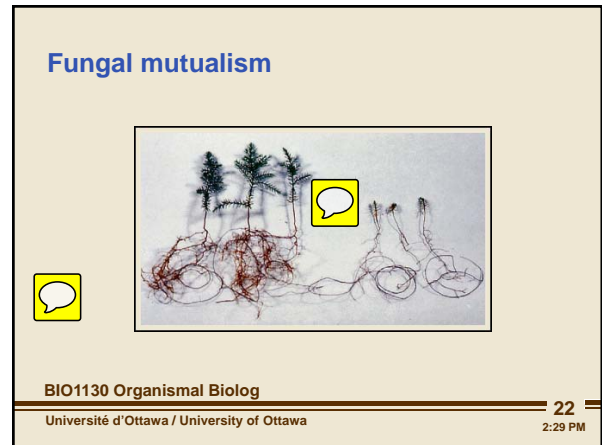
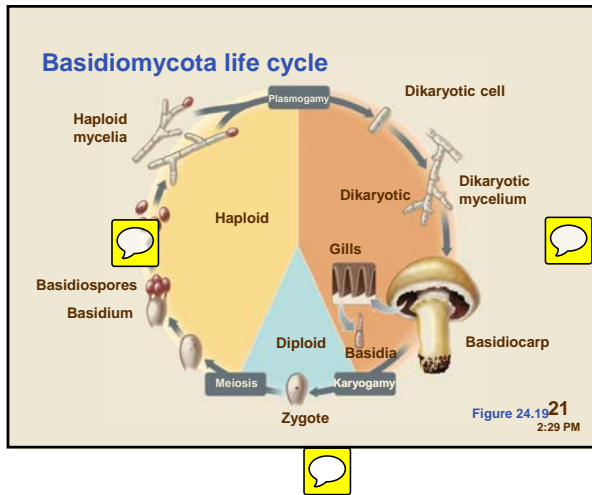
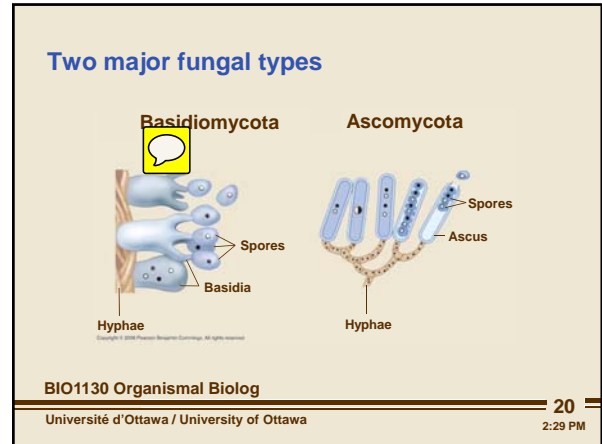
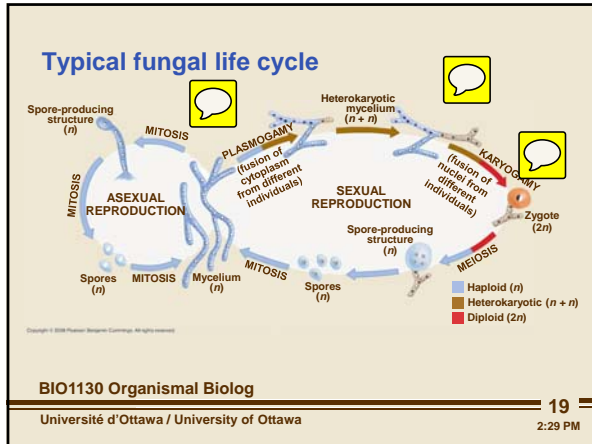
Microsporangia → Microspores → Male gametophyte → sperm
Megaspangia → Megaspores → Female gametophyte → Eggs

12
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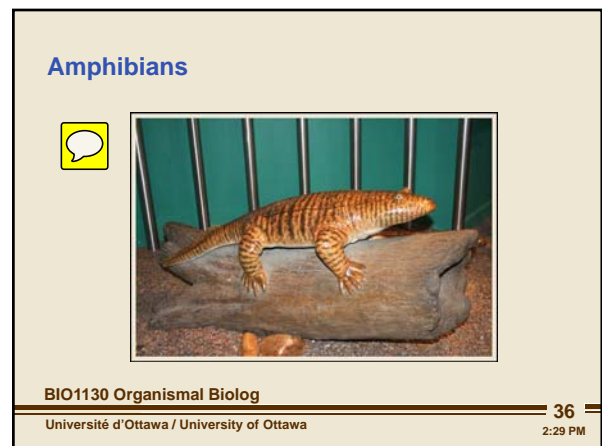
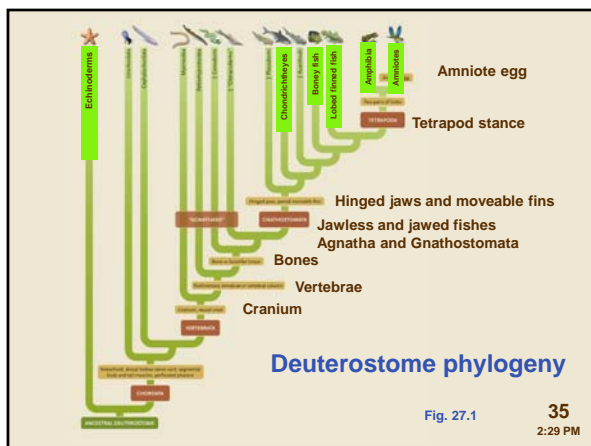
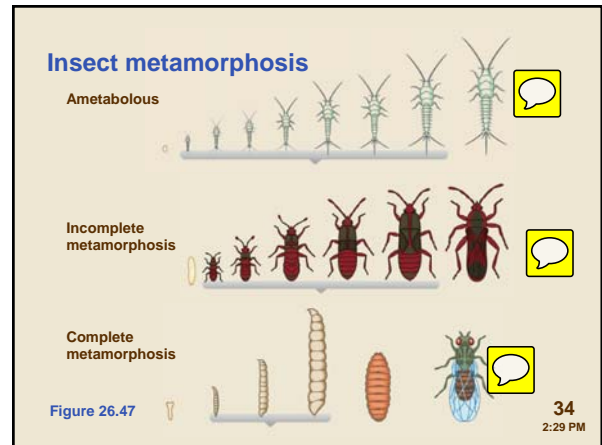
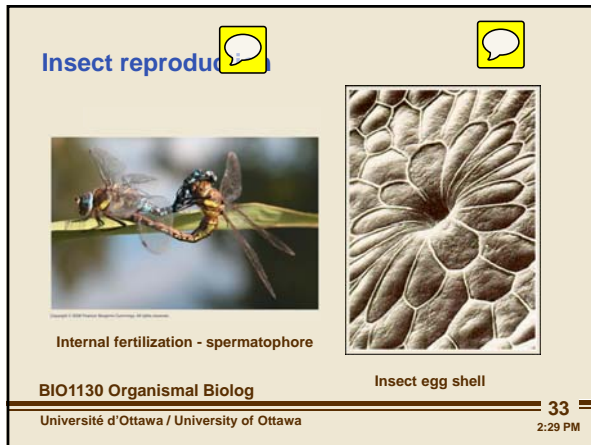
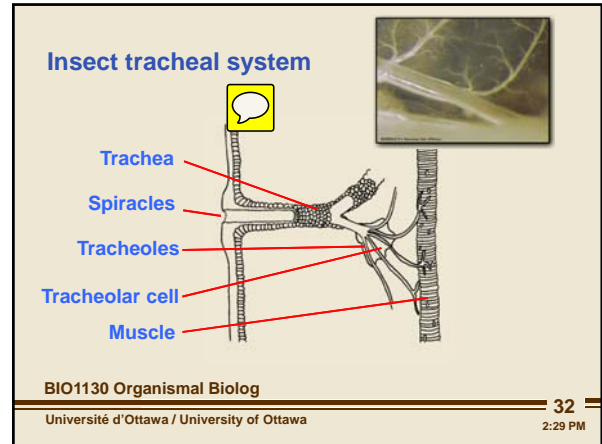
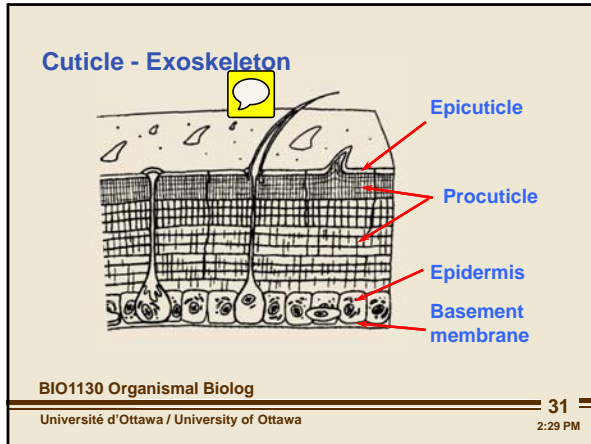
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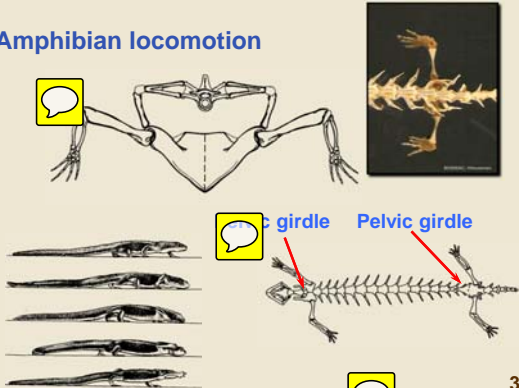
Amphibian food



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37
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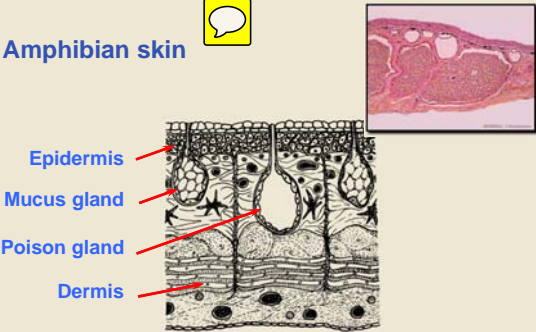
Amphibian locomotion



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38
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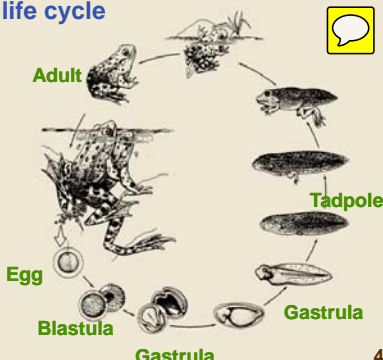
Amphibian skin



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39
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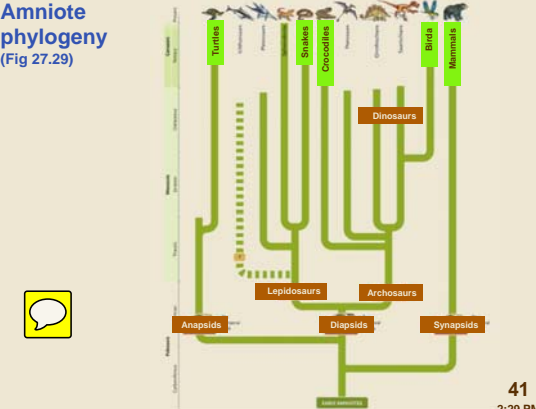
Amphibian life cycle



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40
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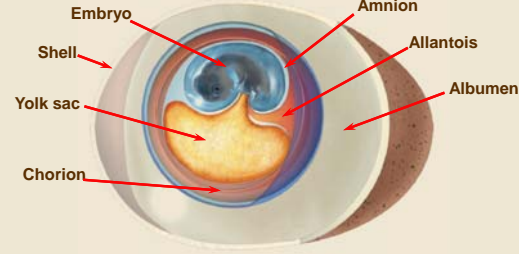
Amniote phylogeny (Fig 27.29)



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41
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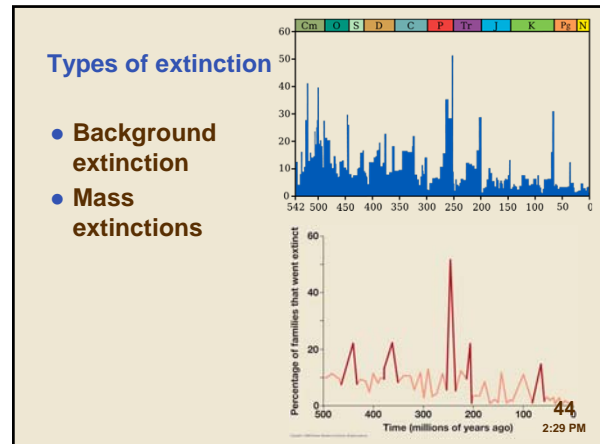
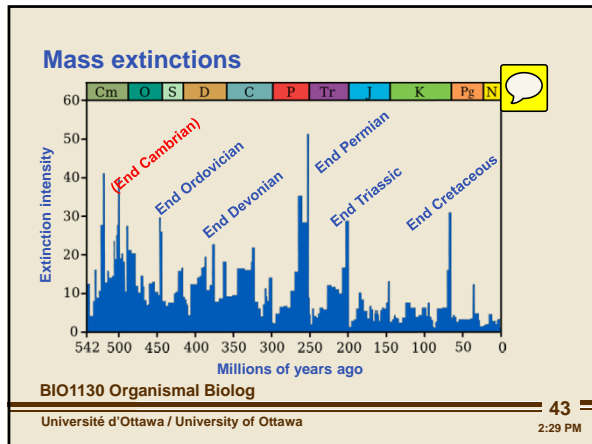
Amniote egg.



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42
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Causes of mass extinction

- Asteroid impacts
- Elevated Carbon dioxide
 - Flood basalts
 - Volcanoes
 - Gas hydrates
- Marine anoxia
- Sea level changes

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Flood basalts

video

Figure 27-15

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46
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Surviving mass extinctions

- Plants
- Insects
- Small size and global distribution
- Generalist life style

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47
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