

Plastic Amniote Phylogeny

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Goal: To solidify students' understanding of the relationships between amniote taxa (both extant and extinct). This can be run as a lab, a group assignment, or a concept test after a lecture/reading.

Suitable for: Early undergraduates and advanced high school students investigating phylogeny, paleontology, evolutionary relationships and life through time.

Structure: Works best in groups of 4-6 but could be done with fewer in a group. I give them a mixed bag of plastic amniote toys (e.g., mammals, dinos, birds, and other reptiles) and they have to (a) draw a phylogeny that shows the relationships between all their plastic organisms and (b) name all the parts of the tree, specifically, clade names, terminal taxa, and synapomorphic or autapomorphic characters for clades). This reinforces "tree thinking", phylogenetic relationships, and the specific relationships in amniota.

Note: This could be run with fewer organisms in each bag depending on how much detail your class goes into (e.g., they could differentiate 5 dinosaurs or only 1).

What you will need:

- Blank Paper and sharpies/pens/pencils
- One each of the following per group (x number of groups you will have)*
 - Non-mammalian synapsid (i.e. Dimetrodon)
 - Mammal (e.g. buffalo or wolf)
 - Plesiosaur
 - Lepidosaur (i.e. snake)
 - Crocodylomorph (e.g. alligator or crocodile)
 - Pterosaur (e.g. Pteranodon)
 - Stegosaur
 - **Note:** This could be run with fewer organisms in each bag depending on how much detail your class goes into (e.g., they could differentiate 5 dinosaurs or only 1).
 - Ceratopsian (e.g. Triceratops)
 - Pachycephalosaur
 - Ankylosaur
 - Hadrosaur
 - Sauropod (e.g. Brachiosaurus or Diplodocus)
 - Non-avian Theropod (e.g. Velociraptor or Tyrannosaurus)
 - Aves (i.e. bird)

**Note: I have bought the following plastic creature packs for this exercise:*

- 13 Birds
www.amazon.com/gp/product/B000GZED7K/ref=oh_aui_detailpage_o01_s00?ie=UTF8&psc=1
- 12 Crocodiles
www.amazon.com/gp/product/B00362RVD8/ref=oh_aui_detailpage_o01_s00?ie=UTF8&psc=1
- 12 Snakes
www.amazon.com/gp/product/B01CDLJEKA/ref=oh_aui_detailpage_o01_s02?ie=UTF8&psc=1
- 2 birds, 10 mammals
www.amazon.com/gp/product/B014Q6PIZ0/ref=oh_aui_detailpage_o01_s02?ie=UTF8&psc=1
- Assorted Dinos (usually 3-6 of each type listed above, 72 total)
www.amazon.com/gp/product/B001DN8I0M/ref=oh_aui_detailpage_o01_s02?ie=UTF8&psc=1

Example: Large Bag Contents (12 organisms/bag) * for a class that goes into dinosaur groups

All groups have:

- Alligator/Crocodile
- Snake
- Bird
- Mammal
- Ceratopsian (Chasmosaurinae or Centrosaurinae)
- Theropod (Raptor or T-rex)
- Sauropod (Brachiosaurus or Diplodocus)
- Hadrosaur (Lambeosaurus or other)
- Ankylosaur
- Stegosaur

These are only in some of the groups:

- Groups 1-2: Pteranodon and Plesiosaur
- Groups 4-6: Pteranodon and Dimetrodon
- Groups 7-9: Plesiosaur and Dimetrodon
- Groups 3, 10: Pteranodon and Pachycephalosaur

Example: Small Bag Contents (10 organisms/bag) * for a class that skims dinosaur groups

All groups have:

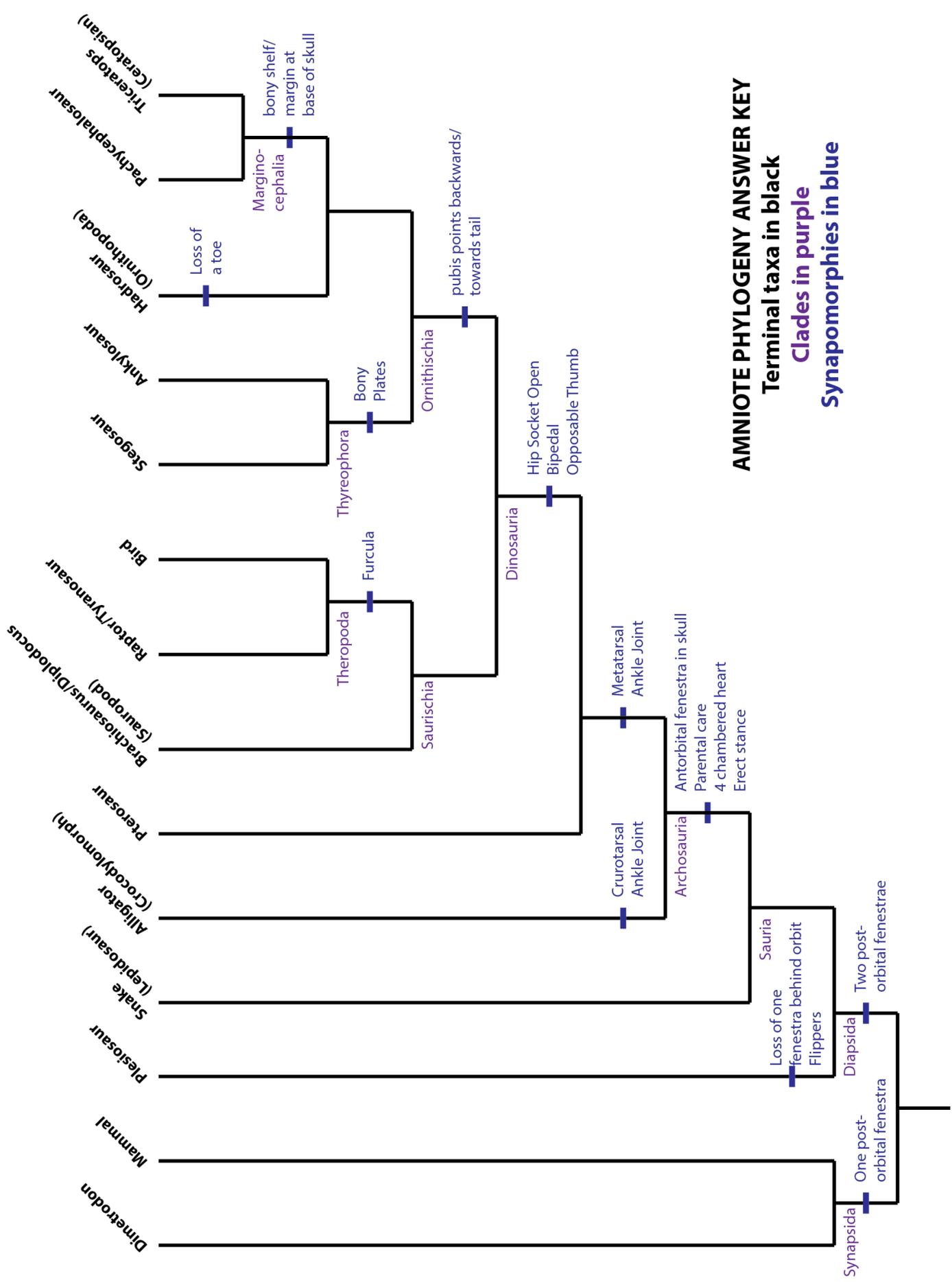
- Alligator/Crocodile
- Snake
- Bird
- Mammal
- Ceratopsian (Chasmosaurinae or Centrosaurinae)
- Theropod (Raptor or T-rex)
- Sauropod (Brachiosaurus or Diplodocus)
- Hadrosaur (Lambeosaurus or other)
- Ankylosaur or Stegosaur

These are only in some of the groups:

- Groups 1-2: Plus Plesiosaur (Ankylosaur)
- Groups 4-6: Plus Dimetrodon (Stegosaur)
- Groups 7-9: Plus Plesiosaur (Ankylosaur)
- Group 9: Plus Plesiosaur (Ankylosaur)
- Groups 3, 10: Plus Pteranodon (Stegosaur)

Exercise:

- Groups of 4-6 students get a bag of plastic animals.
- Using their lecture notes/readings/etc., ask the students to identify their plastic organisms (you can challenge them to ID the generic names, or just stop at family).
- Have the students draw a phylogeny that shows the relationships between them. Especially for university students, have them name the terminal taxa and clades as well as adding the characters that distinguish the groups.
- With the aforementioned organisms, they should be able to resolve the phylogeny on the next page (If they are missing some organisms, their phylogeny will be slightly different).



AMNIOTE PHYLOGENY ANSWER KEY

Terminal taxa in black

Clades in purple

Synapomorphies in blue