Final Review

Echinoderms

- water vascular system of tube feet to move
- no sides; mouth is oral, anus is aboral
- adults have radial symmetry, embryos are bilateral
- where is the "head" on the seas star?
    - Adult: No head
    - Embryo: has head

Chordata

- body plan
    - notochord
    - single hollow dorsal nerve cord
    - pharyngeal gill slits
    - post-anal tail
- plural of genus = genera
- what about protists make the group problematic?
- They are polyphyletic
- Craniates -> Vetebrates -> Gnathostomes -> Tetropods -> Amniotes -> Mammals
- Tiktaalik rosae = fish and tetrapod, transition animal

Amphibians

- terrestrial toads have more "lump-shaped" skin than aquatic frogs
    - advantage of this is larger SA/V ratio
- salamanders and caecilians bend back and forth
- frogs jump around
- amphibians have a "neck" and moveable head
    - lack of gills frees head
- primitive suction feeding method
    - only works in water, cannot suction food from air
        - evolved sticky tongues for land
- frogs vocalize to attract a mate
    - females pick male by longer calls or lower pitch calls (more robust)
- most amphibians still reproduce in water
- aquatic larvae -> terrestrial juveniles
- eggs require water OR males or females carry on back, in mouth, or in tummy
- to allow embryos to form outside eggs formed -> amniotes

Amniotes

- fit for dry environments
- all reptiles and mammals NO amphibians
- internal fertilization

- dry skin

Reptiles

- lay eggs
- spiders first to have silk covered eggs b/c of dessication and dispersal
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Dinosaurs

- includes birds
- ruled during Mesozoic (140 MYA)
- Cretaceous Mass Extinction (65 MYA) all dinos died except for birds

Birds

- belong to reptile, archosaur, and dinosaur clades
- feathers!!!!!
- Most specious group tetrapods
- First bird = Arcaeopteryx (160 MYA)

Mammals

- endothermic
- mammary glands
- hair and layer of fat
- 3 ear ossicles
- arose in Mesozoic (210 MYA)
    - small, rat-sized
- 3 extant lineages of Mammals
    1. Metahurians
        a. (1) Monotremes: Lay and incubate eggs! Produce milk but don't have nipples. Only three species: two echidna, one platypus [only in Australia and New Guinea) Duck Billed Platypus (lays eggs but has no nipples, it exudes milk)
        b. (2) Marsupials: Placental mammals that bear live young and most have a pouch. Most familiar is the kangaroo, koala, and opossums. Most are in Australia (our local one is the opossum in Ohio)
    2. (3) Eutherians: placental mammals that bear live young. Most of the hairy animals that you know are this (some aren't very hairy like whales, dolphins, and elephants) HUMANS!!!
       - Whales are tetrapods that went back into the sea
    3. * Placenta: complex of fetal and maternal membranes regulating exchange between fetal and maternal blood streams

Ectothermy vs. Endothermy

- Ectotherms rely on environmental sources for heat and tend to have fluctuating body temperatures. WHEN MIGHT ECTOTHERM BODY TEMPERATURE BE CONSTANTLY WARM?

- Endotherms use internal (metabolic) heat production to keep warm and tend to have more constant body temperatures

NPR: WE 29 October 2011 (Bulk Feeding of Python)

a. Takes two weeks to digest, all this digesting causes the heart to pump a lot more blood (similar to long distance runners)
b. Pythons sit and wait for a meal to come which takes months but the mean can be huge
c. Heart can rapidly grow by 40% just by devouring a huge meal in a few days. As meal is digested, heart returns to normal.
d. Can eat once a month about 40lbs at once
e. After 24 hours after feeding there is so much fat in the blood that you cannot see through it [milky], but it is good fat
f. Experiment: took blood from a post prandial (after eating) python and injected it into a mouse causing the heart to grow in the mouse → implications of healthy heart growth for mammals
g. Particular ratio of 3-fatty acids makes the heart grow

Temperature Regulation

- All non-avian retiles are ectotherms (i.e, cold blooded)
- Only avian reptiles are endothermic (i.e warm blooded)
- The big difference between ectotherms and endotherms
    - Endotherms have metabolic rates far higher than that of ectotherms of the same size at the same temperature
    - Resting humans spend 1300-1800 kcal in a day
    - Alligator of the same size spends about 60 kcal
    - Require less than 5% of fuel
    - Endothermy cost/benefit? Spend a lot of energy to get energy but you can disperse into new environments with new resources
    - Ectothermy cost/benefit? You don't need a lot to get your energy but you are only in one part of the environment and must worry about predation

Countercurrent Exchange Systems

- What travels down a gradient?
    - HEAT (warmer body to cooler body)
    - Molecules (diffusion)
    - Water (osmosis)
- DOLPHIN BALLS DANGLE OUTSIDE TO KEEP EM COOL
- Birds feed also use countercurrent exchange system through veins and arteries
- How do fish breath?
    - Gas exchange in bony fishes
    - "Breathing" is a function of respiratory systems – Exchange of what gasses?