GEOL 104 Dinosaurs: A Natural History
Test II Review

Scan the review sheet for Test I

Dinosaur Origins
Where do dinosaurs fit among the amniotes?
What is the **definition** of Dinosauria? (the concestor of *Iguanodon* and *Megalosaurus* and all of its descendants)
Significance of *Eoraptor*, *Pisanosaurus*, *Scutellosaurus*, *Saturnalia*, *Herrerasaurus*

Dinosaur Phylogeny
Be familiar with the relationships and some of the main **adaptations** (I've listed some) and **habits** (diet, postulated behavior, distribution in time and space, etc.) of the major dinosaur clades listed below:

Dinosauria: Perforated acetabulum; asymmetrical hand; semi-opposable manual digit I

Saurischia: Complex chambers in vertebrae
- **Herrerasauria**: ?Reversal to 2 sacrals; intramandibular joint
- **Eusaurischia**: Elongated neck; digit II longest in hand; big thumb claw

Among the eusaurischians:
Sauropodomorpha: Leaf-shaped teeth, very elongated neck, small head, elongate femur
- **"Prosauropods"** (life habits: no shared derived characters, since they are probably paraphyletic!!)
- **Sauropoda**: Enormous size; tooth occlusion; obligate quadrupedality; short snouts
  - **Neosauropoda**: Dorsally-placed nares; columnar metacarpals
    - **Diplodocoidea**: Forelimbs much shorter than hindlimb; pencil-shaped teeth
      - **Rebbachisauridae**: gnawing dental battery
      - **Dicraeosauridae**: long snout; nares joined above orbit; whip-like tail; tall neural spines; short neck
      - **Diplodocidae**: long snout; nares jointed above orbit; whip-like tail; elongate neck; enormous size
    - **Macronaria**: Greatly enlarged nares (as big or bigger than orbits); elongated metacarpals
      - **Brachiosauridae**: Forelimbs as long or longer than hindlimbs
      - **Titanosauria**: Extra wide hips; robust ulnae & radii; armor in some

Theropoda: Promaxillary fenestra; Intramandibular joint; loss of manual digit V; furcula; functionally three-toed pes
- **Coelophysoidea**: Subnarial gap
- **Neotheropoda**: Lacrimal fenestra
  - **Ceratosauria**: 7 or more sacrals; reduced manual phalanges
    - **Abelisauridae**: Greatly reduced forearm
  - **Tetanurae**: Enlarged hands; stiffened tail
    - **Spinosauridae**: Elongate narrow snouts; conical teeth; giant size
    - **Avetheropoda**: Maxillary fenestra; very complex chambers in vertebrae; loss of manual digit IV
      - **Carnosauria**: Enlarged naris; extra openings in antorbital region; giant size
      - **Coelurosauria**: Simply downy feathers; enlarged brain; narrow hand; boat-shaped chevrons
        - **Tyrannosauroidea**: Incisor-like premaxillary teeth; fused nasals
          - **Tyrannosauridae**: Enlarged skull; thickened teeth; reduced arms; loss of manual digit III; elongate tibiae and metatarsi; arctometatarsus; giant size
        - **Ornithomimosauria**: Small beaky skull; elongate neck; all three metacarpals the same length
          - **Ornithomimidae**: Toothless skull; elongate tibiae and metatarsi; arctometatarsus

Maniraptora: Elongate forelimb; enlarged ossified sternum; laterally-facing shoulder joints; semilunate carpal; backwards-pointing pubis; broad feathers on arms and tail

Oviraptorosauria: Leaf-shaped teeth or toothless; boxy skull

Therizinosauroidea: Small skull; leaf-shaped teeth; long neck; backwards-pointing pubis; short metatarsi

Eumaniraptora: VERY long arms, tail very mobile near base; distally-placed backwards-facing pedal digit I; backwards-facing pubis; long leg feathers

Deinonychosauria: retractable second pedal digit with sickle-shaped claw

Dromaeosauridae: Stiffened rods in tail; VERY larger sickle-claw

Troodontidae: Short arms; semi-leaf-shaped teeth; elongate tibiae and metatarsi; arctometatarsus in advanced forms

Avialae: Elongate arms; Reduced number of caudals (and shorter tail)

Pygostylia: Pygostyle

Ornithothoraces: Carpometacarpus; tarsometatarsus

Ornithurae: Loss of manual unguals; synsacrum

Carinatae: Keeled sternum

Aves: Toothless beak; Tibiotarsus

Ornithischia: Predentary bone; leaf –shaped teeth; backwards-pointing pubis (except for *Pisanosaurus*); cheeks in most forms

Heterodontosauridae: Deep, powerful skulls; predentary margin ventral to maxillary margin; jaw joint ventral to dentary tooth row

Thyreophora: Scutes; obligate quadrupedality (except for *Scutellosaurus*)

Stegosauria: Plates and spikes; thagomizer

Ankylosauria: Osteoderms fused to skull; rings of body armor on neck; wide hips

Nodosauridae: Expanded process on scapula

Ankylosauridae: Triangular horns on skull; tail club

Neornithischia: Enamel on only one side of teeth

Ornithopoda: Predentary margin ventral to maxillary margin; jaw joint ventral to dentary tooth row

Iguanodontia: Facultative bipeds; toothless premaxilla

Hadrosauriformes: Hinged upper jaw; "Swiss Army Hand" (spike thumb; hoof-like digits II-IV; opposable digit V)

Hadrosauridae: Enlarged snout; grinding dental battery; loss of thumb

Hadrosaurinae: Very large nares; broad snout

Lambeosaurinae: Hollow narial crest

Marginocephalia: Ridge on back of skull

Pachycephalosauria: Thickened skull roof (sometimes domed)

Ceratopsia: Rostral bone; pointed jugals

Neoceratopsia: Enlarged skull; frill; obligate quadrupedality

Ceratopsidae: Horns; shearing dental battery

Centrosaurinae: Short deep snout; nose horn longer than brow horns

Ceratopsinae: Long shallow snout; brow horns longer than nose horn

<u>Bird Origins</u>

Models of flight origin, esp. Arboreal, Cursorial, and Wing-Assisted Incline Running (WAIR)

<u>Dinosaur History</u>

Plate Tectonics: how does plate tectonics affect the surface the Earth, dinosaur history, and the preservation of dinosaur faunas?

Know the major dinosaur-bearing formations of western North America, the dinosaur communities they represent, and some of their equivalents (from the Dinosaur History handout)

Major events in the Mesozoic:

The Triassic-Jurassic Extinction and its effect on dinosaur history

Birth of the Atlantic in Early J (Newark Supergroup)

Origin and significance of Angiospermae (flowering & fruiting plants) in Early K

Global high temperatures in mid-K

Asiamerica vs. Gondwana in the Late K