Dinosaur Paleobiology:

I. Weighing dinosaurs. See lecture on 05.01.2008

II. Dinosaur trace fossils
   A. Skin traces: dinosaurs had scales. some had feathers and “fuzz”
   B. Dinosaur Footprints
      i. How do they form?
      ii. Things to note about them (stride, pace angle, # of toes and claws, heels)
      iii. Foot print taxonomy - problematic if the goal is to link to particular species
      iv. Foot motion
      v. Foot prints and posture - a key line of evidence for upright posture in dinosaurs
      vi. Foot prints and locomotion
         a. Manus only trackways. What do they imply about sauropods?
         b. Calculating dinosaur speed

Stride Length (in meters) is related to the Speed (m/sec) an animal is moving. Because large animals invariably take bigger steps than small animals, they move faster than small animals. We need to come up with some relative measures of Stride Length and Speed. We scale both by the Leg Length, which takes care of size, and also scale speed for gravitational attraction (which pulls animals towards the earth and affects their speeds).

Equation 1: Relative Stride Length = Stride Length/Leg Length
Equation 2: Relative Speed = Speed/(Leg Length x gravitational acceleration)^0.5

When Relative Stride Length is plotted against Relative Speed, a tight relationship is seen.

To calculate the speed of a dinosaur
- Find a trackway and measure the Stride Length.
- Estimate Leg Length from the size of the foot. It has been shown for many animals, including dinosaurs, that Leg Length = 4 x Foot Length.
- Use Equation 1 to calculate Relative Stride Length.
- Use the relationship between Relative Speed and Relative Stride Length to estimate relative speed
- Use Equation 2 to calculate True Speed from Relative Speed.

C. Coprolites: hard to relate to particular dinos. Karen Chin’s work is the most rigorous. Theropod coprolites.

D. Bite Marks: T. rex could bite hard. Is this necessary for a scavenger?

E. Eggs and Nests:
   i. Nest for many groups
   ii. Nests point to behaviors linked to birds
   iii. Early groups have mix of reptilian and bird traits, derived groups more bird-like

III. Growth and growth rates
   A. Estimate growth rates from LAGS and other indicators in bone.
   B. Dinosaur matured in a reasonable amount of time, not massively old
   C. Exponential growth rates in dinosaurs were intermediate between reptiles and endotherms
   D. Large theropods had Type I life history (late mortality after brief period of juvenile mortality)
   E. Theropods got larger by growing faster, not by living longer. Opposite what happens in big varanids.