Section 2. It's Not Easy Being Big: Theropod Biomechanics.

Fun Facts

- The arms of *T. rex* were only about 3 feet (1 m) long and had two-fingered hands.
- *T. rex's* serrated teeth were continually replaced.
- Today, the fastest living animals tend to weigh 110 kg. (220 lbs) or less.
- A big African elephant and *T. rex* weighed about the same.
- Size can be deceiving. *T. rex* and a soccer player both run about the same speed.
- An ostrich and *T. rex* had a common ancestor.
- *Sauroposeidon proteles* weighed close to 120,000 pounds and may have had a body temperature close to 48° C (118° F). *T. rex* had a body temperature of 33° C (91° F).

Q&A

Q: What is the difference between a theropod and a sauropod?
A: Theropods were upright, largely meat eaters, like *Tyrannosaurus rex* (*T. rex*). Sauropods were large, four-legged browsers noted for their long necks and tails and huge size. They were common in North America during the Jurassic and Cretaceous.

Q: How big was *T. rex*?
A: *Tyrannosaurus rex* was one of the largest land carnivores of all time, about 12 to 13 meters (40 to 43.3 feet) long, and 5 m (16.6 ft) tall, when fully grown. Mass estimates have varied widely over the years, from more than 7,200 kilograms (8 short tons), to less than 4,500 kg (5 tons), with most modern estimates ranging between 5,400 and 6,800 kg (between 6 and 7.5 tons).

Q: How fast could *T. rex* run?
A: Probably about 10 mph, about as fast as an average human runner. Although slower than in movies like *Jurassic Park*, this was probably still faster than many of its potential prey.

Q: Could full-grown *T. rex* run faster than a baby *T. rex*?
A: A baby may not have been able to outrun an adult *T. rex*, but at some point in its growth period, a young *T. rex* would have been faster then its parents and then slowed down once it attained a weight of 1,000 kg (2,200 lbs).

Q: How do scientists figure out how big and fast animals were?
A: Size by taking the bone, figuring out what part of the body it came from, using present day mammals as a "model" to extrapolate size; speed by measuring the distance between footprints (if there are trace fossils) or if no footprints, by extrapolating from bones, muscle placement and size; computer models are based on living organisms.

Q: How long could a *T. rex* live?
A: About 28 years. We have to remember that this is based on fossil evidence and it will vary quite a bit from individual to individual.

Q: How do we know that?
A: Certain bones accumulate regular growth rings; the number of rings tells the age of the specimen. *T. rex* young grew as much as 4.5 lbs. per day from 14-18 years.

Q: Were some dinosaurs warm-blooded?
A: We don't know for certain but some fossils show lots of (Haversian) canals in their bones, like those transporting blood in birds and mammals, although some cold-blooded reptiles also have them; scientists have developed several lines of evidence, including bone structure, that indicate some dinos may have been warm-blooded.

Q: What did *T. rex* eat (was it a predator, scavenger, or an opportunist that was both predator and scavenger)?
A: Many scientists believe that *T. rex* took meat any way he could get it. Although lightly built for its size, skull was well muscled and could deliver a powerful bite; 8-inch curved teeth pierced and gripped prey and with a twist of its head could tear away chunks of flesh; was considered solitary scavenger but may have been both ambush hunter and scavenger.

Q: Why are scientists looking at dinosaurs as machines?
A: Dinosaurs are extinct and we can't see how they really moved. We can infer from similar living animals how they moved but there is no way to validate our inferences. If we use biomechanics, applying the principles of physics and engineering to biological movement, we can study animals as if they were machines. Experts examine fossils, observe movements in living species and analyze muscle in order to flesh out these ancient giants.