

A Standing Problem

Scaling: a Weighty Issue

There is an age-old physical dilemma that plagues structural engineers and scale modelers: strength to weight ratio. As a kid, I wondered why the plastic scale model of an airplane was hopelessly unable to mimic the performance of the copied aircraft. Conversely, a plastic car model can be dropped and exposed to scale-speed impacts without so much as a dent. Imagine a highway wreck where vehicles bounced without damage! Similarly, a model bridge made from popsicle sticks could not directly scale up to a size capable of supporting road traffic.

Strength to weight ratio (or Specific Strength) can have surprising consequences. Weight is related to volume (third order) while strength is related to area of material cross-section (second order).

As a real life example, the strength to weight ratio of [Balsa wood is greater than any metallic alloy](#). This is great for building model rockets, yet it's clearly not possible to build an aircraft or rocket capable of carrying humans from Balsa.

Dino-Size Concerns

Looking at living things, size has a big impact on ability. Ants [are able to carry up to 20x their body weight](#) and small lizards and frogs can climb window panes supported only by the attraction force of the glass.

Scaling an animal up to the [massive size of a dinosaur](#) has led some paleontologists to postulate that sauropods (long necked dinosaurs) [must have been aquatic](#), instead of land animals. But this is in conflict with the evidence. In fact, there is a serious scale problem associated with large dinosaurs, as well explained by Ted Holden:

[Dinosaurs ...and the Gravity Problem](#)

How could a dinosaur stand and walk, given their overwhelmingly massive weight and available muscle mass? Specifically, how can dino tracks in apparent soft ground have a depth of a few inches? How deep would a house sink if it was supported on four pillars the size of dino feet? Worse, the majority of the volume of a house is empty space, while a similar sized sauropod is solid!

Have physics changed? Has gravity always remained constant? If the Electric Universe theory holds weight, gravity today may be different than it was in the past:

[Impossible Dinosaurs](#)

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