

Cope's Rule & Gigantism in the Dinosauria

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Cope's Rule is the tendency for organisms along an evolutionary lineage to increase in size. It has long been a contentious issue in evolutionary biology, with large size expected to confer an advantage in both inter- and intraspecific competition. However, it has remained the subject of much debate and until recently was widely disputed to be in operation. Recent analyses have shown that in fact large size confers a significant short-term advantage and this reflects the increasing number of lineages shown to have a trend for gigantism.

Dinosaurs are notable for producing gigantic forms that far exceeded the size of any other terrestrial animals before or since. Various dinosaurian lineages produced giant forms such as *Argentinosaurus* (a 40 m sauropod), *Spinosaurus* (a 17 m theropod), *Ankylosaurus* (a 10 m thyrophorean) and *Shantungosaurus* (a 15 m

ornithopod), with virtually every family containing at least one giant form. Testing for Cope's Rule with multiple methods shows a strong tendency for gigantism throughout the clade, irrespective of diet, bauplan or phylogenetic history. This suggests an active trend towards large size as opposed to passive diversification.

Some clades show a particularly strong trend for large size, (e.g. the theropods) while other show counter-selection at very large size towards a smaller body (e.g. some sauropods). Counter-selection suggests a theoretically 'stable' point of dinosaurian size of 7.8m. Ongoing research into the evolution of gigantism in sauropods attempts to provide evolutionary, ecological and anatomical solutions to the question of how, and why sauropods got so large.