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## A RE-EVALUATION OF THE MASS AND FLIGHT OF GIANT PTEROSAURS

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Giant pteranodontids and azhdarchids are usually shown as ultralight soarers, but these restorations assume unrealistically low specific gravities of only 0.2-0.3. This also leaves them with muscles too small to fill out and operate their long legs, or the wings with their very large pectoral crests. New restorations confirm past volume estimates, but corrected specific gravities indicate 20-29 kg for 5.9 m span *Pterandon*, and 250 kg for the much more robust 11 m span *Quetzalcoatlus*. The last is the heaviest known flier, compared to 120 kg for 8.5 m span, smaller boned teratorn *Argentavis*. This places the wing span-area/mass of giant pterosaurs in the normal range for birds and for 12 m span sailplanes and ultralights.

The heaviest living flying birds, swans and bustards, never soar. Likewise, the azhdarchids' thick wing roots and wrists were not streamlined for soaring. Instead, the 50-70 kg of flight muscles mounted on high leverage pectoral crests provided high power for constant flapping flight. The narrow chord and lightly loaded wings of *Pteranodon* were good for ocean soaring, but its well-muscled pectoral crests show it was a strong flapper as well.

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## TWO CHRONIC MYTHS IN DINOSAUROLOGY: WHY BRAIN SIZE DOESN'T TELL US A DARN THING ABOUT PHYSIOLOGY, AND WHY GIANT ENDOTHERMS DO NOT DROP DEAD FROM HEAT STROKE

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The small brains of most dinosaurs are often cited as favoring low levels of energy intake, and large taxa - sauropods especially - are usually considered too vulnerable to overheating to have been tachymetabolic.

Tuna, leatherbacks, and pterosaurs are highly active and tachymetabolic, yet they have reptilian sized brains. Reef sharks are bradymetabolic, but have complex brains in the ground-bird size range, and advanced rays are low activity ectotherms with brains as large and complex as most placentals.

Elephants do not die from heat stress even during droughts too hot and dry to unload excess heat with radiation or evaporation. Instead, giant endotherms use a classic strategy combining bulk insulation and hyper-elevated body temperatures to keep out external heat, while storing the day's metabolic heat. They are much less vulnerable to overheating than smaller endotherms, and are better able to remain active on hot days.

Even small-brained dinosaurs were often social and parental, so they were intelligent enough to have been highly active endotherms. If so, then some probably evolved large size as an adaptation for hot climates.