
Regular Poster Session III (Friday, November
14, 2025, 4:30 - 6:30 PM)

**Keeping grounded: podathecae, feature
scales, and feathers—tracks, simple-minded
cladistic thinking, and the insulated ancestral
state condition in the Avemetatarsalia**

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A simple-minded, cladistic hypothesis posits that the avemetatarsalian ancestral state conditions for integument were filamentous insulation and pebbly reticulae on the podothecae (PRP), based on organically preserved remains. The Early Jurassic ichnite *Anomoepus* reveals PRP and filaments distal to proximal tail scutellate scales, supporting an origin of these bird-like features at the Triassic origin of dinosaurs, providing the group is monophyletic.

Ichnocladistic analysis of silesaur (*Atreipus*) and chirotheroid tracks show that PRP originated prior to the Dinosauria/Pterosauria node, and are possibly primitive for Pseudosuchia+Avemetatarsalia. This is inconsistent with the argument that dinosaur/bird PRP are modified feathers, which would require feather origins at the Archosauria node or earlier. We instead default to the hypothesis that these scales are simply homologous to reptile scales.

Apomorphies of their respective clades, derived from the ancestral PRP condition for Pseudosuchia+Avemetatarsalia, are: 1) coarse autopod scales of extant crocodyliforms (a semi-aquatic adaptation), evidenced by PRP in the terrestrial crocodyliiform track *Batrachopus*; 2) angular scales of phytosaurs seen in the ichnite *Apatopus*, plausibly also a semi-aquatic adaptation; and 3) proportionally large, polygonal pedal scales of the track *Otozoum* observed in undoubted sauropod footprints and neosauropod integument.

Maximum likelihood models favoring a scaly ancestral state condition for avemetatarsalian integument rely on negative evidence from large dinosaurs. However, their size and thermoregulatory needs (analogous to nearly hairless low-latitude megafauna) plausibly drove filament reduction. Instead, we hypothesize that at least sauropods and hadrosaurs, actually

retained filament homologues as their median feature ‘scales’ (MFS) composed of conjoined filaments. Indeed, hadrosaur MFS have been described as, “...evocative of rhinoceros horns ... composed of an arrangement of hair-like keratinized tubules ...”. If borne out by desperately needed additional analysis, recoding of sauropods and hadrosaurs as having ‘reduced filaments,’ as opposed to scales only, would reverse the maximum likelihood outcomes. The primitively present, filamentous integument in pterosaurs+dinosaurs was a key innovation that allowed them thrive in polar regions and survive multiple episodes of Mesozoic, volcanic winter-induced, terrestrial mass extinctions.
