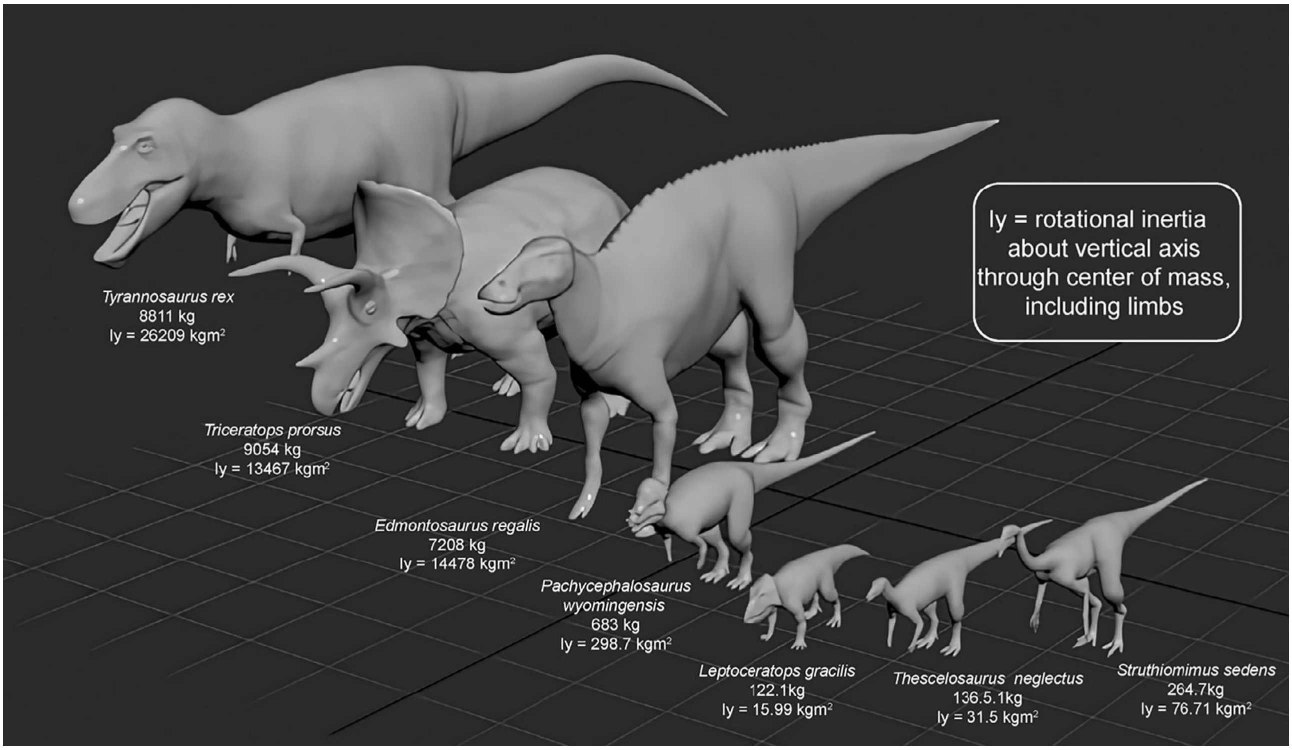

Figure 1. Models and mass property results for representative late Maastrichtian dinosaurs of northern Laramidia. Ceratopsians *Triceratops prorsus* and *Leptoceratops gracilis* have notably lower rotational inertias than other taxa of similar mass. Grid lines = 1 meter.

the limbs. *Edmontosaurus* scaled to the same mass as a large adult *Tyrannosaurus* has 77% of the predator's full body rotational inertia, but values converge when *Tyrannosaurus* pivoted only its axial body, as with both hind limbs planted.

These results suggest different predator-prey interactions between *Tyrannosaurus* and *Edmontosaurus* or *Triceratops*, with each requiring a different hunting strategy. For a predatory adult *T. rex*, the lower rotational inertia of *Triceratops* would likely necessitate a quicker ambush to avoid being outmaneuvered, while *Edmontosaurus* could be more closely matched in a brief pursuit. Mass property refinements for Laramidian dinosaurs will focus the bounds of uncertainty for such inferences, incorporated with musculoskeletal simulation and validation against extant ecological analogs.

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Technical Session 3: Terrestrial Ecosystems – Early Cretaceous (Saturday, June 10, 2023, 10:45 AM)

AN EXCEPTIONAL ASSEMBLAGE OF NEW ORODROMINE DINOSAURS FROM THE POORLY CHARACTERIZED MID-CRETACEOUS OF NORTH AMERICA

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Orodromines were a group of small-bodied, herbivorous, bipedal, neornithischian dinosaurs hypothesized to have lived in burrows (Varricchio et al., 2007). They are represented by approximately seven to nine species spanning

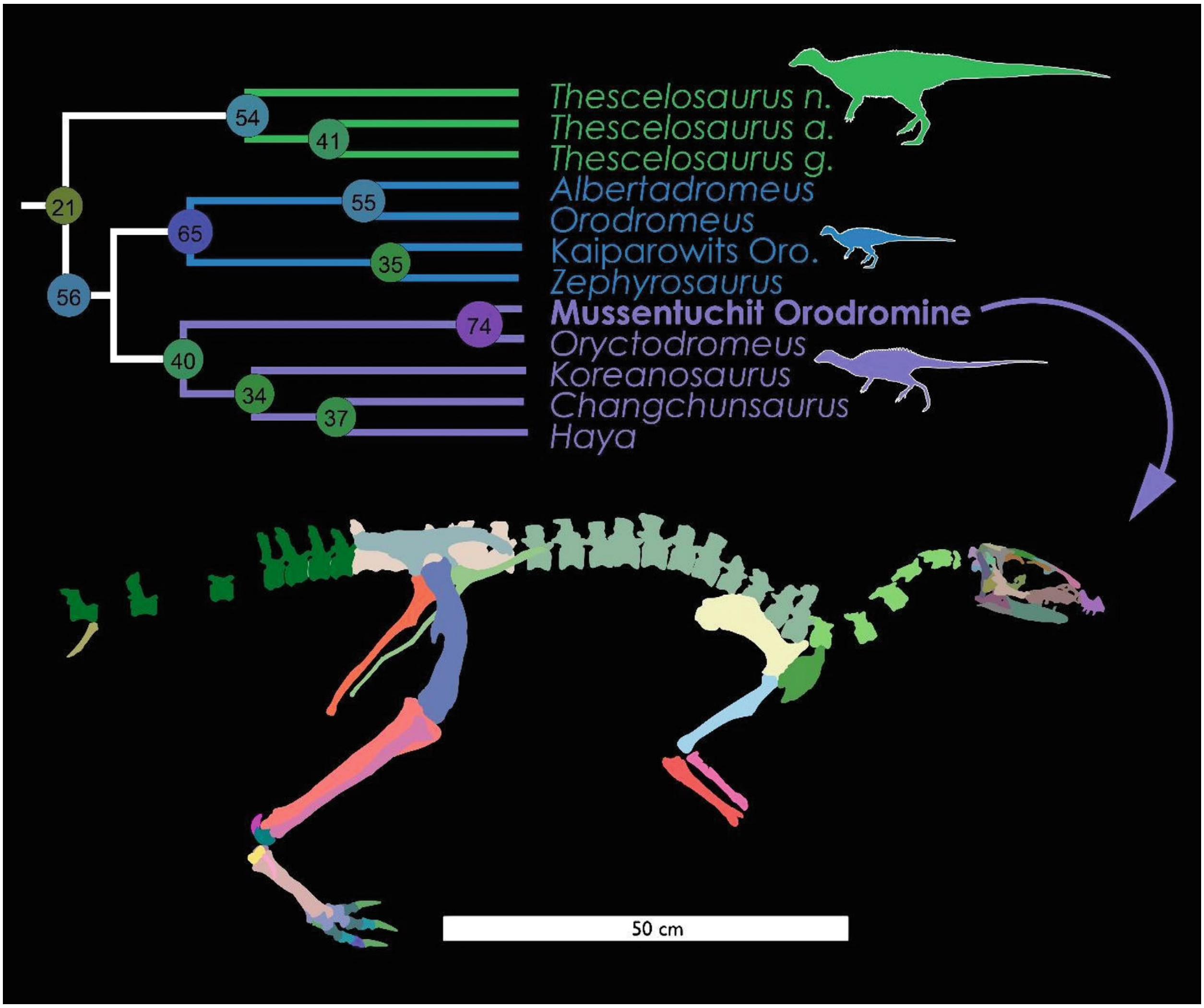

Figure 1: Bayesian Phylogenetic analysis of a modified version of the Barta & Norell (2021) matrix (top), and skeletal reconstruction of the Mussentuchit Orodromine. Numbers at nodes represent the posterior probability, with higher numbers supporting stronger confidence for the monophyly of the clade.

the Aptian through the Campanian and are largely restricted to North America, with at least one, but possibly three species represented from Korea, Northeast China, and Mongolia (Madzia et al., 2018). However, their taxonomic diversity, phylogenetic relationships, and ecology remain enigmatic. Moreover, the broader interrelationships of early-diverging ornithischians persist as one of the most problematic areas of dinosaur phylogenetics, with different studies resolving dramatically different interrelationships, often with poorly supported nodes (e.g., Boyd, 2015; Dieudonné et al., 2021).

This lack of resolution hampers the pursuit of broader questions relating to ornithischian ecology, biogeography, evolutionary rates, diversification, and morphological trends. Inconsistencies in hypothesized evolutionary relationships are due in part to the incomplete preservation of many specimens, lack of detailed osteological descriptions, and the influence of ontogeny, taphonomy, and individual variation within species composed of multiple individuals. Remediating such a deficit requires the comprehensive evaluation of new and existing materials, especially those that fit in between the current evolutionary gaps.

The Cenomanian-aged (99–98 Myr) Mussentuchit Member (MM) of Utah's Cedar Mountain Formation (CMF) has produced a rich record of a new species of orodromine. Materials collected to date include approximately 10 individuals of various ontogenetic stages (based on different sizes of skeletal elements and histological assessment of relative maturity) from five localities spanning less than 600 kyr of geologic time (Tucker et al., 2020). Specimens represent at least one (Makovicky et al., 2014) and possibly multiple new taxa.

To explore the evolutionary relationships of the new taxon, we conducted a series of Bayesian phylogenetic analyses using Beast 2.6.7. We selected the Barta and Norell (2021) matrix because it contains the highest number of thescelosaurids and orodromines. Several character scorings of multiple taxa were reassessed in person and via photographs and 3D models. These analyses recover the MM orodromine as sister to *Oryctodromeus* at a high Posterior Probability of 0.75, together being more closely related to the Asiatic ornithopods *Haya, Changchunsaurus, and Koreanosaurus* than to the other North American orodromines (Figure 1).

Synapomorphies with *Oryctodromeus* include a medial tuberosity on the scapula, an acromion process that is craniodorsally inflected (~105°) from the craniodorsal margin, a non-flaring scapular blade with the distal margin between the superior and inferior angle running in parallel with the ventral margin of the scapula, and a subtle ridge on the caudal surface of the paroccipital process. The MM orodromine differs from *Oryctodromeus* in lacking the sharp and ventrally folded scapular spine, but possessing a dorsoventrally elongate fossa on the medial surface of the occipital condyle located directly caudal to the medial opening of CN XII, and a rostrocaudally oriented ventral canal on the prootic. The latter two traits are absent in *Orodromeus*, *Oryctodromeus*, and *Thescelosaurus*. Dentary teeth show a unique vertical wear facet on the labial surface that terminates abruptly near the crown base. A parietal sagittal crest is absent, a condition only shared by *Lesothosaurus* and *Changmiania*. Intraspecific variation is observed in the postcranial skeleton with some individuals possessing inflated ischial shafts immediately distal to the obturator process and the presence or absence of deep cavities along the ventrolateral margin of fused sacral centra two and three, possibly representing pneumaticity or pathology.

Although there is no direct sedimentological evidence to date that this new species inhabited burrows as in other orodromines, taphonomic patterns are consistent with a subterranean lifestyle. First, orodromines are by far the most abundant small-bodied vertebrates known from macroskeletal remains in the MM, in contrast to the expected sparsity of small-bodied vertebrates with hollow bones (Brown et al., 2013). Second, they represent one of the only vertebrates from the MM that are preserved in partial or full articulation, a condition shared by *Oryctodromeus* from the coeval Wayan-Vaughn Assemblage (WVA) of Montana and Idaho (Krumenacker et al., 2019). Lastly, multiple individuals are often found buried together, with the largest density of bone usually constrained to a one- to two-meter square block in which elements are tightly packed and border or overlay each other. This is in contrast to the most common taphonomic pattern in the MM, in which skeletal elements are often fragmentary, eroded, and/or disassociated. Altogether, these patterns may indicate fossorial behavior, a hypothesis supported by ongoing histological analyses (Avrahami et al., 2019) as well as other studies on closely related species (Fearon & Varricchio, 2016). Additional evidence for fossorial behaviors stems from our morphometric analysis using a dataset expanded from Fearon and Varricchio (2015). The MM orodromine scapulae form a cluster that is similar to yet distinct from *Oryctodromeus*. The close scapular morphology may suggest fossorial behavior that is more widely distributed across early diverging ornithischians than previously considered.

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Technical Session 2: Paleoecology (Thursday, June 8, 2023, 2:15 PM)

NEW PALEOFLORAL SITES FROM THE LATE CRETACEOUS WAPITI FORMATION OF ALBERTA, CANADA: IMPLICATIONS FOR UNDERSTANDING THE PALEOECOLOGY OF BOREAL DINOSAUR COMMUNITIES

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The Late Cretaceous (80 – 68Ma) Wapiti Formation of northwestern Alberta and northeastern British Columbia, Canada spans an interval of geologic time from the lower Campanian to the upper Maastrichtian. The first notable fossil locality from the Wapiti Formation was discovered fifty years ago on Pipestone Creek, near the city of Grande Prairie in northwestern Alberta. This locality, a moxotaxic *Pachyrhinosaurus lakusti* bonebed is one of densest dinosaur deposits in North America, with an average of 100-300 fossils per square metre and with an estimated size of three football fields (Currie et al., 2008). Subsequent paleontological interest in the region led to the discovery of other dinosaur bonebeds (e.g., Fanti et al., 2015), several microvertebrate localities (Fanti & Miyashita, 2009; Fanti et al., 2022), dinosaur trackway sites (Enriquez et al., 2022; Fanti et al., 2013), and hadrosaur specimens displaying soft-tissue preservation (Bell et al., 2014). While the dinosaur fossils and trackways have been well studied, the fossil plant deposits of the Wapiti Formation have received comparatively less attention.

Fossil plant assemblages are of critical importance for recreating the paleoenvironment and understanding the paleoecology of past ecosystems. Assemblages of woody angiosperm dicot leaves and gingkoes can also be an invaluable proxy for paleoclimate reconstruction using the Climate-Leaf Analysis Multivariate Program (CLMAP) (Spicer, 2006). Plant community data is particularly important when elucidating how high seasonality and large changes in photoperiod at high paleolatitudes influenced palaeoecological patterns. Until recently, the limited scientifically rigorous plant collection in Alberta's Wapiti Formation was done in association with dinosaur excavations, which may represent a collection bias.

For the first time in the 2022, a concerted effort was made to find, document, and collect new paleofloral macrosites from the Wapiti Formation in the Grande Prairie area. Prospecting was done on foot and by boat along the Wapiti, Beaverlodge, and Smoky Rivers. Potential fossil plant horizons were identified, test excavations were performed, and collection took place where necessary. During the prospecting trips, a wide range of fossil plant material was recovered, including leaf, flower, stem, and frond fossils, silicified and coalified wood, pinecone casts, paleosols and rooting structures, and amber. Four new paleofloral assemblages were identified and collected.

The first assemblage, from the Spring Creek Paleofloral Site, was dominated by the fronds and cones of the conifers *Metasequoia* and *Parataxodium* in a laminated fine-grained siltstone. Common leaves in this assemblage included *Platanus* and *Merispermities* morphotypes, three types of *Gingkoes* (including an unknown taxon), and a potential water plant (*cf. Ceratophyllum*). In contrast, the assemblage at the DC Bonebed Paleofloral Site contained comparatively few gymnosperms and was dominated by broad-leafed angiosperm fossils (*Colocasia, Merispermities*, *Vitus* morphotypes) in a fine-grained siltstone. This site also contained abundant deposits of amber in the overlying coal layer, which will be used for geochemical paleoclimate analyses. The Pipestone Creek Mouth Paleofloral Site had a lower diversity assemblage preserved in a course sandstone, but containing well-preserved fossils of an angiosperm tree (c.f. *Merispermities* morphotype) and at least one large *Gingko* taxon. The assemblage at the Beaverlodge River Paleofloral Site was dominated by the conifers *Metasequoia* and *Parataxodium and* contained well-presented fossils of both terrestrial and aquatic angiosperms (c.f. *Merispermities, Vitis* and *Cercidiphyllum* morphotypes).

While this data is still preliminary, one important observation noted was the paucity of fern fossils and the