avoid creating catalog number confusion in the future. Similarly, any specimens found to share a duplicate catalog number were also removed from the public dataset until the issue was resolved. As a temporary measure, the second specimen found was given a fourth number in the SMM tripartite numbering system to differentiate the two, until it was determined which specimen was supposed to have that catalog number, and which was the typo.

Other catalog number issues included specimens cataloged into incorrect accessions—either accessions that were unrelated to the Wannagan Creek collection, or accessions that did not exist at all. These specimens were also pulled from the public dataset while it was determined whether this was merely an easily fixed typo, or if these specimens needed a new accession. Finally, there were specimens where the label and the tag listed two different numbers. This was usually easily fixed by checking the specimen against paper records to see which number was correct.

While some catalog number issues can be resolved quickly, some take time, and it is recommended to have a physical note explaining the catalog number issue with the specimen until the issue can be resolved, so that visiting researchers know to ask for a corrected catalog number. If researchers are interested in publishing a specimen with a catalog number issue, that specimen can be expedited through the appropriate process. Following these protocols has helped stop further incorrect SMM catalog numbers from being introduced into the published record.

Funding Sources Institute of Museum and Library Services grant MA-255597-OMS-24.

Technical Session XIV: Mammalian Phylogeny & Function (Saturday, November 15, 2025, 8:00 AM)

Dietary reconstructions and disparity through time of South American fossil metatherians using dental topography

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Dental topography is a powerful and increasingly widely used tool for quantifying tooth shape and its relationship to diet. Here, we use dental topographic methods and a ‘training set’ of lower molars of extant marsupials (43 species, 12 families) and primates (52 species, 13 families) of known diet to reconstruct the diet of 36 extinct metatherians from multiple middle Eocene to early Miocene South American localities. All fossil metatherian data were derived from moulds of casts, which were µCT-scanned at high resolution (16 to 22 µm). Among currently used dental topographic metrics, we found ariaDNE (quantifying curvature) and Relief Index were the least affected by differences in sample type (cast, mould, original specimen) and scanning modality (µCT, surface scan) in our training and test sets. Dietary prediction accuracy using quadratic discriminant analysis was higher using only the marsupial training set (91% mean accuracy) than when using both primates and marsupials (82% mean accuracy). However, the combined training set was used to reconstruct diets of extinct species because it includes diets (e.g., hard-object feeding) not present in the marsupial-only dataset. The majority of fossil metatherians plot within the dental morphospace occupied by extant marsupials and primates; however, some extinct metatherians (the polydolopids *Pseudolops princeps*, *Amphidolops serrula*, and *Polydolops thomasi*, and the paucituberculatan *Perulestes cardichi*) plot outside this space, implying they have no analogues in our extant comparative sample. Consistent dietary interpretations include: the fossil paucituberculatan *Phonocdromus gracilis* as a frugivore-insectivore (>50% posterior probability); the paucituberculatan *Perulestes* *cardichi* (>73%) and microbiotherian *Microbiotherium praecursor* (>54%) as insectivores; and the protodidelphid *Guggenheimia crocheti* as a faunivore (>95%). The Eocene metatherian sample (n = 26) is reconstructed as including faunivores, frugivores, insectivores, frugivore-insectivores, and one hard-object feeder. The Oligocene sample, albeit much smaller (n = 10), includes only insectivores and insectivore-frugivores, reflecting the absence of species in the dental morphospace previously occupied by some Eocene metatherians with larger molars and lower curvature and Relief Index values. However, as our Oligocene sample is limited, further sampling is needed to ensure this is not a sample-specific result.

Funding Sources Natural Environment Research Council (NERC, NE/T000341/1) and the Dutch Research Council (NWO, VI.Veni.232.136).

Symposium: Ancient Biomolecules (Thursday, November 13, 2025, 1:45 PM)

Intracrystalline insights: refining mammalian evolution through enamel-based amino acid geochronology

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Constructing robust dating frameworks for vertebrate fossils remains a significant challenge particularly for Quaternary material that lies beyond the range of radiocarbon. Amino acid geochronology (AAG) of tooth enamel provides a powerful biomolecular solution enabling the direct relative dating of mammalian remains spanning the past several million years. By targeting the intracrystalline protein fraction preserved within enamel (a fraction demonstrated to act as a closed system), this method effectively removes the impacts of leaching, and contamination. Crucially, the technique also allows screening for the endogeneity of amino acids and proteins found within ancient teeth. This validation step is vital for confirming the integrity of data used in palaeoproteomic investigations and underpins the generation of reliable chronological interpretations in enamel AAG studies.

We present two methodological developments that enhance the applicability and reliability of enamel-based AAG: (i) a novel microfluidics-based preparation protocol that reduces sample size and allows enamel processing outside of clean lab facilities promoting more sustainable and inclusive research practices and (ii) the reuse of enamel powders previously exposed to gamma irradiation during electron spin resonance (ESR) dating demonstrating minimal impact on amino acid integrity and allowing integrated multi-method chronologies from the same specimen.

To demonstrate the utility of this approach, we apply it to the case of Sicilian dwarf elephants, developing a new enamel AAG framework that refines the chronology of this iconic insular lineage. This direct dating strategy provides a foundation for testing evolutionary and biogeographic hypotheses while also offering a model for future applications to other faunal assemblages across Palaeolithic contexts. Collectively, these advances position enamel IcPD as a valuable tool in vertebrate palaeontology enabling more accurate and sustainable chronologies for fossil mammals.

Funding Sources This project (EQuaTe) has received funding from the European Research Council (grant agreement No. 865222).

Regular Poster Session I (Wednesday, November 12, 2025, 4:30 - 6:30 PM)

Identifying the trackmaker for the tetradactyl theropod ichnogenus *Saurexallopus*

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