

was identified as *Mammuthus* on the basis of ancient DNA (aDNA) evidence, but validity of this finding has been questioned and debate is ongoing. Despite (i) broad similarities between '*P. creticus*' and *M. meridionalis* identified by various authors and (ii) clear morphological differences between *Palaeoloxodon* and *Mammuthus*, morphological data has not been employed in this debate, until now. We compared '*P. creticus*' type- and referred material with full-sized European and North African Pleistocene elephant taxa, as well as Mediterranean dwarf taxa from Sicily, Malta and Tilos, to establish if a morphological approach could succeed where aDNA failed. We show that '*P. creticus*' is indeed a mammoth, with *M. meridionalis* its likely sister-taxon, and should be revised to the genus *Mammuthus creticus* accordingly.

Preparators' Session, Thursday 11:00

#### EFFECTIVE MICROPREPARATION WORKSTATION SETUP

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An array of tools and equipment are essential for micropreparation including microscope with light box, air scribes, grinding tools, various chemicals, foot pedals, manual tools, and compressed air supply. Setup and organization of equipment as well as maintaining a clear working surface is essential for effective micro-preparation. An adjustable microscope boom stand with ball bearings helps to easily focus on specimens of variable size and shape. In a well-equipped station, multiple air supplied tools can cause disorganization and clutter with tangled tubing and foot pedal supply lines. Air scribes and grinding tools can be connected with multiple hose couplings and kept off the workspace while not in use with spring clips mounted next to a microscope. Using a three-way gang valve mounted on the microscope arm to connect a dental drill, modular adjustable air hose, and pinvice helps to keep all three items ready to be used at any time. Clearly labeled consolidants and solvents are also kept at hand in uniform containers. Compressed air supply can be fitted with two pressure control valves: one set for air scribes requiring 100+ pounds per square inch (psi) pressure and another for dental drills and foot pedals set at a lower pressure.

Poster Session IV, (Saturday)

#### ECOMORPHOLOGY OF CERVID UPPER MOLAR OCCLUSAL SURFACES

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Previous studies have demonstrated that molar occlusal surface morphology in bovids varies consistently with dietary preferences. This study attempts to assess whether the same level of morphological divergence exists in cervids. Multivariate statistics reveals that whilst similar broad morphological generalizations between cervids operating at opposite ends of the browser-grazer continuum exist as they do in bovids, the degree to which this is so is limited. Interspecific comparisons demonstrate that cervid occlusal morphology is more conservative, whereas they show more intraspecific variation than do bovids. Consequently, the use of occlusal surface morphology in cervids would seem to be much less useful in determining dietary preferences in the group, a fact reinforced by the observation of high intraspecific variation in dietary habits within the family. These results also support the newly proposed 'cusp fusion hypothesis' and together go some way to explaining why grazing in ruminants is primarily the domain of the Bovidae.

Poster Session IV, (Saturday)

#### OSTEOLOGICAL AND HISTOLOGICAL CORRELATES OF AMNIOTE SKIN STRUCTURES

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Common amniote skin features, such as scales, beaks, and horn sheaths, are often inferred in extinct taxa on the basis of associated bony features. This study presents a systematic approach to identifying osteological correlates for common skin features by testing for consistent associations between skin and bone morphology in a sample of 83 amniote taxa. Representative areas of skin from the sampled taxa were grouped into one of eight categories using data taken from dissections, preserved specimens, and published accounts. The corresponding bone surface beneath each sampled skin area was identified on a separate skeletal specimen of the same taxon, and the surface morphology of the underlying bone was described by six categorical variables. Skin categories to bone morphology association was tested using a Recursive Partitioning Analysis (RPA), a robust non-parametric algorithm that plays a role similar to discriminant function analysis. The relationship of each skin category to underlying bone was also characterized using classical anatomical and histological techniques. RPA recovered significant relationships between skin and bone features for two skin categories: (i) epidermal scales and (ii) cornified sheaths (e.g., bovid horn sheaths and avian horny beaks). The relationships recovered by RPA for these two skin categories, together with characteristic anatomical and histological features, provide robust osteological and histological correlates for inferring unpreserved skin structures. Three other skin categories showed low-confidence relationships to specific bone variables by RPA, including (iii) projecting skin structures, (iv) armor-like dermis, and (v) thick cornified pads. The osteological and histological structures associated with these three skin categories are sufficient to provide less robust correlates for inferring unpreserved skin structures. The complete RPA and associated osteological and histological characters thus provide a decision tree for inferring unpreserved skin structures in extinct amniotes.

Poster Session II, (Thursday)

#### MINERALIZATION AND GROWTH RATE OF HYPSELODONT CHEEK TEETH: INSIGHTS INTO THE PALEOBIOLOGY OF NOTOUNGULATES

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Hypsodonty in mammal teeth is considered an adaptation to grazing and open habitat feeding. Diets of grass tend to be highly abrasive, and taller teeth compensate for faster wear, ensuring that the grazer's teeth will remain functional for the duration of the animal's life. A further adaptation to gritty foods is the development of rootless, ever-growing teeth, termed hypselodonty. Incisors of modern gnawing mammals like rodents and lagomorphs are typically hypselodont (as well as cheek teeth in many groups), but no extant ungulates possess hypselodont cheek teeth. Many notoungulates, a group of extinct South American ungulate mammals of uncertain affinity, possessed hypselodont incisors and cheek teeth, leading to interpretations that all were grazers. Mesowear and microwear analyses, however, have provided varying dietary evidence for hypsodont and hypselodont notoungulates. We hypothesize that hypselodonty was retained in notoungulate lineages that were formerly grazers, but that later shifted to browsing diets. Hypselodont browsers likely had slower dental growth rates than their grazing ancestors to compensate for the decrease in tooth wear rates. To test this hypothesis, we estimate rates of growth of notoungulate teeth in two ways. First, using serial isotopic analysis, we measure the distance between consecutive peaks or troughs in annual cycles of oxygen isotopic values, providing an estimate of annual growth. Second, we investigate perikymata ("growth lines") on the surface of teeth, which occur at regular temporal intervals in modern and fossil mammals. With scanning electron and optical microscopic analyses of cross-sections of tooth enamel, we determine the daily periodicity for notoungulate perikymata (based on the number of cross-striations) and calculate the growth rate by measuring the distance between adjacent perikymata.

Poster Session I, (Wednesday)

#### THE OSTEODERMS OF *SIMOSUCHUS CLARKI* (CROCODYLIFORMES: NOTOSUCHIA) FROM THE LATE CRETACEOUS OF MADAGASCAR

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The initial description of *Simosuchus clarki* focused on the remarkable cranial adaptations of this bizarre, pug-nosed crocodyliform. Further preparation of the holotype and discovery of additional specimens have yielded nearly all postcranial bones and an extraordinary complement of osteoderms. As in other crocodyliforms, the osteoderms of *Simosuchus* are organized into discrete 'shields,' each covering a major region of the body. The dorsal shield in *Simosuchus* comprises a tetraserial paravertebral shield and accessory ranges of osteoderms in at least four parasagittal rows bilaterally. These osteoderms are tightly sutured to one another at their medial and lateral margins, and imbricate cranially and caudally. An extensive gastral shield includes broad, subrectangular osteoderms interspersed with smaller, irregular intercalary osteoderms. Nuchal and caudal osteoderms are also present. Appendicular osteoderms are also considerably developed, more so than in any notosuchian. Humeral and femoral osteoderms are quadrilateral or ovoid, and articulate via sutures on all sides or are imbricated. Radioulnar osteoderms include a thick discoid element near the ulnar midshaft. Tibiofibular osteoderms are striking elements, with prominent keels that point distally. Paleohistology reveals porous, lightly built osteoderms in the dorsal and appendicular regions, and diploë-like construction in gastral osteoderms. Foramina connect internal spaces of these osteoderms with both superficial and deep surfaces. Details of the growth and longevity of *Simosuchus* are equivocal when assessed using osteoderms. The extreme sagittal segmentation of *Simosuchus* osteoderms results in a broad dorsal shield otherwise known only in eusuchians. This represents a dramatic instance of convergence and permits some interpretation of notosuchian evolution and functional morphology. *Simosuchus* probably exhibited enhanced flexibility with respect to ancestral forms, but the presence of many tightly sutured accessory rows suggests that lateral undulation and swimming were likely restricted. New morphological characters of osteoderms may be informative in studies of crocodyliform phylogeny.

Poster Session III, (Friday)

#### RE-EXAMINATION OF THREE-Dimensionally PRESERVED PTEROSAUR SOFT-TISSUE FROM THE SANTANA FORMATION OF BRAZIL

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A number of pterosaur specimens preserving details of their wing membranes have been reported from Lagerstätte around the world, but few preserve three-dimensional details of the wing-membrane histology. A notable exception to this is DGM 1475-R, a specimen thought to represent a portion of three-dimensionally preserved wing membrane from the Lower Cretaceous Santana Formation of Brazil. The specimen has been reported to reveal several important details of the internal structure of the pterosaur wing membrane, including differentiated layers of epidermal tissue, a stratum vasculosum, stratum spongiosum and a layer of striated muscle. The identification of this specimen as a fragment of wing tissue has not gone unquestioned, however, with some workers suggesting it represents a portion of body-wall tissue. In an effort to resolve this controversy, the specimen is currently undergoing a considerably more detailed and comprehensive analysis than previously