lacking a mechanical signal would exhibit either randomly oriented crystallites with regard to the outer enamel surface (OES) or homogeneity in crystallite orientation, since there would be no selective advantage to having differing orientation on different tooth surfaces. In order to evaluate these assumptions, eight shed teeth from seven extant crocodilian taxa were longitudinally sectioned and examined using a scanning electron microscope (SEM); images were taken using QuartzPCI. The images were analyzed using ImageJ to record crystallite orientation relative to the OES or enamel-dentine junction (EDJ) and statistical analyses were completed using PAST statistical software, analyzing raw angle measures and deviation from 90 degrees (calculated by subtracting measurements from 90 and taking the standard deviation). Apical enamel shows significantly different crystallite orientations from lateral enamel (defined as enamel along the labial and lingual tooth surfaces) in six of the seven taxa using the raw angle measures (Mann-Whitney U-test, $p<0.0014$); tests using deviance from 90 degrees returned high levels of significance (Mann-Whitney U-test, $p<5E-4$) in all seven taxa. The statistical program R was used to generate a random series of angles from 0 to 90 to simulate random crystallite orientation; comparison to deviance from 90 demonstrated significant values (Mann-Whitney U-test, $p<5E-22$) in all taxa. The hypothesis that crocodilian enamel does not exhibit a response to stress placed upon teeth is rejected; different orientations are seen in the apex where the tooth first encounters the prey item. In addition, the apex encounters the prey in a different orientation than does the lateral surface of the tooth, which may help to explain the results. However, there is no clear relationship between orientation and either trophic niche or cranial morphology. Given the unspecified nature of locations within the jaw for our specimens, detailed interspecific comparisons were inapplicable for this investigation. In order to resolve functional adaptations in crocodilian teeth, a larger dataset and continued examination is needed; we believe such work may lead to new strategies for inferring the biology of ancient vertebrates.

Poster Session IV (Saturday, October 20, 4:15 - 6:15 pm)

THE NONAVIAN THEROPOD QUADRATE: SYSTEMATICS USEFULNESS, MAJOR TRENDS AND PHYLOGENETIC MORPHOMETRICS ANALYSIS

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The quadrate in nonavian theropods is incredibly diverse morphologically; however this morphological disparity has been underestimated for taxonomic purposes. The quadrate topological homologies and anatomy, as well as the terminology, among nonavian theropod clades are reviewed. In order to evaluate the phylogenetic potential and investigate the evolutionary transformations of the quadrate, we conducted a Catalano-Goloboff phylogenetic morphometric analysis using 3 morphometric characters, a total of 28 landmarks coded for 23 taxa, as well as a cladistic analysis using 115 discrete quadrate-related characters coded for 43 taxa. The cladistic analysis provides a fully resolved tree mirroring the current classification of nonavian theropods. The quadrate morphology by its own provides a wealth of data with strong phylogenetic signal. Several unambiguous synapomorphies support nonavian theropod relationships and the resulting consensus tree allows inference of major trends in the evolution of this bone. Important synapomorphies include: for Abelisauridae, a lateral ramus extending to the ectocondyle; for Tetanurae, the absence of the lateral process; for Spinosauridae, a medial curvature of the ventral part of the pterygoid ramus occurring just above the mandibular articulation; for Neotetanurae, an anterior margin of the pterygoid flange formed by a roughly parabolic margin; and for Tyrannosauroidea, a semi-oval pterygoid flange shape in medial view. The Catalano-Goloboff phylogenetic morphometric analysis reveals two main morphotypes of the mandibular articulation of the quadrate linked to function. The first morphotype, characterized by an anteroposteriorly broad mandibular articulation with two ovoid/subcircular condyles roughly subequal in size, is found in Ceratosauria, Tyrannosauroidea and Oviraptorosauria. This morphotype allows a very weak displacement of the mandible laterally. The second morphotype is characterized by an elongate and anteroposteriorly narrow mandibular articulation and a long and parabolic/sigmoid ectocondyle. Present in Megalosauroidea, Carcharodontosauridae and Dromaeosauridae, this morphotype permits the lower jaw rami to be displaced laterally when the mouth opened.

Poster Session II (Thursday, October 18, 4:15 - 6:15 pm)

FIRST REPORT OF AN ANURAN FROM THE FOSSIL BUTTE MEMBER (EARLY EOCENE, WASATCHIAN) OF THE GREEN RIVER FORMATION, WYOMING

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The Green River Formation was primarily deposited in three lakes, Lake Uinta, Lake Gosiute, and Fossil Lake, during the Eocene. Although the formation is famous for the numerous exceptionally well-preserved fossils that it has produced, the remains of anurans are extremely rare with only three currently known specimens. One is an unidentified specimen preserved as a mostly carbonized skin imprint from the Wasatchian-Bridgerian Parachute Creek Member deposits of Lake Uinta. The second consists of an impression of a nearly complete, articulated skeleton of the pelobatid, *Eopelobates* sp., from the Bridgerian Laney Member deposits of Lake Gosiute. The third, and focus of this presentation, is a nearly complete, articulated skeleton of a new genus and species from the Wasatchian Fossil Butte Member deposits of Fossil Lake.

The new anuran was recovered from a whitish, laminated, calcimicrite limestone as part (FMNH PR2384) and counterpart (held in a private collection). Most of the nearly complete and articulated skeleton is retained on the part where it is exposed in dorsal aspect. The counterpart is heavily restored and contains only a few pieces of original bone and very poor impression of the skull. The specimen is very small, with a snout-vent-length (measured from tip of snout to end of pelvic girdle) of 19.3 mm, which could indicate an immature ontogenetic age. An ossified columella and sphenethmoid are present, however, which indicates that the frog is postmetamorphic because these bones, when present, ossify after metamorphosis is completed. It is most likely a young adult, because the carpal bones are ossified but the distal tarsal bones, which generally ossify late, are not.

This anuran possesses an interesting mix of characters that initially did not readily ally it with any currently known anuran family. A phylogenetic analysis that incorporated representative costatans, anomocoelans, and neobatrachians was undertaken to determine its relationships. Results of this analysis places the Green River frog within Anomocoela, as the sister taxon to *Pelodytes*. This clade is the sister taxon to the remainder of the anomocoelans. The clade Anomocoela is the sister taxon of Neobatrachia, with *Hadromophryne natalensis* basal to this clade.

Poster Session IV (Saturday, October 20, 4:15 - 6:15 pm)

PRELIMINARY FAUNAL ANALYSIS OF THE DONGGUTUO SITE, NIHEWAN BASIN, CHINA

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Donggutuo is a 1.1 million year old archaeological site in the Nihewan Basin of China located approximately 100 miles west of Beijing. The Nihewan Basin area is of great importance in human evolution because it recorded the behaviors of early hominids as they migrated out of Africa and into this new geographic area over one million years ago. The presence of over 10,000 stone tools at Donggutuo attests to the presence of *Homo erectus* in the Nihewan Basin, but as of yet there have been no *H. erectus* specimens found in this area. Joint US-Chinese teams excavated this site in 1991, 1992, and 2000-2001, and it was the first site in China to record precise provenience data during excavation. A thorough analysis of the material was conducted in an effort to establish an agent of accumulation for this site and to test paleoenvironmental reconstruction hypotheses for this area. The current analysis consists of 2162 specimens from all three recorded field seasons. Surface damage indicates carnivore involvement in the accumulation of this site, but there is an indication of hominid involvement as well in the form of both cutmarks and hammerstone percussion marks. Therefore, this faunal analysis establishes a direct connection between these stone tools made by early hominids and the accumulated fauna. In an effort to supplement paleoenvironmental reconstructions of the Nihewan Basin, specimens have been identified to the most specific taxonomic level possible. Despite a large amount of unidentifiable specimens (20.21%) and unidentifiable long bone fragments (29.32%), the analysis of identifiable specimens thus far indicates a high frequency of Equidae in addition to Elephantidae, Rhinocerotidae, and Bovidae. The high proportion of Equidae may suggest a generally open environment during the time of deposition while *H. erectus* was moving into this new geographic area. However, further identification of the faunal specimens is required for a more specific paleoenvironmental reconstruction.

Symposium: Phylogenetic and Comparitive Paleobiology: New Quantitative Approaches to the Study of Vertebrate Macroevolution (Friday, October 19, 11:15 am)

BONY ATTACHMENTS OF FLIGHT FEATHERS IN NEORNITHINE BIRDS: ANATOMY, HISTOLOGY AND FUNCTIONAL VARIATION

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Attachments of the major forelimb feathers (remiges) of paravians are sometimes associated with bony features on the ulna, metacarpus, and phalanges, variously referred to as quill knobs or remigial papillae. These bony features provide a link between the fossilizing skeleton and the morphology of the soft-tissue wing, but their anatomical and functional relationships are currently poorly understood. We examined the fine-scale anatomy and ecological context of remigial papillae in a broad sample of extant neornithine birds. Soft tissue relationships of remex-related bony features were determined in a range of neoavian taxa by a standard battery of anatomical techniques, including dissection, microCT, and plastic-embedded hard tissue histological sectioning. Preliminary results from this part of the analysis include a new description of the anatomy, histology, and osteohistology of remigial ligament attachments to the ulna, the minor metacarpal, and the phalanges of the major digit. The histological results indicate grossly visible bony correlates for feather attachment, some of which have previously been overlooked. Phylogenetic and functional relationships of these bony features were examined by redundancy analysis (RDA), a form of constrained ordination that allows functional and behavioral information to be explicitly included in the definition of a morphospace. For this analysis, principal coordinate (PCO) scores of categorical variables describing bony features for 87 extant neornithine birds were included in a multiple multivariate regression, with log body mass and the significant PCO scores of a phylogenetic distance matrix as covariates. Variation due to phylogeny was partialled out, and the resulting regression against body mass formed the basis of an RDA ordination space. This preliminary RDA suggests that whereas the prominence of a second, smaller set of ventral remigial papillae on the ulna may be weakly related to body size, variation in the other bony features related to feather attachment is largely independent of mass. Wing shape may be a more important determinant of feather-related bony features,