abundant at the J&M site, including 19 teeth belonging to the guitarfish *Myledaphus bipartitus*. The rays *Cristomylus* sp. and *Pseudomyledaphus* sp. are new records for the Williams Fork Formation, represented by three and 45 teeth respectively. These three taxa comprise the majority (~64%) of our recovered elasmobranch fossils from the J&M site. We also recovered 19 teeth of the hybodont shark *Lonchidion griffisi*, previously known only from putatively estuarine localities in the Mesaverde Formation in Wyoming. Most *Lonchidion griffisi* teeth from the J&M site are fragmentary, but multiple complete and nearly complete crowns display clear, regular serrations along both the occlusal crest and the labial peg, features diagnostic of the species. We also report two more selachian taxa from the J&M site. We attribute 17 squat, inclined, triangular teeth with little to no enamel folding on the labial surface, and no lateral cusplets to the genus *Chiloscyllium*. Two elasmobranch teeth that are squat and triangular with lateral cusplets present and heavy enamel folding on the labial surface are attributed to *Cantioscyllium markaguntensis*. *Lonchidion griffisi*, *Cantioscyllium markaguntensis,* and *Chiloscyllium* sp. are all new records for both the J&M site and the WFF. Isolated osteichthyan teeth belonging to *Paralbula casei* and indeterminate pycnodonts may also represent marine faunal elements present at the J&M site, and are relatively common. Teeth of the amiid *Melvius* sp. are the most abundant identifiable fossil material recovered from the site, and are represented by over 100 specimens. Along with 12 lepisosteid teeth, these fossils provide evidence for a more freshwater fauna at the J&M site. We also repot a broken tooth of an indeterminate lungfish, the first from the J&M site. Between the selachians and the osteichthyans, these faunal groups may represent evidence for a brackish water depositional environment for the J&M site.

Poster Symposium (Wednesday–Saturday, October 17–20, 2018, 4:15 – 6:15 PM)

AN ASSESSMENT OF CONVERGENCE IN ECOLOGY, MORPHOLOGY, AND FUNCTIONAL PERFORMANCE IN OLD AND NEW WORLD VULTURES

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Vultures are a polyphyletic group of raptorial birds that have convergently evolved a scavenging lifestyle, once in the New World clade (Cathartidae), and twice in the Old World clade (Accipitridae: Aegypiinae and Gypaetiinae). Furthermore, within these groups three specialized feeding guilds have also converged between the two families: large "rippers," who tear open carcasses and consume tough hides; "gulpers," who consume soft viscera; and small "scrappers," who pick at the bones and scraps around a carcass. Despite this, recent morphometric analysis has demonstrated that skull shape variation between the two families of vultures shows a pattern that is closer to parallelism than convergence, and that skull shape is highly allometric. It is therefore possible that the shape differences associated with these guilds are a reflection of size-based niche partitioning, rather than being driven by mechanical selection for different feeding styles, and that performance may be highly constrained by phylogeny. A finite element (FE) study was conducted on the mandibles of representatives of all three guilds in both families, using models constructed from tomographic (CT) scans. All models were loaded with a muscle-driven bite that was scaled to have the same applied load/surface area ratio, in order to facilitate comparison of relative efficiency of performance between birds of different size. Although broad similarities in deformation arise between all vultures, birds in the Cathartidae have mandibles that are more robust and ventrally downturned than their counterparts in the Accipitridae, leading to lower feeding stresses regardless of feeding guild. This demonstrates that phylogeny impacts performance even in the presence of strong morphological and ecological convergence. Interestingly, all extant members of the Cathartidae are vultures, whereas the same is not true of Accipitridae, where vulture ecomorphs have evolved twice from within clades bracketed by eagles (in the case of Aegypiinae) and kites (Gypaetiinae), suggesting that differences between the families may be tied to phylogenetic inertia in the Accipitridae. This means that the attribution of a scavenging lifestyle to extinct birds should, in the absence of other clues such as gut contents, be conducted within a phylogenetic context as much as possible.

Grant Information
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Technical Session XIV (Saturday, October 20, 2018, 9:15 AM)

THE HEAD AND SHOULDER OF A STENSIOELLID FISH RESOLVES THE PLACODERM-GRADE AFFINITY OF THIS GROUP

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Stensioellida are an enigmatic group of jawed fishes from the Early Devonian Hunsrueck Slate of Germany. This problematic group has been variously interpreted as either placoderms or holocephalan chondrichthyans, and are thus relevant to questions of the earliest appearance of the chondrichthyan crown group. Furthermore, there is an open question as to whether Stensioellida are a natural group or a 'wastebin' for incertae sedis gnathostomes from the Hunsrueck Slate. Importantly, the Hunsrueck Slate provides some of the oldest examples of articulated placoderm fishes. Nevertheless, many of these placoderms—putative or otherwise—have resisted anatomical and phylogenetic understanding as a result of the highly flattened, pyritized, and weakly metamorphosed fossils. Here we present a remarkably preserved braincase and shoulder girdle complex of a stensioellid from the Hunsrueck Slate, which we have investigated using X-ray computed tomography scanning. The details of the braincase show a combination of rhenanid and 'acanthothoracid'-type placoderm characters, including paired occipital glenoids, paravagal cavities, which confirm its placoderm-grade identity. The orbital region is 'petalichthyid'-like, with a broad suborbital floor and well-developed transverse otic processes bounding the orbits laterally. Our 3D data clarify the unusual shoulder girdle morphology of *Stensioella*, including a key apomorphy that unites this taxon with the specimen under study here. The stensioellid shoulder girdle most closely resembles the peculiar morphology of rhenanids. Based on this information, we suggest that stensioellids are proximate relatives of rhenanids. This work helps settle a long- standing debate about the phylogenetically enigmatic stensioellids as placoderms and establishes that the Stensioellida are a valid taxon. The holocephalan affinity of stensioellids can be rejected.

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Poster Session II (Thursday, October 18, 2018, 4:15 – 6:15 PM)

FRAGMENTARY SPECIMENS PROVIDE EVIDENCE FOR HIDDEN TAXONOMIC DIVERSITY OF ORNITHISCHIAN DINOSAURS WITHIN THE LOWER JURASSIC KAYENTA FORMATION (NORTHEASTERN ARIZONA, U.S.A.)

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The Lower Jurassic Kayenta Formation in northeastern Arizona preserves the earliest unambiguous body fossil record of ornithischian dinosaurs in North America. The most abundant ornithischian within the Kayenta Formation is the thyreophoran *Scutellosaurus lawleri*, and although a greater taxonomic diversity of ornithischian dinosaurs has been alluded to in the literature (including a larger thyreophoran and a heterodontosaurid), *Scutellosaurus lawleri* remains the only species-level ornithischian taxon named from the Kayenta Formation. Several fragmentary pelvic and hindlimb specimens from the Kayenta Formation are here referred to Ornithischia using both an apomorphy-based approach and unique combinations of character states. These specimens are morphologically distinct from *Scutellosaurus*, but only the femora are complete enough to infer a more exclusive taxonomic referral within Ornithischia.

Isolated femora are referred to Ornithischia using two apomorphies: the proximal end of the anterior trochanter is separated from the shaft by a marked cleft, and the absence of a trochanteric shelf. Both apomorphies are convergent with several saurischian taxa, but these specimens are excluded from Saurischia in lacking a deep groove between the lateral distal condyle and the crista tibiofibularis. An apomorphy-based referral of these specimens to a more exclusive clade within Ornithischia is not possible with existing phylogenetic character sets, but the shape of the anterior trochanter hints at a possible neornithischian affinity. In heterodontosaurids and non-eurypodan thyreophorans, the anterior trochanter projects lateral to the greater trochanter and forms an obtuse angle with the long axis of the articular surface of the proximal end of the femur when viewed in proximal view. In contrast, the anterior trochanter of the isolated femora from the Kayenta Formation is inset medially relative to the greater trochanter and forms a right angle with the long axis of the proximal end of the femur, similar to that of the early neornithischian *Lesothosaurus*.

Neornithischian body fossils have been recognized from Lower Jurassic strata only in Gondwana, but it is unclear whether their apparent absence within that same interval in Laurasia is a natural biogeographic phenomenon or simply a result of undersampling. Although tenuous, the possible identification of neornithischian material from the Kayenta Formation is thus significant and encourages further paleontological exploration.

Grant Information
David S. Chapman and Inga M. Chapman Fund; Doris O. and Samuel P. Welles Research Fund

Podium Symposium (Friday, October 19, 2018, 9:45 AM)

WWW.MARKMYBIRD.ORG: CROWD-SOURCINGMACRO-EVOLUTIONARY PATTERNS IN BEAK SHAPE

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The study of macroevolutionary patterns requires a comprehensive sample of the group in question. In some large groups, this may easily run in to hundreds, if not thousands, of species. The acquisition of three-dimensional shape data is notoriously time consuming, and although several advances have been made in the availability of rapid or low-cost scanning methods to capture three-dimensional surface geometries, the rapid placement of landmarks for geometric morphometric analysis has lagged behind. This is because automated methods of landmark placement often fail to correctly place landmarks that are biologically homologous, and because geometric morphometrics is highly sensitive to differences in landmarks that are placed manually, creating error when multiple human landmarkers are recruited. In this latter case, such user errors can be minimized with sufficient replication, but such efforts are beyond the workforce capabilities of most labs. Birds (class Aves) have over 10,000 extant species, and much of their evolutionary success has been attributed to the phenotypic lability of the beak. In order to quantify patterns in beak shape macroevolution across this large clade, we created a crowd-sourcing landmarking website, www.markmybird.org, inviting members of the public to place simple landmarks on surface scans of beaks obtained from museum study skins, with the ultimate goal of landmarking all bird species. Since launching in late 2015, an average of 33 beaks have been landmarked per day, with a relatively low rejection rate of approximately 10% based on automatic detection of poorly placed landmarks, despite the minimal training offered to users. This has resulted in over 31,000 unique landmark configurations submitted to date. To illustrate the scientific utility of this approach, a case study of over 2,000 species (> 97% of genera) reveals several interesting patterns that would not be apparent at a smaller scale. These include variable rates of beak shape evolution across the avian tree associated with changes in the mode of evolution through time, particularly at a time bracketing the Cretaceous-Paleogene boundary, and also a conserved trajectory of beak shape that is common across families, suggestive of an underlying constraint on phenotype. Crowd-sourcing is therefore a viable and attractive