in macroevolution. We compared the IMMAs of two hip extensor muscles—the gluteus medius and semimembranosus—across locomotor types within the rodent clade Caviomorpha. We asked which muscle shows a stronger adaptive signal in IMMA variation and how these functional differences are realized morphologically. Hip extension was virtually modeled for 61 species. Size-corrected analyses revealed that the IMMAs of both muscles are similarly adaptive. Notably, cursorial species exhibited relatively large IMMAs in both muscles. Larger IMMAs imply greater torque but reduced potential for rapid joint rotation, suggesting that hip extensors in cursorial caviomorphs are less specialized for high angular velocities than other cursorial mammals. Patterns of morphological variation differed between muscles. In the semimembranosus, the origin exhibited the greatest relative variation, whereas in the gluteus medius both origin and insertion showed similarly high variation. However, convergent IMMA values among several lineages were achieved through different morphological configurations. This suggests that the hip geometry resulting from muscle attachments in caviomorph rodents—and possibly mammals more broadly—provides substantial morphological flexibility on which natural selection can act.

A16.4 ONE DENTICLE, ONE PIXEL: HIERARCHICAL PHOTONIC ARCHITECTURE UNDERLYING BLUE SHARK COUNTERSHADING

Tuesday 7th July 2026 **09:45**

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The blue shark (*Prionace glauca*) exhibits a striking dorsoventral colour gradient, transitioning from vibrant blue dorsally to silver and white ventrally. Despite its ecological significance in pelagic camouflage, its physical basis remains unresolved.

Here, we demonstrate that this colour system does not arise from dermal chromatophores, as assumed for most vertebrates, but from a previously unrecognised photonic architecture housed within the pulp cavity of individual dermal denticles that cover the skin.

Notably, the external morphology of denticle does not differ among colour zones. Using diffuse reflectance spectroscopy, micro-computed tomography, histology, and correlative electron microscopy (ESEM, TEM, and FIB–SEM), we show that colour variation is organised across coupled micro- and nanoscale architectures.

In blue-zone denticles, iridophores and melanophores form a densely packed tessellated pattern within an expanded crown-restricted pulp cavity. This vertically organised light reflector–absorber arrangement enhances spectral saturation while maintaining low iridescence.

In the transition (silver) zone, these cells segregate into a partially layered pattern, producing a broader reflective response. White zone denticles lack melanophores and contain only reflective cells.

In blue and transition zones, iridophores contain quasi-parallel stacks of purine crystals with regular spacing that support coherent scattering, whereas in the white zone, the crystals are shorter and anisotropically disordered, producing broadband incoherent scattering.

Together, these findings establish blue shark denticles as mechanically protected optical "pixels" whose coupled microscale cellular organisation and nanoscale crystal architectures generate the shark's countershaded colour gradient, offering a biological blueprint for sustainable bioinspired structural-colour materials with robust optical responses across diverse environments.

A16.5 HOMINOID SHOULDER KINEMATICS: A COMPARISON BETWEEN CHIMPANZEES AND HUMANS

Tuesday 7th July 2026 **10:00**

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Locomotion in chimpanzees (*Pan troglodytes*) involves coordinated use of upper and lower limbs for knuckle-walking and vertical climbing. In contrast, humans (*Homo sapiens*) are exclusively bipedal and do not use upper limbs for locomotion. Along with these different loading regimes and upper limb morphology, we expect differences in their shoulder kinematics. In this study, we compare the contribution of the different shoulder joints to humeral movement in chimpanzees and humans.

Four chimpanzee specimens opportunistically obtained from collaborating zoos were CT scanned, and one shoulder was excluded due to a clavicle fracture. 3D movements were recorded using an optical motion capture system for the remaining shoulders. This was done by inserting transcortical pins containing marker clusters into the sternum, clavicle, humerus and scapula, and manipulating the humerus. The study was approved by the ethical committee and no animals were sacrificed for this.

Recorded movements included abduction, anteflexion, shrug, protraction and retraction. Kinematics were computed for the scapulothoracic, glenohumeral, sternoclavicular and acromioclavicular joints, and analysed using Statistical Parametric Mapping. Humeral mobility was measured as humerus-thorax angles. The chimpanzee data were compared with human kinematics previously measured using the same protocol.

Chimpanzee and human scapulae showed different starting orientations and opposite behaviour in anterior-posterior tilt during abduction, and different magnitudes of medial-lateral rotation during shrugging. Chimpanzee clavicles showed greater rotation of the clavicle during abduction and anteflexion.

Our study shows that there are systematic differences between chimpanzees and humans in the contribution of the joints of the shoulder girdle to overall humeral movement