Here we present the results of an experiment to quantify intra- and interobserver variation in anatomical measurements that was conducted using a sample of 51 anatomists at the 56th Symposium of Vertebrate Palaeontology and Comparative Anatomy, Dublin, 2008. Surprisingly, significant interobserver variation was identified, with a difference of as much as 14% of the mean specimen length being reported. Illustrated instructions were not found to reduce the amount of variation reported, but the scale and complexity of the elements being measured was found to influence variation, with both larger and more complex structures increasing the variation. A bootstrap analysis indicated that disparity in measurement increases logarithmically with the number of observers. Our findings raise concerns about the introduction of noise and potential bias that should be taken into account when analysing composite datasets for meta-analyses.

The size of the avian cerebellar flocculus fossa cannot be used to predict flying ability in extinct birds

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The Principle of Proper Mass predicts that the relative importance of sensory modalities in a particular taxon will be reflected by the size of brain regions engaged in processing those stimuli. Extinct animal behaviour has long been inferred on this basis from qualitative assessments of brain region size in endocasts. For instance, flight capability in pterosaurs and early birds has been inferred from the relative size of the cerebellar flocculus, which in life protrudes from the lateral surface of the cerebellum. The flocculus integrates sensory information about head rotation and translation in order to stabilise visual gaze via the vestibulo-ocular reflex (VOR). The VOR is more important for highly manoeuvrable flying species, so the flocculus should be relatively larger in those than in less manoeuvrable fliers and flightless birds. However, this assumption has never been tested empirically. Here, we used micro-CT analysis of the skulls of 60 extant bird species to reconstruct 'virtual' endocasts. The volumes of the flocculus fossa and brain cavity as a whole were measured and these values correlated with indices of flying behaviour. No significant relationship was found between flocculus fossa size and flight behaviour, a result likely to be due to variable development of vascular structures within the floccular fossa. Our findings demonstrate THAT the relative size of the flocculus on endocasts is unreliable for use in inferring locomotor behaviour in extinct birds. Furthermore, the large flocculae of bird-like theropods cannot be used as evidence FOR THE derivation of these taxa from an avialan ancestor.

The evolution and development of skeletal pneumaticity: Exceptions to the epithelial hypothesis suggest other levels of control

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According to Witmer's epithelial hypothesis (EH), pneumatic diverticula resorb bone wherever they can, bone grows in response to biomechanical stress, and the morphology of a pneumatic bone represents an optimisation between these opposing forces. EH predicts that bone cannot persist adjacent to a diverticulum unless it is maintained by loading. However, examples of incomplete pneumatization suggest three categories of exceptions to EH:

Evolutionary—In basal sauropodomorphs postcranial pneumaticity is limited to scattered vertebral fossae. Fossae are evolutionarily antecedent to more invasive forms of pneumaticity, so EH may describe the behaviour of derived pneumatic systems but not the early evolutionary stages in which the morphogenetic "rules" are still being worked out.

Anatomical—Scattered fossae in the tails of *Apatosaurus* and *Giraffatitan* are puzzling, because the presacral vertebrae are highly pneumatic, without obvious reservoirs of unresorbed bone. It is as if, upon expanding into a new body region, the diverticula had to re-evolve the ability to pneumatize bone. Furthermore, in basal saurischians postcranial pneumaticity is less invasive than cranial pneumaticity. So diverticula may behave differently in different body regions of the same animal.

Ontogenetic—Finally, even in derived pneumatic systems such as mammalian cranial sinuses and bird vertebrae, large volumes of unpneumatized bone may persist next to otherwise invasive diverticula. Some ornithologists have suggested an ontogenetic window for pneumatization, an idea in need of testing.

Numerous observations from medicine, comparative anatomy, and palaeontology are consistent with EH, so it remains a useful model for pneumatization apart from these confounding factors.

SVPCA Posters

A reappraisàl of the aberrant pterodactyloid *Istiodactylus latidens* from the Wessex Formation, Isle of Wight, Southern England

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Istiodactylus latidens (sail finger - broad tooth) is an aberrant ornithocheiroid pterosaur from the Wealden Group (Barremian-Aptian, Lower Cretaceous) of the Isle of Wight, southern England. Formerly known as *Ornithodesmus latidens*, it was placed in a new genus, Istiodactylus when the type specimen of *Ornithodesmus* was shown to be dinosaurian.

The holotype of *Istiodactylus latidens* (NHMUK PV R.176) was discovered by amateur palaeontologist, Reverend William D. Fox, sometime in the 1800s, but certainly before his death in 1881, and was sold to the NHM in 1882. Although named by Seeley, the holotype was not described in any detail until Reginald Walter Hooley's publication of 1913 where, along with an additional two topotypes, it was covered in some considerable detail. Since then, istiodactylid-like pterosaurs have been discovered in China and possibly the Lebanon. (An istiodactylid from Canada is most likely non-pterosaurian). More recently, it has been recognised that Istiodactylus and allies are an unusual group of pterosaurs in that the rostrum and lingually compressed, triangular teeth differ significantly from all other ornithocheiroid pterosaurs. Thus, the family Istiodactylidae has been erected for their reception.

It is the aim of this project to re-evaluate and describe the osteology of *Istiodactylus* and attempt to determine aspects of the animal's palaeoautecology and evolutionary relationships using modern palaeontological techniques. All specimens referred to *I. latidens* are preserved in 3D, with much of the skull known and some of the bone surfaces bearing well-defined muscle scars, all of which provide an opportunity to investigate the biomechanics of this taxon.

Although *Istiododactylus* has been included in a number of important cladistic studies of the Pterosauria as a whole, all of these analyses appear to be based largely on data derived from older studies. Recently Witton performed a cladistic analysis of putative istiodactylids, finding many to lie outside the clade. A new, more inclusive specimen based analysis is required to determine the integrity and scope of Istiodactylidae.

Fossil mammals, phylogenies and climate: the effects of phylogenetic relatedness on range sizes and replacement patterns in changing environments

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Recent studies have indicated that relatedness, speciation rates, and dietary specialisation have differing influences on evolutionary dynamics within different Cenozoic mammal orders and families. Additionally, the finding that Cenozoic mammals have predictable (directional) range sizes has been called into question recently. The NOW (New and Old Worlds) database of fossil mammals contains extensive information on Cenozoic (65 Ma–recent) land mammal taxa and localities. A key strength of the NOW database is that, in addition to the locality-taxon data, the taxa are recorded with their eco-morphological properties. However, the lack of a comprehensive, large-scale phylogenetic framework has prevented quantifying the importance of relatedness of taxa in the observed evolutionary patterns in past NOW related studies. To address this problem, we are constructing supertrees, using both extinct and extant taxa, for a number of major mammalian clades, starting with the orders Carnivora and Proboscidea. These novel supertree phylogenies, NOW data, Cenozoic climate/environmental proxies, existing and new phylogenetic comparative and range-overlap methods, are used to explore several macro-evolutionary questions relating to range sizes, occupancy, replacement and co-occurrence patterns of mammals. Initial results with Eurasian localities and taxa indicate that while body size is heritable, range size is neither heritable nor does it correlate with bodysize. However, there is, as expected, a correlation between taxon duration and range size, but whether this is due to sampling effects has not yet been determined. The importance of relatedness in taxon replacement varies among clades and between time intervals.