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Morphological convergence and cranial biomechanics of diprotodont mammals

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The rodent-like feeding system comprises a pair of enormously enlarged, ever-growing incisors and reduced set of cheek teeth separated by a diastema resulting from the loss of the distal incisors, canines and mesial premolars. As well as being a defining feature of rodents, this morphology is also found in a number of other extant mammalian taxa such as lagomorphs, hyraxes, the aye-aye and the wombat. Using geometric morphometrics, we found that morphological convergence in these mammals is not just confined to the dentition or but is also seen more widely across the cranium and mandible, suggesting that the rodent-like dentition imposes a constraint on skull morphology. We now seek to expand this study by examining extinct rodent-like mammals, in particular the multituberculates.

Secondly, we wish to understand how the form of the skull influences feeding performance in rodents and rodent-like mammals. Previous work has used finite element analysis to virtually simulate feeding in three extant rodents (squirrel, guinea pig and rat) and showed that rat skulls were the most efficient at transforming muscle force into bite force. Subsequent finite element analysis on the extinct giant rodent *Josephoartigasia monesi* revealed that the incisors were overbuilt compared to the bite forces that could be produced, suggesting that the incisors may have been used for other activities such as foraging or defence. We now wish to analyse cranial biomechanics in multituberculates to compare them to rodents, perhaps shedding light on the extinction of the multituberculates near the end of the Eocene.

References

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