

Nanostiffness Heterogeneities in Artiodactyl Skulls

Scientific Achievement

Posterior regions of Artiodactyl mammals' skulls are stiffer than anterior regions. Artiodactyl mammals that participate in head-to-head combat (bighorn sheep, goats, etc.) have a stiffer posterior mandible than those that don't.

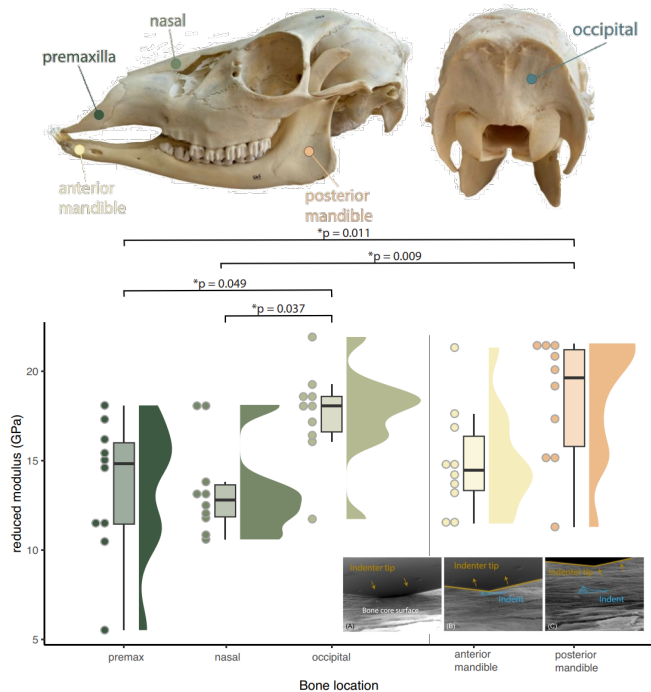
Significance and Impact

Differentiation in skull properties over time suggests that combat-oriented Artiodactyl mammals adapted their effective bone properties to improve impact performance. The paper elucidates many of the challenges of valid nanoindentation methodology, a topic familiar in the nanomechanics community but less familiar in the comparative and evolutionary biology community.

Research Details

- Use of nanoindentation minimizes disruption of museum specimens.
- Phenogram analysis of museum artiodactyl skulls spanned the past 60 million years.

Adams, D. S.; Boyce, B. L.; Hooks, D. E.; Garber, K. W.; Klitsner, B.; Price, S. A.; Blob, R. "A Brief Introductory Guide to Nanoindentation for Comparative and Evolutionary Biologists, with a Case Study of Bone Material Property Diversity across Artiodactyl Skulls." *Integrative Organismal Biology*, Volume 7, Issue 1, 2025



Spatial variation in the reduced modulus distribution in five locations across a range of artiodactyl skulls

Work was performed, in part, at the Center for Integrated Nanotechnologies.