

The relationship between delicate suture structure and damping performance of biomaterials

June 9 2020

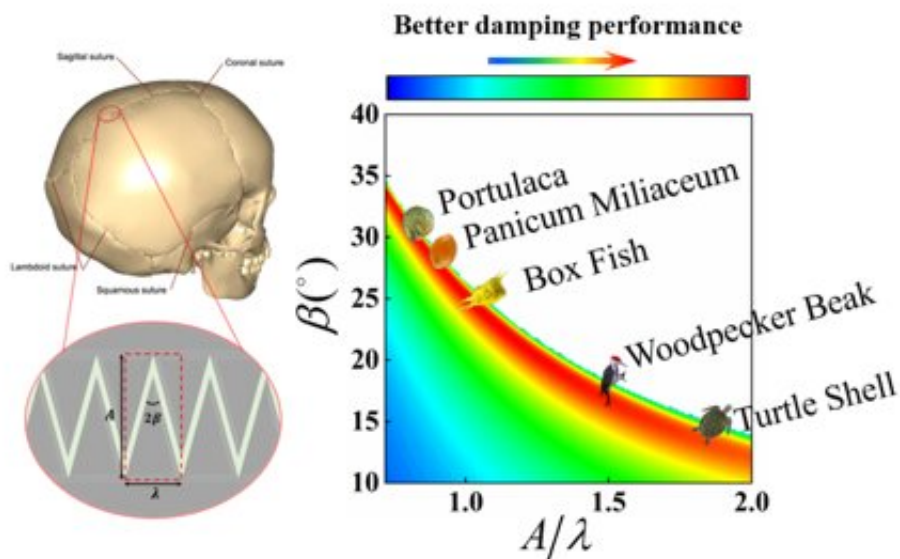


Figure 1. The theoretical model predictions suggest that sutural structures found in a number of natural manifestations have evolved to their optimal geometries to achieve the best damping performance. Credit: Peking University

High-performance advanced composite materials integrating high stiffness, strength and excellent damping performance are in urgent demand in aerospace, energy, high-speed transportation and other fields. However, it is difficult for traditional damping materials to excel in both damping performance and those static mechanical properties. In

contrast, the biological materials in nature achieve the coexistence of superior static and damping properties through sophisticated microstructure design. For example, suture tessellations of different length scales are widely found in biological materials such as animal skulls, woodpecker beaks, turtle shells, purslane seeds, etc.

Recently, the research team of Professor Wei Xiaoding in the Department of Mechanics and Engineering Science published their [theoretical studies](#) on the effect of suture structure on the energy dissipation of biocomposites in the *Journal of the Mechanics and Physics of Solids*. Their work establishes the relationship between sutural geometry and damping performance. It shows how biomaterials in nature assemble the structural load-bearing units delicately through the sutural interfaces to realize the simultaneous optimization of excellent load-bearing capability and dynamic energy dissipation performance. The theory can explain how different [biological materials](#) have evolved suture angles and amplitudes of different scales during the long evolutionary process (Figure 1).

The team further synthesized a bioinspired composite with sutural interfaces through a multi-material 3D printer. Experiments show that the bioinspired design achieves an outstanding damping performance while having an excellent load-bearing capacity. The outcome from this study can provide valuable guidance to the design and manufacture of a new generation of advanced structural [composite materials](#) with outstanding static and dynamic mechanical properties.

More information: Zhongliang Yu et al. Achieving outstanding damping performance through bio-inspired sutural tessellations, *Journal of the Mechanics and Physics of Solids* (2020). [DOI: 10.1016/j.jmps.2020.104010](#)

Provided by Peking University

Citation: The relationship between delicate suture structure and damping performance of biomaterials (2020, June 9) retrieved 29 June 2024 from

<https://phys.org/news/2020-06-relationship-delicate-suture-damping-biomaterials.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.