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Mechanics of Suture Joints YANING LI, JUHA SONG, CHRISTINE ORTIZ, MARY BOYCE, MIT, ORTIZ GROUP/DMSE/MIT TEAM, BOYCE GROUP/ME/MIT TEAM — Biological sutures are joints which connect two stiff skeletal or skeletal-like components. These joints possess a wavy geometry with a thin organic layer providing adhesion. Examples of biological sutures include mammalian skulls, the pelvic assembly of the armored fish Gasterosteus aculeatus (the three-spined stickleback), and the suture joints in the shell of the red-eared slider turtle. Biological sutures allow for movement and compliance, control stress concentrations, transmit loads, reduce fatigue stress and absorb energy. In this investigation, the mechanics of the role of suture geometry in providing a naturally optimized joint is explored. In particular, analytical and numerical micromechanical models of the suture joint are constructed. The anisotropic mechanical stiffness and strength are studied as a function of suture wavelength, amplitude and the material properties of the skeletal and organic components, revealing key insights into the optimized nature of these ubiquitous natural joints.

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