

Nacre and the environment

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Nacre, the iridescent inner lining of many mollusk shells, is widely studied due to its formidable fracture toughness. Nacre is iridescent because its structure alternates thin organic sheets and $\sim 0.5\mu\text{m}$ -thick aragonite crystalline tablet layers. Mechanisms of nacre biomineralization have been documented: organic sheets form first [1] and these underpin aragonite polymorph selection [2-4]; each nacre tablet starts growing from a single Nudelman site [5]; tablets form a Voronoi construction [6], with near-epitaxial crystal growth [7-9] through Checa bridges [9] [10]; and c-axes gradually order away from the nacre-prismatic boundary [9] [11]. What factors, biological or physical, determine nacre layer thickness (LT), however, remains unknown. Here we provide evidence that LT may depend on environmental temperature (T). We observe strong correlation of T and LT, measured with clumped isotopes [12] and Polarization-dependent Imaging Contrast (PIC)-mapping [13], respectively, in *Pinna* shells from the Cretaceous, Eocene, Miocene, and modern.

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