(Palaeo)ecological aspects to the evolution of shell microstructure and mineralogy

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In recent years shell microstructure and mineralogy has attracted attention from scientists in two separate branches of science, namely those trying to establish characters of phylogenetic significance and material scientists in the search of bio-inspired novel materials. There has been far less recent interest in what might be thought of as the 'middle ground' between these endeavours, that is understanding the significance of the wide microstructural and mineralogical diversity.

There seems little doubt that the primitive molluscan shells were wholly aragonitic, and that a combination of prisms and nacre were widespread amongst early taxa. Today this arrangement is uncommon in both bivalves and gastropods, with most taxa employing a wide variety of apparently more derived aragonite and calcite microstructures arranged in different combinations. Where does this diversity come from? Why have some groups of molluscs acquired particularly microstructural/mineralogical arrangements and not others? Does it have to be adaptive? And if so, adaptive to what? Were changes in microstructural arrangements important in determining past (and so possibly future) ecological innovations or challenges?

Demonstrating solid links between the evolution of shell properties and specific ecologies rather than 'adaptive fairy tales' is not a trivial exercise. Difficulties arise from problems with demonstrating putative selective advantages, accurately tracing microstructural innovations in fossil material and the lack of analytic power where particular microstructures are autapomorphic. In this talk I will focus on a number of different derived microstructures/mineralogies and associated ecologies and habitats.