Bioinspired design: towards multifunctionality -Prof. F. Libonati, Università di Genova

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The high quest for lightweight, strength, and toughness is driving the research toward the design of de novo high-performance materials. Nature is a magnificent example of how-through the design and self-assembly of heterogeneous hierarchical structures-it is possible to amplify the properties of the constituent building blocks of biological materials, optimize such materials for the environment where they live, and adapt them to changing conditions. As evolution continues to drive the adaptive process of making natural materials over time, engineering is now attempting to emulate this extraordinary capability, lately via bioinspired architected materials and additive manufacturing. However, the advance of novel technologies in key areas, such as transportation, biomedicine, building and infrastructures, increasingly requests new high-performance structural materials able to adapt to diverse and changing conditions. Besides key mechanical properties, additional functionalities-characteristic of natural and living tissues-are required, from lightweight to sensing external stimuli, or shape morphing. This talk will review several natural examples of multifunctionality to provide inspiration for the design of novel multifunctional systems: from biological and biomineralized tissues to plants and marine systems.