



Biological Materials of Marine Origin: Invertebrates (Biologically-Inspired Systems)

Hermann Ehrlich

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Biological substances appeared in marine environments at the dawn of evolution. At that moment, the first organisms acquired the ability to synthesize polymer chains which were the basis, in their turn, for the formation of the building blocks that fueled the so-called self-assembling process. They, in their turn, produced more complicated structures. The phenomenon of three main organic structural and self-folding polymers (chitin, cellulose, and collagen) probably determined the further development and evolution of bioorganic structures and, of course, the organisms themselves.

All the three biopolymers, notwithstanding their differences in chemical composition, have the common principles in their organization: nanofibrils with the diameter 1.5–2 nm, the ability to self-assemble, production of fibrillar and fiber-like structures with hierarchical organization from nano—up to macrolevels, the ability to perform both the role of scaffolds and the templates for biomineralization and formation of the rigid skeletal structures. Chitin and collagen in particular played the determining role in the formation of skeletal structure in marine invertebrate organisms. These two biopolymers possess all the qualities needed to refer to them simultaneously as biological materials and biomaterials, the latter thanks to their successful application in biomedicine. The fact that modern science finds chitin and collagen both in unicellular and in multicellular invertebrates in fossil and modern species confirms beyond a doubt the success of these biological materials in the evolution of biological species during millions of years. I realize that this success should be consolidated at genetic level and the detection of corresponding conserved genes must be the main priority.

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