Institute of Paleobiology PAS
Seminar

Morphogenesis of Protein Superstructures in Demospongiae

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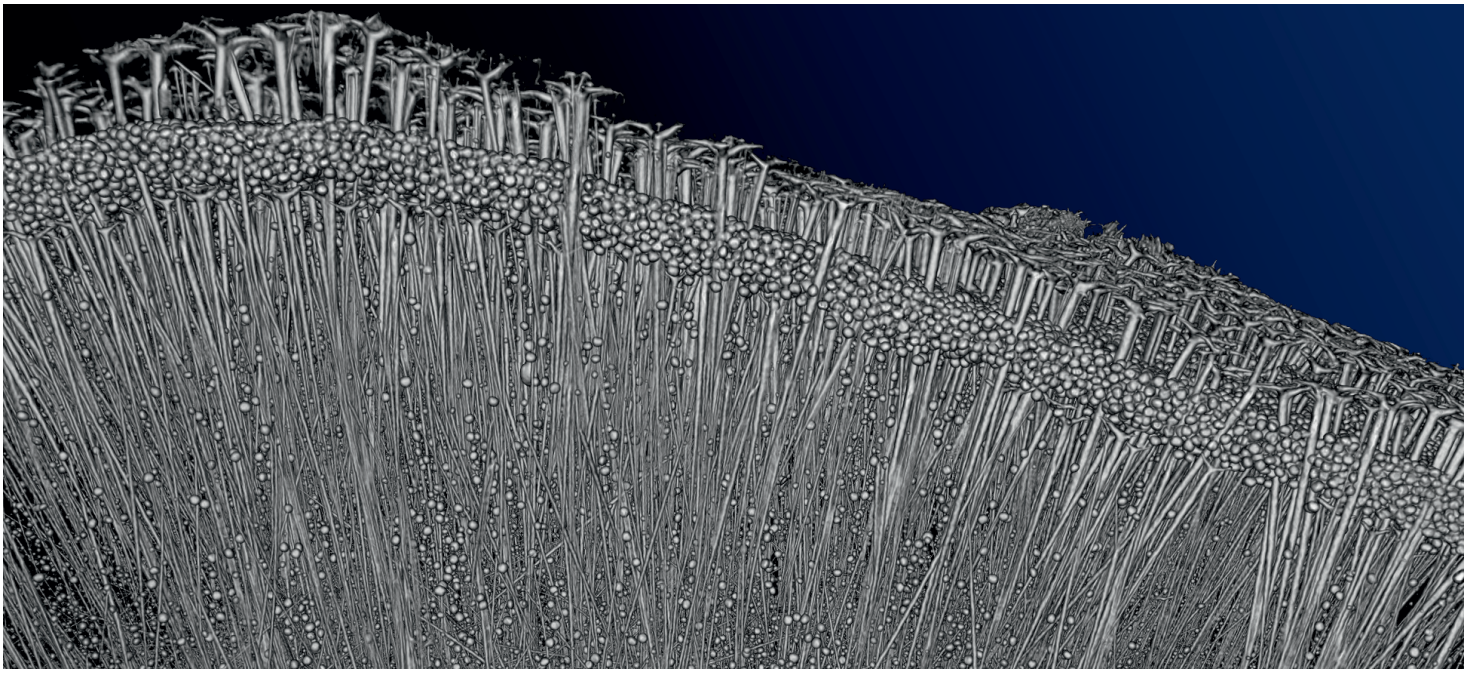

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Short abstract: *Living organisms form complex mineralized architectures that perform a variety of essential functions. These biological materials are not only responsible for structural support and mechanical strength, but often provide optical, magnetic and sensing capabilities. This diversity in functionality is accomplished using a relatively narrow range of inorganic and organic components arranged into an astonishing variety of highly ordered hierarchical architectures. The control over the shape of the inorganic mineral building units, which in most cases differs significantly from their synthetic and geological counterparts, is executed by the cellular components. Here, growth and form are regulated by generating biochemical and physical boundary conditions that guide the self-assembly of a specific morphology. In the case of crystalline minerals, it is well established that the organic framework secreted by the cellular tissue manipulates the thermodynamics and kinetics of growth to give rise to complex morphologies that contradict the highly symmetrical crystal habit of the pure mineral phase. In essence, incorporated macromolecular content is used to challenge the crystallographic constraints imposed by the physical properties of the mineral. However, the mechanisms by which macromolecular frameworks shape and impose order on inherently disordered amorphous minerals are not well understood. In this work, we describe the formation of skeletal elements of sponges made of amorphous glass. Templated by branched single-crystalline protein filaments, these elements are a paradigm example of symmetry in biological systems. In this talk, I will review all aspects of this extraordinary self-assembly, biomineralization and morphogenesis scheme.*