6th International School and Conference on Biological Materials Science

BioINSP 2022

Book of Abstracts

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Plenary

Shape in the digital age: forward and inverse problems

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How can we design shape (for function)? I will describe a few inverse problems in physical geometry inspired by this simple question in a few different settings. These include kirigami tilings for planar and three-dimensional shapes, origami tessellations for complex curved surfaces, and printing and growing strategies to create dynamic flowers and faces, using a combination of experimental, computational and theoretical approaches. Along the way I will show how we can also control the energy landscape of the resulting set of shapes by varying the connectivity of the underlying unit cells that allows us to go from completely floppy networks to rigid structures and even totimorphs - structures that have an infinite range of energetically equivalent shapes.

Learning from cicadas: Bioinspired functional structures against multidrug-resistant bacteria

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Multidrug-resistant bacteria such as hospital germs pose enormous challenges on patients and the health systems. Most antibiotic resistances are based on the respective chemistry of the pharmaceutical. On the other hand, antibacterials based on mechanical/structural mechanisms provide antifouling and/or bactericidal properties. Against such structures, bacteria cannot develop antibiotic resistances. The presentation will give an overview of such physical bactericides that are in various stages of technical development. Furthermore, current research that deals with bactericidal nanostructures on the wings of cicadas and dragonflies will be introduced. Positive and negative replicas of these nanostructures are produced in various materials using inexpensive protocols. *Escherichia coli* (gram-negative) and *Staphylococcus aureus* (gram-positive) are used to test and compare the resulting bactericidal effectiveness. Such research shall yield biomimetic low-cost, large-area antibacterial surfaces for application in, e.g., door handles, wall coatings and surgical instruments.

Authors

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