

Bioinspiration of Photonic Crystals and Color Change in Organisms

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During the process of evolution, nature has encountered a multitude of challenges, which have been met with the development of optimal solutions through the mechanism of natural selection. These solutions have undergone refinement over time, resulting in the creation of highly efficient and enduring strategies. One particular challenge that nature has faced is the phenomenon of color change in organisms. A significant mechanism for generating color involves the utilization of one- to three-dimensional photonic crystal structures, which give rise to bright and rainbow colors. These structures have been observed in a variety of organisms, including insects (such as cockroaches and butterflies), birds (such as peacock feathers), plants (such as Edelweiss flowers), and marine animals (such as fishes and sea worms). The phenomenon of color change facilitated by these structures serves a range of purposes, such as sexual communication, cryptic behavior, adaptation to the environment, and the deterrence or deception of predators. In this review, we address the photonic crystal structure-mediated color change in fish, beetles, and butterflies. Finally, we explore various industries bioinspired of these structures, including artificial colors, sensors, solar cells, nanolithography, display screens, and banknote counterfeiting.

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