Title: The World of Color: Seeing the Relationship Between Quantum Theory and Colors of Nature

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The colors seen in nature are usually derived from biological pigments that absorb certain wavelengths of light and reflect all others. Most organisms are incapable of producing blue color with pigments making the color a rare find. Blue Morpho butterflies exhibit differing levels of blue iridescent coloring that is dependent on the wing pigmentation and nanostructure assortment for each species. The intermingling of chemical and physical mechanisms to produce their unique bright blue color is what makes Blue Morpho butterflies such an exceptional species.

A set of interdisciplinary experiments were developed to investigate the nature and applications of structural coloration. Nanotechnological techniques were enforced to procure images of the *Morpho* butterfly wings on the nanoscale with a Scanning Electron Microscope (SEM). These images illustrated the physical nanostructures that permit structural coloration. Spectrometer measurements attributed to the understanding of the physical processes of structural coloration by providing a visualization of the effects of thin-film interference on the wavelength of light emitted. These readings revealed varying levels of blue reflectance in the different *Morpho* butterfly species. Solution tests with bleach, isopropyl alcohol, and toluene conducted on *Morpho* wings and purely pigmented butterfly wings distinguished the presence of structural and pigmentary colors in butterfly wings, revealing that Blue Morpho wing coloration was primarily attributed to its physical nanostructures.

Butterfly nanostructure can be replicated to create efficient biological sensors. Future research seeks to utilize the configuration of these nanostructures to produce pressure sensors with a multitude of applications such as glaucoma detection.

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