# Patterns on Beetles and Butterflies: Origins of their color and Patterns

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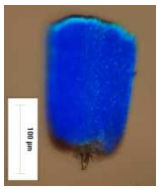
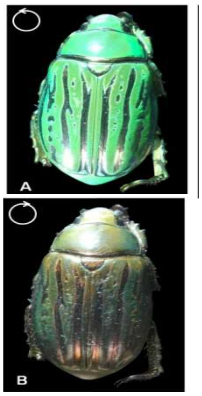
***CREOL102, 11:00am - 12:00pm, Friday, February 5, 2010***

## Abstract

The study of photonics in nature contains beautiful and diverse examples of sub-wavelength structural features that create observed colors through thin layered or multilayered interference, diffraction, zero order diffraction and light scattering. In this talk I will discuss two such examples: Butterflies and Beetles, both of which attracted the attention of great scientists including Newton, Rayleigh, Michelson and Raman, among others.



The beautiful iridescent colors found on the wings of butterflies and beetles have attracted the attention of brilliant minds over the past centuries starting with Newton, who understood that these colors must be due to the presence of “thin film structures”. In other words, the colors are produced by periodic structures of cuticle-air that mimic photonic crystals. We have embarked on a systematic study of the optics of individual wing scales and will provide a glimpse of those results.




In the second part of the talk, we take a closer look at the colors produced by iridescent, metallic green beetle, Chrysina Gloriosa that selectively reflects left circularly polarized light when illuminated with unpolarized light which is observed to possess a nearly hexagonal cellular pattern on its exoskeleton. Using crystallographic concepts and Voronoi analysis of the structure present on the exoskeleton, we determine that these cells (~10 microns each) are organized with pentagons and heptagons, interdispersed typically as clusters, between hexagons. In an optical microscope, each cell appears to contain a bright yellow core, placed in greenish cell that has yellowish borders. Using confocal microscope and the auto-fluorescence of the exoskeleton matrix, we visualize that these cells consist of nearly concentric, nested arcs that lie on surface of a shallow cone.

**Biography:** *Professor Mohan Srinivasarao received his M.S. (Polymer Science) in 1985 and Ph.D. in Chemistry in 1990,both from Carnegie Mellon University. He worked on flow and magnetic field induced instabilities of a rodlike polymer forming a nematic phase in solution under the supervision of Professor Guy Berry. He spent a few years as a postdoctoral fellow with Professor Richard S. Stein at the University of Massachusetts at Amherst before moving to AT&T Bell Labs where he worked on polymer-dispersed liquid crystals for display device applications. He has been a professor at Georgia Tech for over 10 years.*

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