Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Structural origin of circularly polarized iridescence in jeweled beetles MATIJA CRNE, Procter & Gamble, Germany, VIVEK SHARMA, Hatsopoulos Microfluids Laboratory, Dept of Mechanical Eng., MIT, Cambridge, MA 02139, JUNG O. PARK, MOHAN SRINIVASARAO, School of Polymer, Textile & Fiber Eng, Gerogia Tech., Atlanta, GA 30332 — The iridescent metallic green beetle, Chrysina gloriosa, selectively reflects left circularly polarized light. The exoskeleton is decorated by hexagonal cells ($\sim$10 micron) that coexist with pentagons and heptagons. We find that the fraction of hexagons decreases with an increase in curvature. In bright field microscopy, each cell contains a bright yellow core, placed in a greenish cell with yellowish border, but the core disappears in the dark field. Using confocal microscopy, we observe that these cells consist of nearly concentric, nested arcs that lie on surface of a shallow cone. We infer that the patterns are structurally and optically analogous to the focal conic domains formed spontaneously on the free surface of a cholesteric liquid crystal. The microstructure provides the bases for the morphogenesis as well as key insights for emulating the intricate optical response the exoskeleton of scarab beetles.

Vivek Sharma
Hatsopoulos Microfluids Laboratory, Dept of Mechanical Eng.,
Massachusetts Institute of Technology, Cambridge, MA 02139

Date submitted: 04 Jan 2010 Electronic form version 1.4