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Microscopy and Chemical Inversing Techniques to Determine the Photonic Crystal Structure of Iridescent Beetle Scales in the Cerambycidae Family LAUREN RICHEY, JOHN GARDNER, MICHAEL STANDING, Brigham Young University, MATTHEW JORGENSEN, MICHAEL BARTL, University of Utah — Photonic crystals (PCs) are periodic structures that manipulate electromagnetic waves by defining allowed and forbidden frequency bands known as photonic band gaps. Despite production of PC structures operating at infrared wavelengths, visible counterparts are difficult to fabricate because periodicities must satisfy the diffraction criteria. As part of an ongoing search for naturally occurring PCs [1], a three-dimensional array of nanoscopic spheres in the iridescent scales of the Cerambycidae insects *A. elegans* and *G. celestis* has been found. Such arrays are similar to opal gemstones and self-assembled colloidal spheres which can be chemically inverted to create a lattice-like PC. Through a chemical replication process [2], scanning electron microscopy analysis, sequential focused ion beam slicing and three-dimensional modeling, we analyzed the structural arrangement of the nanoscopic spheres. The study of naturally occurring structures and their inversing techniques into PCs allows for diversity in optical PC fabrication. [1] J.W. Galusha et al., *Phys. Rev. E* 77 (2008) 050904. [2] J.W. Galusha et al., J. Mater. Chem. 20 (2010) 1277.

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