Researchers document aviary eggshell with iridescence for the first time

December 10 2014, by Bob Yirka

Photographs (a–c) of T. major, E. elegans and N. maculosa nests. Average length breadth of eggs (a–c): 58 48 mm, 53 39 mm and 40 29 mm. Photo credits: Karsten Thomsen, Sam Houston and Shirley Sekarajasingham. *Journal of the Royal Society Interface*, Published 10 December 2014 . DOI: 10.1098/rsif.2014.1210

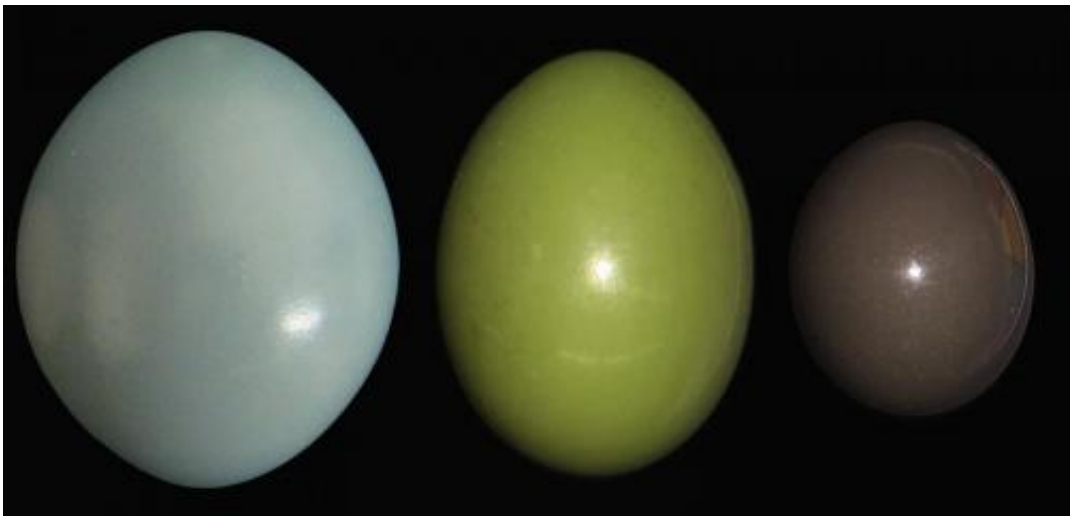
(Phys.org)—A team of researchers with members from New Zealand, Czech Republic and the U.S. has documented for the first time an example of an aviary egg that has iridescence. In their paper published in *Journal of the Royal Society Interface*, the team describes their study of eggs laid by great tinamou, which revealed the nature of the egg coloring.

Bird eggs come in a wide variety of colors, which scientists suspect is nature's way of keeping them hidden so that other animals won't come along and eat them. Prior research has found that most egg coloring is due to just two different pigments. In this new study, the researchers

took a closer look at the shiny blue eggs laid by great tinamou, better known in Central and South America, where they live, as "mountain hen."

In investigating the eggs, the researchers found that they were iridescent—they look to be different colors depending on the angle they are viewed from—a first for an avian eggshell. That got the researchers wondering about the source of the iridescence. Close examination showed that the eggs were covered with a smooth cuticle (which they found to be made of calcium phosphate, calcium carbonate, and some other yet to be identified organic compounds) which gave the egg its glossy sheen. When they removed the cuticle from a portion of an egg sample—they found that it was blue underneath, but that the iridescence was gone. Thus, they concluded that the iridescent blue was due to a combination of the pigment and cuticle.

The researchers can't say for sure why the bird eggs have such features as they would appear to draw attention to them, rather than help keep them hidden. It seems possible that the iridescence actually causes the eggs to be more difficult to see in their particular environment to a particular type of prey. More likely, the researchers suggest is that eggs that stand out can be more easily spotted or differentiated from other eggs from birds of the same species, which could serve as a means of encouraging males to assist with incubation.



From left to right: eggs of the great tinamou (*Tinamus major*), elegant crested tinamou (*Eudromia elegans*), and spotted nothura (*Nothura maculosa*). Credit: Photograph of great tinamou egg (UMMZ 191600) used with permission from the University of Michigan Museum of Zoology. Photo credits: D. Hanley (great tinamou) and M. Hauber (elegant crested tinamou and spotted nothura).

More information: A nanostructural basis for gloss of avian eggshells, *Journal of the Royal Society Interface*, Published 10 December 2014 . DOI: 10.1098/rsif.2014.1210

ABSTRACT

The role of pigments in generating the colour and maculation of birds' eggs is well characterized, whereas the effects of the eggshell's nanostructure on the visual appearance of eggs are little studied. Here, we examined the nanostructural basis of glossiness of tinamou eggs. Tinamou eggs are well known for their glossy appearance, but the underlying mechanism responsible for this optical effect is unclear. Using experimental manipulations in conjunction with angle-resolved spectrophotometry, scanning electron microscopy, atomic force

microscopy and chemical analyses, we show that the glossy appearance of tinamou eggshells is produced by an extremely smooth cuticle, composed of calcium carbonate, calcium phosphate and, potentially, organic compounds such as proteins and pigments. Optical calculations corroborate surface smoothness as the main factor producing gloss. Furthermore, we reveal the presence of weak iridescence on eggs of the great tinamou (Tinamus major), an optical effect never previously documented for bird eggs. These data highlight the need for further exploration into the nanostructural mechanisms for the production of colour and other optical effects of avian eggshells.

Press release