

Egg camouflage research animation

June 11 2014, by Arran Frood



A pair of plover eggs partly hidden by their camouflage. Image: Jolyon Troscianko

Did you ever look at the marks and speckles on an egg and wonder what they are for? Pretty as they can be, they are not merely ornamental but have evolved to hide the egg from hungry predators.

A teaser for our upcoming full video feature on animal vision and [camouflage](#) research, the short video below shows a systematic analysis of the innocuous-looking mottled markings that are actually the last line of defence for the helpless young chick inside the egg. See more from this research group in our uber-popular ' [Can you spot the bird?](#) ' and ' [Who's eating my eggs?](#) ' video features.

Researchers at the University of Exeter and the [University of Cambridge](#)

are investigating the fundamental bioscience behind how the marks on eggs work as camouflage systems, and how this relates to the visual biology of different animals that eat eggs in the wild. Studying camouflage outside of the lab is notoriously difficult because it's hard to control variables such as light and record aspects of animal behaviour, to say nothing of the fact that camouflaged animals are so hard to see. But it's work that has applications from the military to urban living space design.

For their study system, the researchers have chosen ground-nesting birds such as plovers and nightjars because when the birds fly away (or 'flush') from predators their eggs are vulnerable - only the eggs' spots and speckles can hide it from becoming a meal. That the eggs stay still in the nest during the long incubation period also gives the researchers an advantage because they can take pictures of the eggs, then come back over time to see if the nest has survived or perished. The researchers, including [Dr Jolyon Troscianko](#) from the University of Exeter, have taken more than 15,000 images as part of the project.

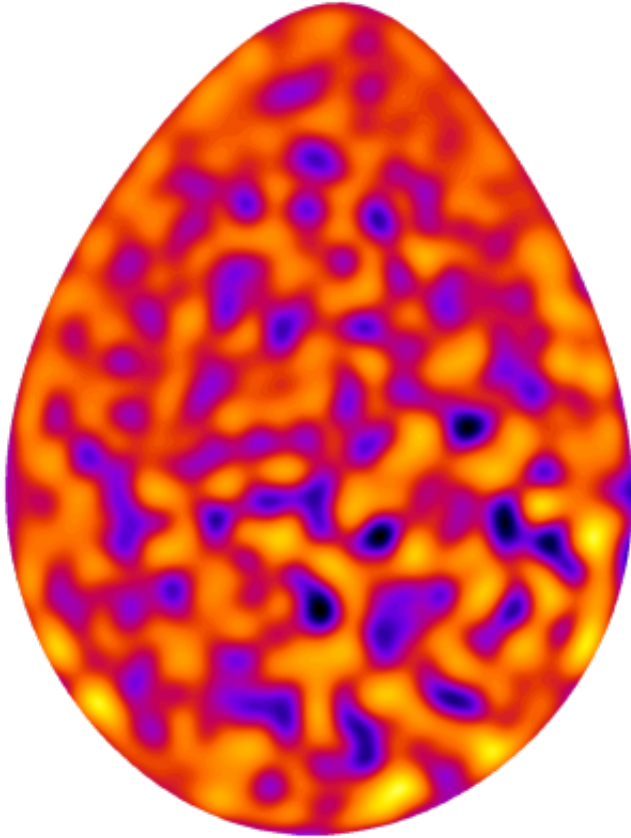
Model behaviour

Back in the lab, Troscianko and colleagues analyse the images using custom software to quantify the egg's colours and patterns, comparing them to background imagery at lots of different scales. "This allows us to see how well the colours and markings on the eggs match the background surrounding the eggs as perceived by a predator's visual system," says Troscianko. "We can then see how important pattern matching, colour matching or contrast matching are for protecting the eggs from being spotted by predators."



A normal plover egg. Credit: Jolyon Troscianko

This modelling analysis allows precise measurement of egg factors that may be important, such colour, brightness and contrast differences, and the amount of edge disruption. This example in the video shows an analysis of pattern differences. "This crowned-plover egg photo is being put through a series of filters that only allow small pattern details through first, then larger and larger patterns. The black and blue regions show where the egg has strong patterns at each scale. We can then see whether the background has similarly strong patterns at a similar scale."



A plover egg with its markings deconstructed for analysis. Credit: Jolyon Troscianko

"At this point we attempt to answer the key questions about what makes good camouflage... whether the crucial feature of the egg's camouflage is its colour, its pattern, its brightness, or to what extent its outline is disrupted by strong markings like these," says Troscianko. "We can also test whether the birds specifically choose nesting sites with a background that makes their eggs look as camouflaged as possible."

The work is part of a wider project co-led by [Dr Martin Stevens](http://www.bbsrc.ac.uk/upload/structure/img/i-external.png) at the University of Exeter's [Sensory Ecology and Evolution group](#) and [Dr Claire Spottiswoode](#) of the University of Cambridge, with [Jared Wilson-](#)

[Aggarwal](#) also of the University of Exeter.

More aspects of this project, including citizen science games such as [Egglab](#) that will map humans' visual abilities to spot [eggs](#) that evolve over time as the game progressed will be covered in a future feature.

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Biotechnology and Biological Sciences Research Council

Citation: Egg camouflage research animation (2014, June 11) retrieved 9 April 2024 from <https://phys.org/news/2014-06-egg-camouflage-animation.html>

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