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# Actually, a leopard can change its spots

Edited by Clive Cookson

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Living in a variety of environments, leopards can develop atypical spot colours and patterns  
Zoology

Actually, a leopard can change its spots

Rudyard Kipling had more or less the right idea. In the "How the Leopard Got His Spots" story from the *Just So* collection, the Ethiopian endowed his feline friend with spots as camouflage for life in the trees. "You can lie out on a leafy branch and look like sunshine sifting through the leaves; and you can lie right across the centre of a path and look like nothing in particular," the Ethiopian told the Leopard. "Think of that and purr!"

Scientists at Bristol University analysed the markings of 35 wild cat species to understand better what drives the evolution of so many beautiful and intriguing patterns. They captured detailed differences in the visual appearance of the cats by linking them to a mathematical model of pattern development.

Broadly they confirmed that coat markings help the animals to melt into their surroundings. All cats benefit from camouflage as predators, helping them to stalk their prey until they are close enough to catch it. And small cats also benefit from protection from predation by big carnivores.

Cats such as leopards – which live in dense habitats, among trees and are active at low light levels – are the most likely to be patterned, especially with irregular or complex shapes. Species that live in open grassland, such as lions, tend to have plainer coats.

The research also explains why black leopards are common but black cheetahs unknown. Unlike cheetahs, leopards live in a wide range of habitats and have varied behavioural patterns.

Having several environmental niches that different individuals of the species can exploit allows atypical colours and patterns to become stable within a population.

Although a clear link between environment and patterning was established, the study highlighted some anomalies that remain unexplained. For example, a number of cats, such as the bay cat and the flat-headed cat, have plain coats despite a preference for closed environments.

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The research (published in Proceedings of the Royal Society B) also highlighted just how rare vertical stripes are.

Only tigers always have vertically elongated patterns. Since tigers seem to be well camouflaged, this raises the question of why vertical stripes are not more common in cats and other mammals.

The researchers ruled out any significant role for coat patterns either as sexual attractants or social signalling systems.

And analysis of the evolutionary history of coat patterns shows they can arise and disappear relatively quickly.

"The method we have developed offers insights into cat patterning at many levels of explanation and we are now applying it to other groups of animals," says Will Allen, who led the research.

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After 35 years spent studying the protein amyloid, Mark Pepys, professor of medicine at University College London, is finding persistence pays off.

For 35 years, Pepys has been studying amyloid, an insoluble protein that can cause serious disease when excessive amounts build up in the body.

And now, a paper published last week in the top journal Nature showed that a drug that he designed in the 1990s, called CPHPC, works well in combination with a newly designed antibody to clear amyloid deposits in laboratory mice.

A trial in patients will follow soon. If that succeeds too, the immediate clinical benefits will go to sufferers of an incurable disease called systemic amyloidosis, which causes organ failure in tens of thousands of people worldwide.

Amyloidosis, which affects about one person in 1,000, results from the build-up of abnormal fibres in the body. In the case of Alzheimer's, amyloid deposits contribute to the destruction of the brain.

The original breakthrough came in the 1980s when Pepys realised that a normal blood protein called serum amyloid P component or sap was the key to tackling amyloidosis.

Sap is always present in amyloid deposits as well as in the blood, and it contributes to the formation and persistence of amyloid.

In collaboration with Roche, the Swiss drug company, he developed CPHPC, a drug that targets SAP and removes it from the blood. This treatment stopped further accumulation of amyloid but did not lead to clearance of existing deposits, perhaps because it did not remove all the SAP from the amyloid.

Roche then pulled out of the collaboration but Pepys wasn't discouraged. Nor was the Medical Research Council, which has funded his work from the start.

He had the idea of combining CPHPC with an antibody to target the residual SAP – and he persuaded another pharmaceutical giant, GlaxoSmithKline, to work on its development.

"Our findings open up promising prospects for successful intervention in patients," said Professor Pepys.

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