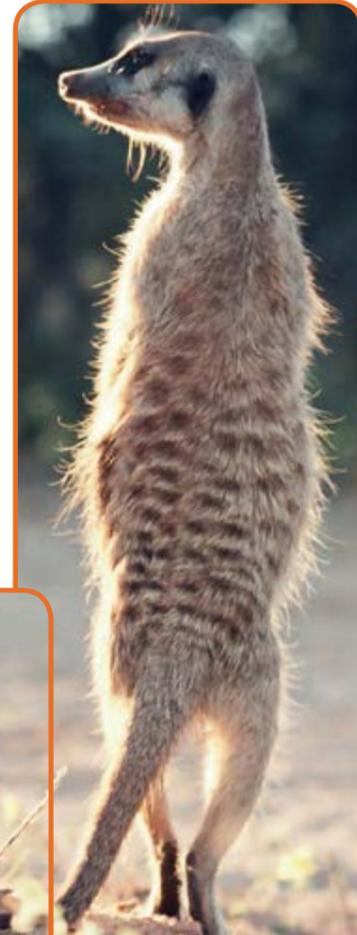




Teaching and learning by Observation in Meerkats

Teaching, where knowledgeable individuals go out of their way to help others learn, is a cornerstone of human culture. Until recently it was thought that humans were the only teachers in the animal kingdom, but our research has found that meerkats teach their pups how to hunt by providing the pups with opportunities to practice their skills.¹

We have also shown that meerkats can pick up new ways of obtaining food by observing other group members: in field experiments where we trained ‘demonstrator’ meerkats to obtain food using different methods, the demonstrators’ techniques spread locally within their groups.²



Chimpanzee Cultures

A half-century of studies of wild chimpanzees has revealed behavioural differences across Africa that appear to be local traditions.¹ However, it’s difficult in the wild to perform behavioural experiments to test whether these are truly socially learned traditions, so we have pioneered such experiments with captive apes. Our exhibit illustrates a study in which a single chimpanzee in each of two groups was shown a different method to deal with an artificial foraging task² then reunited with her group.

We have shown that several alternative techniques like this can spread in different groups and become local traditions.² Our studies of apes help reconstruct the evolutionary origins of human culture.

Social networks channel the spread of innovations

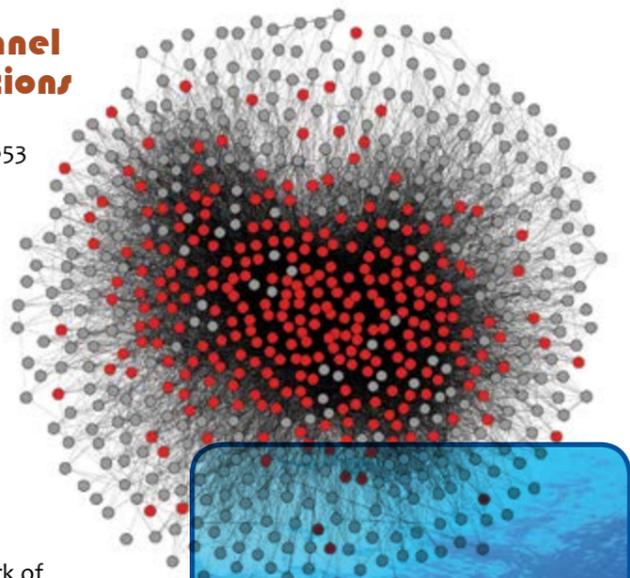
Collating 73,790 observations of 653 humpback whales sighted more than 20 times over a 27 year period allowed us to trace the spread of a hunting innovation first spotted in a single individual. This ‘lob-tail’ behaviour involves smacking the tail on the ocean surface to make a shoal of fish bunch, and be more efficiently harvested by the whales’ ‘bubble-netting’ hunt technique.

Mapping the social network of the whales by observing who associated with whom revealed that the new innovation had diffused along the lines of the network, thus implicating social learning.¹

In similar fashion, being a socially central ‘well-connected’ monkey predicted the adoption of alternative foraging methods we introduced experimentally into two groups of squirrel monkeys.²



*see synergy.st-andrews.ac.uk/animalcultures/ resources for references on these pages

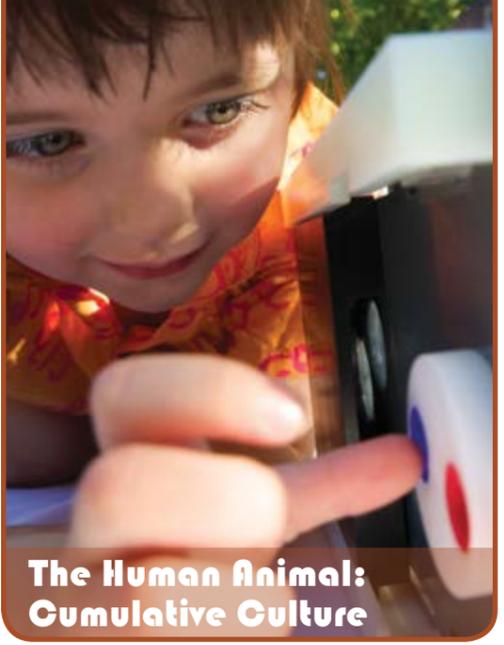


The “When in Rome ...” rule in wild primates

How powerful is learning from others, rather than learning oneself? To find out, we first let groups of African vervet monkeys learn to prefer a monthly corn provision dyed one colour over bitter corn dyed differently.

When a cohort of infants later began to try solid food we reintroduced both colours of corn without any bitterness. Social learning was so powerful for these infants, 26/27 first ate only the local colour their mother preferred.

More striking was the behaviour of immigrant males who transferred from ‘eat pink’ groups to ‘eat blue’ or vice versa. All but one followed the rule “When in Rome ...” and switched to the new local preference.¹ Such conformity seems surprising, but other of our recent results with chimpanzees is consistent with such effects². Can you suggest a hypothesis for why the migrant males act as they do?



The Human Animal: Cumulative Culture

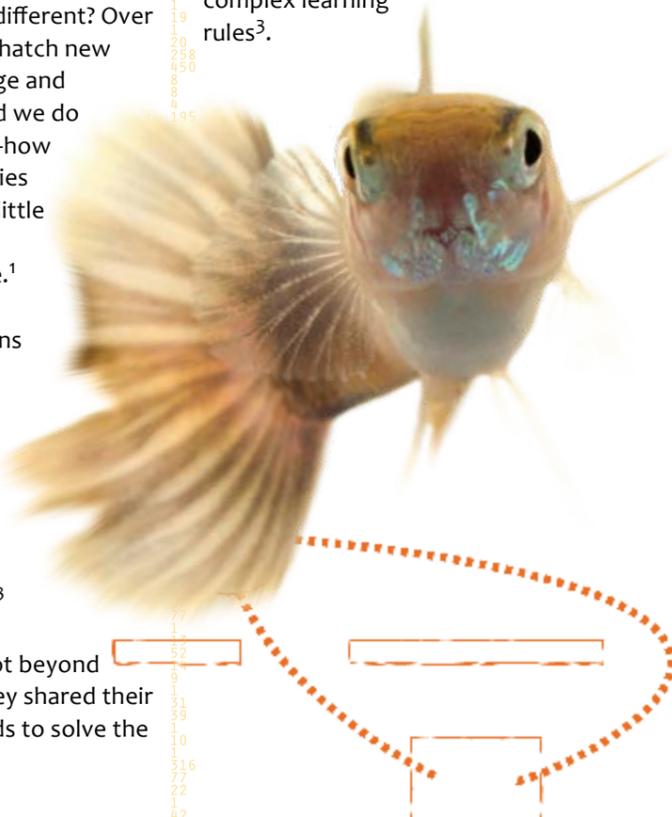
What makes human culture different? Over the generations we humans hatch new ideas, broaden our knowledge and expand our technology – and we do this by building on the know-how of our ancestors. Other species exhibit traditions, but show little sign of ‘ratcheting up’ their cultural know-how over time.¹

To understand what underpins this difference we compared the approaches of children, chimpanzees and capuchin monkeys to tasks that could be solved at increasingly difficult levels to extract better and better rewards.^{2,3}

Only children consistently got beyond the simplest initial stage. They shared their skills, knowledge and rewards to solve the task together.³

Culture in fish?

Many fishes have traditions for following particular routes, using specific places for mating or feeding, and preferring particular foods, which are learned from more experienced individuals. Some of the best evidence for animal traditions is found in fishes, because removal and relocation experiments have prove their behaviour to be socially transmitted, and maintained across generations.¹ Our laboratory experiments have shown that novel feeding behaviour can be transmitted through shoals of fish, that simple copying and following processes can generate behavioural traditions², and that some fish copy using surprisingly complex learning rules³.



New Caledonian Crows

New Caledonian crows use tools to extract prey from dead wood and vegetation.^{1,2} Several other animal species are known to use tools, but these tropical corvids (crows) stand out. New Caledonian crows have a very rich range of unusually complex tool designs. In fact, they are the only species, other than humans, to craft hooked foraging tools. It has been suggested that this technological sophistication may be due to the cultural transmission and accumulation of information.

We investigated whether crow social networks could support the spread of tool-innovations. Using new tracking technology, we examined the social networks of wild crows, recording when birds met each other and for how long.³

Our study showed that young crows may learn not only from their parents, but also from many unrelated crows in the population. This is an important step in testing the existence of ‘crow cultures’.

What's the significance of these studies?

Our research is generously funded by many different bodies including BBSRC. Why is it important? One set of answers is at the level of fundamental scientific understanding of human nature, and where the transmission of cultural information fits into the wider natural world. This essentially appeals to our scientific curiosity about ourselves, why we function as we do and more generally, how biological systems work.

The more practical and applied implications of this work are very diverse. They range from children's education, to robotics (what is necessary to have one being copy another?), animal welfare, conservation and reintroduction (what is involved in relocating a culturally-dependent animal to a new environment) and medicine (as culture shapes genetics). Our discoveries are also frequently drawn upon by the media, such as the BBC Natural History Unit, producing programmes marketed around the world.

Glossary

Social learning: "learning that is facilitated by observation of, or interaction with, another individual (or its products)"
(Hoppitt & Laland, 2013).

Tradition: "a distinctive behavior pattern shared by two or more individuals in a social unit, which persists over time and that new practitioners acquire in part through socially aided learning"
(D. Frigaszy & S. Perry, 2003).

Culture: is defined by some as synonymous with tradition; others require additional criteria such as that cultures are constituted of multiple and/or diverse kinds of traditions, such as technology and social customs
(A. Whiten & C. van Schaik 2007; see Whiten, 2005 and Laland and Galef, 2009, for further discussion).



find out more...

web:
synergy.st-andrews.ac.uk/animalcultures

The Resources section of the site has details of further links and reading material, including source articles indicated by superscripts in summaries overleaf.

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ANIMAL cultures

Nature's Second Inheritance System



Professor Andrew Whiten, Professor Kevin Laland,
Dr Luke Rendell, Dr Christian Rutz, Dr Lewis Dean,
Dr Erica van de Waal



Dr Elizabeth (Bess) Price

Dr Alex Thornton

Ms Alaina Macri MSc, Mr Stephen Woollard MSc

Introduction

Culture so strongly shapes we humans that it might seem at first sight to separate us from the rest of biology and from Darwinian evolution. Our recent research supported by BBSRC and other bodies paints a very different picture.

We've discovered that 'culture' (broadly, the passing on of traditions by learning from others) is a much more important process in the animal kingdom than has been assumed. It's richer in quality than anybody thought, in a range of animals from fish to apes, and even insects^{1,2}.

And because culture provides a second kind of inheritance³, piggy-backing on existing genetic inheritance, discovering the forms it takes is extending and transforming our understanding of biology and the forms Darwinian evolution can take. Our exhibit displays some highlights of what we have discovered about social learning and culture in fish, crows, whales, meerkats, monkeys and chimpanzees.

Together, these case studies illustrate how we are at last establishing a real 'science of culture'⁴.

1. Laland, K. N. & Galef, B. G. (Eds.) The Question of Animal Culture. Harvard University Press.
2. Whiten, A., Hinde, R. A., Stringer, C. B. & Laland, K. N. (Eds.) Culture Evolves. Oxford University Press.
3. Whiten, A. The second inheritance system of chimpanzees and humans. Nature 437, 52-55.
4. Mesoudi, A., Whiten, A. & Laland, K. N. Towards a unified science of cultural evolution. Behavioral and Brain Sciences 29, 329-383.

ANIMAL cultures

Nature's Second Inheritance System

