

Cultured we may be but chimps, meerkats and even fish have a claim too. So why didn't guppies invent the tango, asks Kate Douglas

Culture club

CULTURE: the word conjures images of nights at the opera, airy art galleries and classical architecture. Whether you consider culture and all its trappings to be elitist and intimidating or enriching and the pinnacle of civilisation, there is one point on which most people agree – culture is distinctly human. So it was quite surreal to find myself, last June, in the foyer of the Queen Elizabeth concert hall in London, in a group of 700 people, discussing the cultural lives of orangutans, meerkats and fish.

The meeting, called Culture Evolves, was held to help celebrate the 350th anniversary of the Royal Society of London. It was an indication of just how far the scientific study of culture has come in recent years. It is little more than a decade since a landmark paper in *Nature* identified dozens of cultural activities in chimps, catapulting culture out of the exclusively human domain. Since then, culture in non-humans has become a hot topic, with evidence piling up that it can be found right down through the animal kingdom, even as far as insects.

All of which presents an enigma. If culture is so prevalent in the animal kingdom, why are we the only creature with traditions as complex or diverse as the cha-cha or the Japanese Noh drama? This question was debated at the meeting, with interesting answers emerging, some of which even hint at where human culture will go from here. “[The research] looks set to transform our understanding of ourselves,” says meeting co-organiser Andrew Whiten of the University of St Andrews, UK.

A word about definitions before genteel readers start choking on their afternoon tea: nobody is proposing that animals have anything close to what you might call “high culture”. If you want to understand what biologists mean when they refer to animal culture, forget Rimbaud, classical concerts and

art appreciation: think instead about all the things humans do that go under the umbrella of cultural diversity – traditions such as languages, cuisines, fashion, ritual and games. An animal species in which distinct groups display such socially learned traditions may be said to possess culture – although some biologists still prefer not to use the C word.

The idea that culture is not exclusively human has been hotly contested for at least half a century, with proponents citing classic examples, like one troop of Japanese macaques who developed a tendency to wash their sweet potatoes in the sea before eating them. Others, however, doubted whether such traditions could be equated with culture. Things came to a head in 1999 when Whiten teamed up with a group of luminaries in the world of primatology to catalogue chimp local traditions (*Nature*, vol 399, p 682).

Chimp customs

Trawling through reports from over 150 years of observation of chimpanzees from seven different sites, the researchers identified 65 categories of behaviour, 42 of which varied between populations. A few of these differences could be explained by ecological factors – in four sites where there was a high risk of being attacked by predators, for example, the chimps did not build sleeping nests on the ground as they did in other places. When such instances were removed, that still left 39 areas in which different communities had distinct behaviours. These ranged from the construction and use of specific tools for termite fishing or cracking recalcitrant nuts, to idiosyncratic courtship routines and particular styles of grooming – some groups do it with one arm clasped overhead, for example. Ruling out the possibility that these behaviours were either genetically predetermined or learned by

individuals through trial and error, the team concluded that they must be passed on from one animal to another via social learning, and therefore constituted cultural traditions.

The combination of so much evidence, big-name authors and publication in *Nature* finally persuaded many animal behaviourists to embrace the idea that culture is not exclusively human. Before long, many more creatures had gained admission into the culture club. In 2001, Hal Whitehead from





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Dalhousie University in Halifax, Nova Scotia, Canada, and Luke Rendell from the University of St Andrews, UK, published a paper in which they identified a variety of cultural traits in whales and dolphins, including specific songs, migratory traditions and foraging techniques (*Behavioral and Brain Sciences*, vol 24, p 309).

Then in 2003, Carel van Schaik at the University of Zurich, Switzerland, and colleagues, catalogued 24 cultural traditions in orang-utans. These ranged from the practice

of making “dolls” from bundles of leaves to blowing raspberries at each other before bedtime (*Science*, vol 299, p 102). The same year Susan Perry of the University of California, Los Angeles, revealed culture in capuchin monkeys in Costa Rica, which have some truly bizarre traditions, like poking each other in the eye and sniffing one another’s hands (*Current Anthropology*, vol 44, p 241).

It is clear to see why social learning would be beneficial to these species. An animal that

can copy behaviour already acquired by a compatriot can pick up new skills more quickly. This is particularly advantageous in fast-changing environments, where behaviours that are hard-wired into the genes would soon become redundant. But what about more “cognitively challenged” animals – would they have the brainpower to cash-in on social learning?

It has long been known that some birds learn their songs from one another, but



“Orang-utan cultural traditions range from the practice of making ‘dolls’ from bundles of leaves to blowing raspberries at each other at bedtime”

many researchers were sceptical that they would use social learning beyond this one specific trait. There is now convincing evidence that they do. For example, Tore Slagsvold of the University of Oslo, Norway, described at the Culture Evolves meeting how he transferred the eggs of blue tits to the nests of great tits, and vice versa. He found that the fostered chicks acquired foraging behaviours characteristic of their adoptive parents. Since both species inhabit essentially the same natural environment, this indicates that the way in which they exploit it is largely determined by culture rather than a genetic predisposition (*Proceedings of the Royal Society, B*, vol 274, p 19).

That's not all. Fish also learn techniques from their peers to navigate many of life's problems, from deciding what to eat and where to find food, to recognising and avoiding predators. Moving even further down the animal kingdom, there is even some evidence of social learning in insects including crickets and bees, leading some to claim that they, too, may have their own cultural traditions (*Behavioral Ecology and Sociobiology*, vol 61, p 1789).

Within just 11 years of Whiten and colleagues' seminal *Nature* paper, it has now

become clear that the fundamental building block of culture – social learning – is widespread in the animal kingdom. A conundrum remains, however. If a fish with a brain the size of a petit pois is sophisticated enough for social learning, how come millions of years of evolution have only produced one species with traditions as diverse as the tango, brutalism and dim-sum?

One possible explanation, explored at the meeting, springs from the growing realisation that learning by copying is not the unalloyed good it was once thought to be. Although social learning is an efficient way of picking up information, if used indiscriminately it can be arbitrary or even harmful. An inability to abandon learned traditions could mean that animals get locked into using an inefficient strategy when environmental conditions change. Worse still, local traditions may even emerge that confer no benefits and simply put you at a disadvantage, which seems to have happened among some Kalahari meerkats.

Life is tough for these animals, and pups rely heavily on social learning to work out what is edible and how to avoid being eaten themselves, but the tendency to copy also extends to another habit with no apparent benefits. Alex Thornton at the University of

Cambridge has discovered that some groups consistently get up later than others, even though this lay-a-bed tradition gives less time for foraging (*Proceedings of the Royal Society B*, vol 277, p 3623).

Judging when and who to copy should therefore be vital. Is this where humans steal a march over other animals? Unlike many other species, we do not merely copy our parents, but instead consider everyone around us as potential role models. This should give us more opportunities to acquire useful traditions, provided that we can work out who is most likely to possess good information.

It turns out that we are particularly skilled at making this distinction. Adults are known to choose the most successful, prestigious and knowledgeable individuals to copy. Even children are highly selective of who to trust, rather than blindly copying the people they know best, as had previously been believed. “By age 5, kids prefer information from reliable informants to familiar ones,” says Paul Harris of Harvard University, who presented work on the topic at the Culture Evolves meeting.

All of this is very sensible and clever, but there's a problem: “Every single one of these effects have previously been observed in fish,” says Kevin Laland at the University of St Andrews, who studies social learning in guppies. We might like to think that we are more discriminating than a fish, but perhaps what really sets us apart from other species is not who we learn from, but how we learn.

“In animals, social learning occurs through



Mmm, a washed sweet potato tastes much better

Culture evolves

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observation," says Gergely Csibra of the Central European University in Budapest, Hungary. We, however, have a more active system of instruction that includes both teachers and learners. He has dubbed this "natural pedagogy" and believes it evolved in the human line in response to technological advances. Around 2.6 million years ago, our ancestors began making tools. As tools increased in complexity the technology became more "opaque," says Csibra. This meant that learners could not simply copy by observing, so knowledge came to be passed on by explicit demonstration, either using non-verbal techniques or the evolved trait of language. As a result, he asserts, only humans are psychologically adapted to assume the roles of both teacher and pupil (*New Scientist*, vol 2545, p 42).

Further evidence that the complexity of human technology pushed us to become better social learners comes from another distinctly human quirk: over-imitation. Unlike chimps and other social learners, young children copy every single step performed by a demonstrator, even ones that are clearly irrelevant. Various experiments by Derek Lyons at the University of California, Irvine, have ruled out the possibilities that kids over-imitate because they think it is expected of them, or from a desire to be like the adult demonstrator, or simply because they want to. "Over-imitation is involuntary," he says. He concludes that when children are taught a new procedure they automatically encode all the actions as causally meaningful (*Proceedings of the National Academy of Sciences*, vol 104, p 19751). This may sometimes lead to the reproduction of irrelevant actions, but in a world where cultural artefacts are

often complex, on balance it is a useful adaptation.

All of which suggests a kind of positive feedback loop, in which the complexities of early technology pushed us to evolve better methods of social learning. These improved learning abilities then accelerated cultural transmission, ultimately pushing us towards greater and greater cultural complexity.

Runaway evolution

As powerful a driver of cultural development as technology may have been, there is inevitably a great deal more to it than that. Francesco d'Errico at the University of Bordeaux, France, and Chris Stringer of the Natural History Museum in London recently turned to the archaeological record to track cultural change in prehistory. They found that cultural developments such as innovations in the way stone tools are created happened in leaps and bounds, rather than in a more gradual, steady trend. That may be because our psychology also includes a strong conservative streak.

Harris finds, for example, that children will preferentially imitate people who conform to social norms. This trait makes it difficult for new traditions to get off the ground, and outside forces may therefore be required to tip the balance in favour of innovation, d'Errico and Stringer conclude. From their study, three broad factors seem to be key: changes in climate, population growth and high levels of cultural exchange. Agriculture, for instance, is thought to have emerged 10,000 years ago partly as a result of increasing population pressure in the eastern Mediterranean.

If these factors shaped cultural evolution in

the past, can we make any predictions about the future? With increasing opportunities for cultural exchange via the internet and globalisation, perhaps we should expect to see runaway cultural evolution? "There are countervailing forces," says Mark Collard from Simon Fraser University in Burnaby, British Columbia, Canada, who spoke at the Culture Evolves meeting about what causes cultural complexity. On the one hand, he points out that the internet and globalisation allow social information to be shared by large numbers of people across the world who could never have connected before. That could lead to a breakdown in cultural barriers as different traditions merge together and begin to lose some of their individuality. Look at any social networking site, however, and you'll see that people still form distinct cliques – more so than ever, in fact, since it's now much easier for individuals to hook up with others who share their passions, no matter how far-out these may be. "The internet allows groupishness," says Collard.

Throughout human evolution, people have used traditions and cultural practices to distinguish themselves from other camps. "Humans have a long history of erecting barriers," says another conference delegate, evolutionary biologist Mark Pagel of the University of Reading, UK. Cliques on the internet are no different, each propagating their own distinct trends and fashions. Our tendency for groupishness may be a somewhat unappealing trait in many circumstances, but it may just be the saving grace that allows our amazing cultural diversity to flourish in the future. ■

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