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The Burgeoning Reach of Social Learning and Culture in Animals' Lives

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Introduction

Culture – the totality of traditions acquired in a community by social learning from others – has increasingly been found to be pervasive not only in humans but in many animals' lives, with profound implications for comparative cognitive science as well as evolutionary biology, anthropology and conservation (Aplin, 2019; Brakes et al., 2019; Whiten, 2011; Whiten, 2017a; Whiten et al., 2017). Compared to individual learning, learning from experienced others can more safely and efficiently assimilate the wisdom already accumulated in those individuals.

The Reach of Culture Across Species and Behavioral Domains

Discoveries by my research group and others have charted the reach of culture across an ever-expanding diversity of vertebrate and invertebrate species, from primates to cetaceans, birds, fish and insects (Whitehead and Rendell, 2015; Whiten, 2017a, 2017b, Lachlan and Whiten, 2020). Over the present century this evidence has come to span numerous behavioral domains ranging from foraging, migration, vocal repertoires, tool use and social behavior.

The Reach of Social Learning Through Animals' Lifetimes

In many species cultural transmission is critical in juvenile phases, but recent studies have shown it also to be relevant through the lifetime, playing an important role where mature individuals disperse to other groups (Whiten and van de Waal, 2018). For example, in an experiment in which whole groups of wild vervet monkeys were initially trained to avoid one of two colored corn provisions because of a distasteful additive and later tested with no additive, all of 27 infants naïve to the corn took the color preferred in their group. However, males who dispersed on maturity to groups that ate a color opposite to that in their natal groups likewise readily adopted the new local norm they witnessed, a dramatic effect attributed to a generally adaptive disposition for social conformity (van de Waal, Borgeaud and Whiten, 2013).

The Cognitive Reach of Social Learning

The psychological reach of culture is reflected in the knowledge and skills an animal thus acquires, achieved via an array of different social learning processes. These have been found to range from the simplest, where learners' attention is simply channeled towards ecologically important cues, such as in foraging, to those where there is evidence of copying complex patterns of behavior or other elements such as tool use techniques (Whiten, 2021a,b). The prediction that cultural complexity will select for enhanced cultural cognition and encephalization (van Schaik and Burkart, 2011) has been supported by recent large-scale analyses across primates (Street et al., 2017).

Such social learning is further guided by a suite of adaptive learning biases. A variety of such biases have been identified in four major categories: those that are 'state-based' (e.g. copy when uncertain), 'frequency dependent' (e.g. copy what a majority of others do), 'model-based' (e.g. copy high rankers) or 'content based' (e.g. copy behavior seen to earn highest payoff) (Kendal et al., 2018). The complexity of decision-making can span more than one of these. For example, Bono et al. (2018) discovered that prediction of biases in whom to learn from required knowledge of three variables: the sex of the learner, the sex of the model witnessed and the relative payoff of the option chosen by the model.

The Question of Cumulative Culture

In humans, cumulative cultural change over generations has generated the complex cultural phenomena we witness today. Animal cultures have been thought to lack this cumulative power (Tennie, Call and Tomasello, 2009), but recent findings suggest that elementary versions may be important in animals' lives (Whiten, 2019).

Transmission chain experiments in which experienced individuals are progressively replaced by naïve recruits in small social groups of homing pigeons have begun to demonstrate contexts in which such cumulative change may occur (Sasaki and Biro, 2017). In wild populations of bighorn sheep, groups translocated to areas naïve to them initially ranged little, but over subsequent decades and several generations they demonstrated progressively enhanced skills in seasonal migrations exploiting higher and more distant optimal foraging patches (Jesmer et al. 2018). It now becomes of interest to unpick the spirals of individual contributions and cultural transmission that these occurrences implicate. For example, presenting chimpanzees with a challenging foraging problem requiring novel tool use, Vale et al. (2017) reported episodes in which different individuals contributed separate solutions to subcomponents of the task, which they then combined, creating innovations that spread more widely among others through social learning.

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