

Understanding cumulative cultural evolution

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In a narrow critique of two early papers in the literature on cumulative cultural evolution, Vaesen et al. (1) misunderstand the work they criticize, mischaracterize multiple lines of research, and selectively ignore much evidence. While largely recycling prior criticisms, they provide no new models, evidence, or explanations (2).

Not only do their criticisms of Henrich's (3) and Powell et al.'s (4) modeling assumptions miss their mark (2), but Vaesen et al. (1) also ignore many other models that do not rely on these assumptions yet arrive at similar predictions. These other models variously include conformist transmission and explore these processes using nonnormal distributions, discrete traits, networks, etc. (2, 5). Of course, no one expects demographic/population variables to be the only things that matter; cultural packages related to clothing or housing, for example, will vary with latitude for reasons unrelated to demographics, risk, or mobility.

Vaesen et al. (1) are correct that these models assume that at least some individuals can sometimes assess the relative success or payoffs of different traits or individuals, but they are incorrect in claiming that there is little evidence for such learning. First, they ignore a vast body of laboratory evidence showing that infants, children, and adults use cues of success, skill, or competence in learning (2, 6). Second, Vaesen et al. (1) also ignore work showing that (i) Hadza and Ache foragers acquire cultural information obliquely from broad networks (7) and (ii) success biases are well documented in traditional populations (2). Finally, the studies cited by Vaesen et al. (1) do not support their claims about vertical transmission; instead, all support the two-stage learning process used by Henrich (3), Powell et al. (4), and many others. Here,

individuals initially learn from their parents, and then update only if they observe others who are more successful than their parents. Evidence from fisher-horticulturalists and foragers support this pattern and shows that second-stage updating from nonparents is particularly prevalent in domains with high variation in skill/success. For example, Aka foragers learn from great hunters and prestigious shamans (2).

Vaesen et al. (1) ignore laboratory tests of these models (2). Using novel learning tasks, several experiments show how group size and interconnectedness influence the accumulation of skill, know-how, and complexity, and some demonstrate the "Tasmanian effect" (8). If the models are so poor, it is peculiar that they have withstood multiple experimental tests by independent researchers.

Vaesen et al. cite studies by Collard and coworkers (refs. 67, 70, 72, 73, 75, and 79 in ref. 1) that do not find a significant relationship between census population sizes and complexity. However, the theory explicitly predicts that it is the size of the population that shares information—the effective cultural population size (3)—that matters, and if there is extensive contact between local or linguistic groups, there is no reason to expect census population size to correspond to the theoretically relevant population. Inappropriately, Collard and coworkers used highly interconnected populations, and make no effort to measure these interconnections or deal with the conceptual problems of using census estimates (refs. 67, 70, 72, 73, 75, and 79 in ref. 1). Finally, Vaesen et al. (1) ignore important findings linking population size to both linguistic complexity and innovation rates (2, 9, 10).

1 Vaesen K, Collard M, Cosgrove R, Roebroeks W (2016) Population size does not explain past changes in cultural complexity. *Proc Natl Acad Sci USA* 113(16):E2241–E2247.

2 Henrich J, et al. (2015) Appendix to Understanding Cumulative Cultural Evolution: A Reply to Vaesen, Collard, et al. (June 20, 2016). Available at ssrn.com/abstract=2798257. Accessed September 30, 2016.

3 Henrich J (2004) Demography and cultural evolution: Why adaptive cultural processes produced maladaptive losses in Tasmania. *Am Antiq* 69(2):197–214.

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