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O'Brien and Laland point out that human culture is exceptional in its cumulative nature. This is often characterized by the ratchet effect, highlighting that high-fidelity social transmission can underpin the accumulation of trait modifications. They also note that the developmental niche-construction processes underlying cultural evolution are understudied. I agree that the evolutionary consequences of culturally constructed learning environments are indeed understudied and that attention to this area may provide a fresh assessment of cumulative cultural evolution.

An important focus of cumulative cultural evolution research is in assessing individual cognitive prerequisites that facilitate high-fidelity cultural transmission and the adoption of adaptive innovations (Ehn and Laland 2012). However, it is also important to consider the role of developmental niche construction and the ecological inheritance of learning environments, including forms of symbolic representation and material culture, on cumulative cultural evolution (Cole 1995; Sterelny 2012; Wheeler and Clark 2009).

Culturally derived scaffolding for learning can have a direct effect on the differential adoption and retention of cultural traits (cultural selection). For instance, pedagogical traditions in apprenticeships, including traditional patterns of intervention, correction, and collaboration may influence the fidelity of transmission and the potential for cumulative cultural evolution (Gergely and Csibra 2006; Tehrani and Reide 2008; Tennie, Call, and Tomasello 2009).

There is also the potential for cumulative cultural evolutionary dynamics to be shaped by forms of symbolic representation. Mathematical history provides particularly obvious examples, where invention of new notation systems, for instance Hindu-Arabic in place of Roman numerals or Feynman diagrams in quantum mechanics, dramatically altered the evolvability of research fields (Gauvain 1998).

Thus, for the cumulative cultural evolution of many traits, high-fidelity social transmission and the potential for invention may be critically affected by culturally constructed learning environments (Tennie, Call, and Tomasello 2009). Furthermore, a complete account of cognition required for cumulative cultural evolution may often be reliant on its extension beyond the mind of the individual and on its distributed nature across people and artefacts (Donald 2000; Hutchins 1995, 2008). Without accounting explicitly for the role of developmental niche construction and the ecological inheritance of learning environments, there can be an over- or misattribution of cognitive facility to the mind in order to explain the cumulative cultural evolution of skills such as computational tasks (Hutchins 1995).

O'Brien and Laland provide a detailed account of potential gene-culture coevolutionary pathways affecting the cumulative cultural evolution of farming technologies and medicinal practices. A key process in these dynamics is likely to be the niche construction of inherited learning environments, which themselves can be subject to cultural selection and affected by ecological and genetic evolutionary dynamics of human, crop, livestock, and pathogen populations. Thus, the simple ratchet analogy hides complex mechanisms that can result in cumulative cultural evolution of knowledge and beliefs (Tennie, Call, and Tomasello 2009).

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O'Brien and Laland advocate niche-construction theory and gene-culture coevolutionary theory as a broad theoretical framework useful to archaeology and anthropology. I would like to press this claim further and to argue that niche-construction theory offers a route toward encompassing the social and biological sciences in a single theoretical framework.

Durkheim argued that the social sciences study the emergent properties of social systems. In his statistical study of suicide (Durkheim 1952 [1897]), he proposed that the sociological dimension of suicide was to be found in the correlation between suicide rates and the relative coherence of society. Lansing (2003:185) points out Durkheim's remarkable prescience in anticipating the development of complex systems theory, arguing that the concept of fitness landscape developed by Sewell-Wright arose from the work of pioneers in statistics such as Durkheim. Lansing's study of Balinese water temple networks as complex adaptive systems found that, although local communities do not consciously attempt to create an optimal pattern of staggered cropping schedules for entire watersheds, the actual patterns closely resemble computer simulations of the optimal solution. Global control of terrace ecology emerges as local actors strike a balance between opposing constraints (Lansing 2003:199). Giddens's (1984:35) description of "structuration," the long-term process through which agents are bound together in a social network, is entirely compatible with this approach (cf. Kendal, forthcoming). O'Brien and Laland point out that "ecological inheritance more closely resembles the inheritance of land or other property than it does the inheritance of genes."

Durkheim used an analogy taken from Darwin to challenge his contemporary Tarde's account of the diffusion of innovations as a simple transmission chain, writing: "Darwin says that in a small area, opened to immigration, and where, consequently, the conflict of individuals must be acute, there is always to be seen a very great diversity in the species inhabiting it" (Durkheim 1933 [1893]:266; see also Layton 2010). When rural communities expand, Durkheim argued, they come into