Cultural evolution is not equivalent to Darwinian evolution

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Abstract: Darwinian evolution, defined as evolution arising from selection based directly on the properties of individuals, does not account for cultural constructs providing the organizational basis of human societies. The difficulty with linking Darwinian evolution to structural properties of cultural constructs is exemplified with kinship terminologies, a cultural construct that structures and delineates the domain of kin in human societies.

Cultural anthropologists, according to Mesoudi et al., are concerned with the same kind of issues and questions as evolutionary biologists. Because variability, inheritance, and selection also apply to cultural phenomena, then cultural anthropology, they suggest, could benefit by taking advantage of the theoretical and methodological advances made by evolutionary biologists. The only barrier, they note, is the unwarranted refusal by cultural anthropologists to drop their assumption that evolution (read: Darwinian evolution) is not relevant to understanding culture change. Yet cultural evolution, though not in the form of Darwinian evolution, has long been a central concept in anthropology: "Cultural selection . . . operates not on individuals but *on cultural traits* and *on societies*" (Carneiro 1985, p. 77, emphasis in the original). However, despite championing Darwinian evolution for understanding cultural evolution, the authors admit in the end that the matter may be more complex: "'social constructions' . . . have no real equivalent in the biological domain . . . [and this] requires a different evolutionary treatment from the one developed within biology" (target article, sect. 4, para. 5). So can we account for change within "culture as a kind of mental phenomenon" (D'Andrade 2001, p. 243) by reference to Darwinian evolution, where selection is based on properties of individuals? The answer is no (Read 2003). To see why, consider a universal cultural construct fundamental to human social systems, namely kinship, as it is expressed through a kinship terminology.

By a kinship terminology, I mean the terms that identify one's (cultural) kin; for example, mother, aunt, cousin, and so on, for English speakers. The terms are culture-specific (e.g., unlike some kinship terminologies, English speakers do not have separate terms for mother's sister versus father's sister); hence, there is a problem translating the terms from one language/culture to the terms of another language/culture. Analytically the translation problem is circumvented by mapping kin terms to a common genealogical domain that makes possible genealogical definitions of kin terms regardless of language, such as aunt = {parent's sister, parent's brother's wife} for English speakers.

We can see the social importance of kinship terminologies by considering the role of kinship in small-scale societies. Typically, societal membership is determined through kinship. Hunter-gatherers in the Kalahari Desert of Botswana, for example, refer to themselves as the *ju/wasi*, which means, roughly, "we, the real people" (Marshall 1976, p. 17). Real persons are one's kin, and one's kin are those persons included in the scope of reference of kin terms. The distinction between kin and non-kin is nontrivial, and for some groups, such as the Waorani of Ecuador, it meant the difference between being able to engage in social interaction or being killed on sight (Wilson & Yost 2001).

Terminological knowledge is located in individuals and hence can be considered to be part of the phenotype of individuals. Yet individual benefit does not arise, unlike for many biological traits, simply from having terminological knowledge as a trait. Instead, individual benefit arises from the properties of the social group formed of persons sharing the same terminology and who thereby are mutually kin.

How do we account for the macro-level phenomena of social relations and individual benefit structured through a kinship terminology? Mesoudi et al. consider that evolution occurs at the trait level because they accept uncritically the idea that macro-evolution is Darwinian microevolution writ large (but see Erwin 2000; Carroll 2001; Simons 2002; among others, for some of the issues involved). However, their argument does not work for kinship terminologies.

A terminology is not just a collection of terms, as it has a structural form (in the algebraic sense) determined by the way we compute kin relations using kin terms (Read 1984; 2001; 2005). If John, Mary, and Jim are English speakers and John refers to Mary by the kin term *aunt* and Mary refers to Jim by the kin term *son*, then when John refers to Jim by the kin term *cousin*, *cousin* is the product of the kin terms *aunt* and *son*. More generally, if person A (properly) refers to person B using the kin term *K* and person B (properly) refers to person C using the kin term *L*, then the product of K and L is the kin term *M* (if any) that A properly uses for person C. Through ethnographic elicitation of this kind of kin term usage, we can make evident a conceptual structure that expresses the manner in which the kin terms forming a particular terminology constitute a structured set of symbols (=terms).

The form of the structure is highly constrained. It can be constructed algorithmically by expanding a core structure so as to structurally introduce two basic properties of kinship terminologies: (1) reciprocity of kin terms, and (2) sex marking of kin terms. The core structure is generated algebraically by applying repeatedly the kin term product to the generating term(s), such as the kin term *parent* for the American kinship terminology.

Terminologies differ from one another with respect to the set of generating kin terms and the algorithms for introducing the above two terminological properties but share commonality by having structures that can be generated in this manner. Even more, the generative logic leads to 100% correct predictions of the genealogical definitions of kin terms, even though seemingly simple changes to a terminology (such as introducing the terms *aunt-in-law* and *uncle-in-law* into the American kinship terminology) would negate the ability to correctly predict genealogical definitions of kin terms.

The generative logic of terminologies would not arise from historically contingent selection based on phenotypic properties of individuals acting at the level of individual kin terms. Further, though terminologies are mental constructs transmitted in a social context through a developing child's enculturation, knowing in more detail the mapping of individual kin terms – seemingly good candidates for memes – onto neurological location(s) will not tell us much either about the structural arrangement of kin terms or about the processes used by the brain to infer the implicit organizational structure of a kinship terminology. The structural logic of kinship terminologies appears to be inferred, much as the brain infers the implicit organizational structure of a language. The selection acting on kinship terminologies occurs at the level of structural properties and their consequences for the social organization of kin determined through the kinship terminology.

Evo-devo, modularity, and evolvability: Insights for cultural evolution

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Abstract: Evolutionary developmental biology ("evo-devo") may provide insights and new methods for studies of cognition and cultural evolution. For example, I propose using cultural selection and individual learning to examine constraints on cultural evolution. Modularity, the idea that traits

https://doi.org/10.1017/S0140525X0638908X Published online by Cambridge University Press