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Comment

All social behavior is replication
Comment on "Replication and emergence in cultural transmission" by Monica Tamariz

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Monica Tamariz' article addresses the question of what counts as replication in cultural transmission (evolution). In language change, the domain of cultural evolution I am most familiar with, this debate in some form dates back to the late nineteenth century. On one view, the primary replicator is a speaker's knowledge of their language, their grammar as it is now called, and the replication process is language learning by an infant, or possibly a second language learner. On the other view, the primary replicator is an utterance or the linguistic structures produced therein (linguemes; [1]), and the replication process is speaking.

Tamariz argues that the primary locus of replication in cultural evolution is through acts of social behavior. She argues persuasively against the widespread view that the primary locus of replication is mental knowledge: 'a cultural trait in the learner's mind cannot be directly caused by a trait in the teacher's mind, if only because the former does not have access to the latter. Any causation must be mediated by observable, public proxies of the mental trait such as observed actions in the physical environment.' In contrast, social behaviors satisfy all of the definitional criteria to be replicators. I have no disagreement with this argument (see [1]).

However, Tamariz makes a distinction between two types of public social behaviors, and restricts her notion of replication to just one of them. The first type she calls 'inheritance'. Inheritance involves the acquisition of a cultural trait by a naïve learner, from another member of the culture, usually an expert in the cultural trait. Inheritance is characterized by imitating the behavior without being cognizant of, or at least not fully cognizant of, its normal social function. The second type she calls 'usage'. Usage is the production of a behavior, such as a linguistic utterance, 'for its normal purpose', which presupposes that the user has already learned the cultural trait to at least some degree of proficiency.

For Tamariz only 'inheritance' in her sense is replication. 'Usage' is emergent, along with mental traits that Tamariz also excludes from the replication process. In other words, Tamariz rejects mental traits as replicators in favor of behaviors—but she has retained learning rather than positing usage as the replication process. I find this to be a problematic and perhaps inconsistent position.

In a fully usage-based model of cultural evolution (such as [1]), all cultural behaviors are replicators, and replication occurs in all instances of usage. Each time I open my mouth to speak, for example, I replicate sounds, words and

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grammatical constructions that I have heard before (including, and especially, my own prior utterances containing them). Replication is rarely perfect, and 'mutations' are introduced in the replication process [3,4,2]. These altered replications may be biased, probably in terms of physiological constraints in phonetic articulation and audition (for sounds) and cognitive constraints on communication (for words and constructions).

Selection—differential replication—also operates in usage. I follow Hull's [5] General Analysis of Selection that introduces the role of interactor, an entity whose interaction with the environment causes replication to be differential. In Croft [1], I argue that the interactor is the speaker; social factors provide selection pressures that lead to differential replication of linguemes and hence the adoption of new linguistic conventions in the speech community. One piece of evidence for the independent role of social factors is that the physiologically or cognitively less favored variant of a replicator may nevertheless become established as a cultural convention in some cultures (albeit a minority of such cultures).

Tamariz argues that only imitation in the naïve learning process independent of mastery of function counts as replication. But it is unclear at what point in the learning process replication of behavior stops being 'inheritance' (replication) and becomes 'usage' (emergence). Learning of function is gradual. The meanings (function) of words and constructions change in expert usage, that is, usage by an adult member of the culture. A good example of this is the many changes in meaning of technical terms in a professional field such as linguistics or evolutionary theory.

An important criterion for a replicator that is not explicitly mentioned by Tamariz is that replicators can themselves be replicated, that is, replicators form lineages. Yet the functionless replications by naïve learners do not form lineages. Only usage that leads to social-interactional success gives rise to differential replication, that is, selection. Many utterances by language learners fit this category, but the vast majority of replications that are themselves replicated are produced by adult speakers.

The notion of 'function' is broader than the one implied by Tamariz in her distinction between 'inheritance' and 'usage'. For example, rituals still have a function even when the motivations for specific acts as part of the ritual have been forgotten or reinterpreted. In language use, phonemes (sounds) perform many important functions in the hierarchical organization of linguistic utterances, not to mention the function of social identity (accent), even if they do not in themselves communicate meaning.

I have argued that all usage is replication, and that usage by naïve learners does not have a privileged status. In fact, usage by naïve learners do not form long lineages and in fact is selected against. It is not always socially successful, and children do not form a social group whose behaviors are normally emulated. (In contrast, children emulate their older peers, and as Tamariz notes they are very good at doing so.) Instead, competent replication of social behaviors forms lineages and is subject to differential replication, that is, selection.

Nevertheless, there remain challenges for the view that replicators are instances of social behavior such as language use, and the replication process is (re)use of the social behavior. Words and constructions involve both form and meaning; and meaning is present in the interlocutor's minds. In the forthcoming second edition of Croft [1],[1] I suggest that Developmental Systems Theory may provide an answer to this problem. DST argues that the replicator is the life cycle of an organism. It is possible to conceive of the utterance/replicator as a life cycle, from the formation of an intention by the speaker through its expression in the utterance to the interpretation of the utterance by the hearer. Hence the cultural function of social behaviors may be part of cultural replicators.

References

[1] Croft William. Explaining language change: an evolutionary approach. London: Longman; 2000.
[2] Croft William. The origins of grammaticalization in the verbalization of experience. Linguistics 2010;48:1–48.
[3] Ohala John. Sound change is drawn from a pool of synchronic variation. In: Breivik Leiv Egil, Jahr Ernst Håkon, editors. Language change: contributions to the study of its causes. Berlin: Mouton de Gruyter; 1989. p. 173–98.
[4] Pierrehumbert Janet. Phonetic diversity, statistical learning, and acquisition of phonology. Lang Speech 2003;46:115–54.
[5] Hull David L. Science as a process: an evolutionary account of the social and conceptual development of science. Chicago: University of Chicago Press; 1988.

[1] The relevant argument is presented in greater detail at http://www.unm.edu/~wcroft/Papers/ELC2-Chap02.pdf.