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Chromodynamics of Accents?

Our social preferences are unique, allowing us to pursue collective endeavors with strangers at remarkably large scales. A lot of research has been devoted to explain why we came to be that way. Models have played a critical role, exposing the consistency of possible accounts to mathematical rigor. However, evaluating competing hypotheses requires the thorough comparison of theoretical models with empirical evidence and experimental studies. Emma Cohen carefully builds such a bridge between mathematical models of tag-based cooperation and the literature on accents. In this note, we argue that tag reliability is a necessary but not sufficient condition for a tag to facilitate the evolution of cooperation.

The most basic models of the evolution of cooperation consider two types. Cooperators pay a cost to help others, and defectors avoid paying the cost while reaping benefits from cooperators. When everyone is equally likely to interact with everyone else, cooperation does not evolve. This changes if alike types are more likely to interact with each other. If helpers assort such that interactions among them are dispro-

portionally frequent, then cooperation can evolve (Fletcher and Doebeli 2009). Within this framework, the role of models is to formalize and evaluate different mechanisms to produce such assortment. Tag-based cooperation is one such mechanism. If individuals cooperate with others that bear an arbitrary tag, cooperation is in principle possible. Help is preferentially channeled to those who share the tag, and thus cooperative interactions are assorted.

A way in which tag-based cooperation can work is if the tag and the cooperative behavior are tightly linked. This gives no room for faking the tag, and cooperation is stable (Haig 1996; Keller and Ross 1998). But if the tag and the cooperative behavior are only weakly linked, defectors can fake the tag, and cooperation breaks down. As a result, the plausibility of this mechanism is often judged on the existence of a “reliable” tag that is hard to fake. Cohen builds upon this and devotes a great deal of her argumentation toward convincing the readers that accents are reliable tags. However, the underlying reasoning arises from models that are inherently static and therefore ignore the dynamic nature of evolution.

In a model with mutations, any tag will be eventually faked. What makes a model work is that once a tag has been faked, a new signal must be established in order to exclude defectors. Whether tag-based cooperation can evolve therefore depends on who takes the lead in the race of faking and moving away from fakers. Two related and somehow contradictory characteristics determine this: as explained above, an appropriate tag needs to be hard to fake. But in addition, once the tag is forged, cooperators need the ability to swiftly establish another tag. What this implies is that tags need to be reliable, but they need to be inherently dynamic as well.

Emma Cohen makes a convincing case for accent reliability, but what about the capacity of accents to change once defectors have cracked them? This kind of dynamics is as important as tag reliability in theoretical models. Arguably, the dynamic nature of human language would seem to imply that accents are a good candidate for fluidity as well, but we believe that a systematic account on this issue, similar to the one presented for the case of reliability, would strengthen the case.

In addition, alternative models could incorporate the distinctive features of language and ancestral human interactions. For example, while many models of tag-based cooperation consider continuous tags in one or two dimensions (Antal et al. 2009; Riolo, Cohen, and Axelrod 2001) or even discrete tags (Jansen and Van Baalen 2006; Traulsen and Schuster 2003), accents may have multiple facets and are probably better described by multiple dimensions. This can be captured, for example, by set structured models in which every individual belongs to several sets, as described by Tarnita et al. (2009). Moreover, the large scale of human cooperation may not be described appropriately by pairwise interactions, dismissing more complex settings that could be particularly relevant in the case of humans (Gokhale and Traulsen 2010).

Theorists often note in passing that their tag-based models could be directly applicable to microbes, fads, or accents.

Often, such statements lack any empirical backup (e.g., Traulsen 2008). Cohen makes an important step toward a solid connection between such basic theoretical models and empirical accounts. While it may be sobering to see how few details of mathematical models turn out to have empirical relevance, it is important for modelers to understand on which level such a comparison is typically made.

The recipe for human sociality is likely to involve many ingredients, and tag-based cooperation based on accent may be one of them. In the end, it is unlikely that only one explanation will paint the complete picture of our social behavior, but evaluating the models in the light of empirical and experimental evidence is essential to determine which models matter, and how.