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Carl Brusse

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Adaptive signaling in a lineage explanation, needs to be adaptive

Carl Brusse ^{a,b}

^aSchool of Philosophy, The Australian National University, Canberra, Australia; ^bDepartment of Philosophy and Charles Perkins Centre, University of Sydney, Sydney, Australia

Lang and Kundt have presented what can be seen as a “lineage explanation” (Calcott, 2009): an explanatory sequence of incremental changes driven by plausible mechanisms, in this case the adaptive advantages of increasingly sophisticated forms of cooperative signaling. Evidence has been impressively marshaled to constrain the various causal mechanisms – this is what marks out genuine candidates for historical explanation from “just so” stories, as constructing a coherent narrative this rich and empirically detailed is a non-trivial task (Currie & Sterelny, 2017). The exact way that this has been done will no doubt be rigorously critiqued. But taking signaling theory and developing it from an abstraction into a fully-fledged lineage explanation is a valuable contribution to the literature, and well-deserving of the scrutiny.

I will instead focus on a small but significant theoretical point, to do with how to interpret commitment signals as an adaptive mechanism within that explanation. Breaking signals down into similarity, coalitional, and commitment signals is important, both for describing how ritual complexity builds up over time, and for the robustness that comes with multi-modal signaling. Like adaptive signaling as an evolutionary driver, much of this is translated over from the animal communication literature. In the translation from animal signaling to human cultural signaling though, biological fitness becomes less plausible as a universal driver of selective adaptation. Alternative interpretations are needed.

Adaptive signaling, as distinct from the closely related theory of credibility enhancing displays, or CREDs (Henrich, 2009), takes advantage of evolutionary game theory to explain the co-adaptation of sender and receiver strategies to one another (Maynard Smith & Harper, 2003). Henrich and others rightly point out that natural selection via reproductive fitness is an implausible explanation for the complex cultural phenotypes of ritual signaling systems themselves (distinct from the evolution of cognitive capacities which facilitate them). Luckily, models of adaptive signaling, understood via evolutionary game theory, only require *some* pairing of (i) payoff structures and (ii) strategy update mechanisms, such that players update their strategies in the direction of improved payoff. These can happen in economic and learning contexts as well as the biological/reproductive (Brusse et al., 2022, pp. 14–15), as demonstrated by the parallel signaling literature in economics.

In the case of similarity and coalitional signals, the interpretations are not problematic. Most signaling in non-human primates presumably evolved via natural selection. More learning-based similarity and coalitional signals in humans evolve because of the biased learning of signal-response strategies – an adaptive, cultural-selectionist interpretation is available here via imitation of successful models. In either case, payoff structures for the underlying signaling game (coordination games of mutual benefit) are realized by various benefits of social success.

But commitment signals are different in several important respects. As the authors note, they are not strictly mutualistic. There is partial conflict of interest between receivers who seek cooperative partners, and senders, who may be like-mindedly cooperative or would-be free riders. Signaling

equilibria for these payoff structures require either unfakeable signals of commitment, or fakeable signals with differential costs/benefits that disincentivize signaling by free-riders (differential direct signal costs, punishment, etc.). Again, for culturally transmitted ritual behavior there will be a cultural-selectionist interpretation.

But Lang and Kundt's choice here, Sosis's influential "perceived cost" interpretation of religious signaling (2003), is self-undermining. As argued elsewhere (Brusse, 2020, p. 283), perceived costs alone can't balance the payoff structure of signaling games in a way which both explains costly ritual and also gives it an evolved, adaptive function. Either cost-benefit perceptions are accurate (i.e., underlying incentives for honesty also exist, which is not part of the Sosis model), or they are not. If accurate, then they are redundant. But if not, they are maladaptive: either the committed/believers are paying too much for the benefits they get, or the free-riders/skeptics are missing a trick. Perception explains proximate behavior, but the ultimate explanatory burden shifts to explaining the existence and persistence of those same perceptions. This might not matter much in the contexts Sosis originally considered, such as in novel religious movements, or in concert with established techniques to manipulate and police the flock. But it is problematic for an incremental story about how we ever got to such levels of sophistication. It is implausible to explain the deep origin of substantive religious costs by offsetting them against the merely psychological benefits of acting in accordance with (costly) erroneous perceptions. This is especially true given that Sosis's motivating perceptions stem from religious beliefs, e.g., committed individuals only see ritual costs as worthwhile because of them.

Perceived costs are therefore insufficient for this component of Lang and Kundt's lineage explanation. They do not offer an adaptive mechanism to propel the evolution of commitment signals, they cry out for their own explanation, and they would leave commitment signals as something quite distinct from similarity and coalitional signals. Ironically, they are more like Henrich's credibility-enhancing displays than the signaling from animal communication. And something like the CREDs model would be helpful to explain how beliefs/perceptions and (signal) behaviors might stabilize each other.

This is by no means fatal, and there are easy fixes available. Lang and Kundt could hybridize their adaptive story with CREDs in the case of commitment signals, as the two models complement one other and make similar predictions (Brusse et al., 2022). Alternatively, a purely adaptive paradigm can be retained if more substantive cost-benefit interpretations of commitment signaling are used (Iannaccone, 1992). It might also help to locate the needed incentive differentials in the benefits of cooperation, not signal costs. For example, when compared to skeptics and flakes, committed individuals will tend to spend more beneficial time in the good graces of a community before falling out with it (Brusse, 2020). This might be all the game-theoretic incentive required for honest signaling (perhaps via religious sincerity) to be selected for.

Either way, Lang and Kundt's exciting maturation of signaling theory here shows that adaptive signaling, carefully applied, is an explanatory resource with considerable potential.

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ORCID

Carl Brusse  <http://orcid.org/0000-0001-5732-8750>

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