

Reply to Baumard and Liénard: Mechanistic accounts need to specify why reputation systems yield cooperative outcomes on observed scales

Baumard and Liénard's letter (1) is based on a misreading of our article (2) and unfamiliarity with the modern literature on the evolution of cooperation.

Baumard and Liénard misstate that we provide evidence that warriors get rewarded in proportion to their contribution. We actually say that older warriors are supposed to receive more and men of the same age equal shares, but actual distributions are often affected by opportunistic scrounging.

Baumard and Liénard argue that warfare is not group-functional, citing the effect of warfare on mortality and fertility. This logic is erroneous. It is irrelevant whether warfare is bad for groups on average. What matters is this: do groups that raid more effectively do better than groups that are ineffective? Baumard and Liénard's argument is analogous to arguing that selection cannot favor increased male aggression in dominance contests because it leads to increased mortality.

Baumard and Liénard argue that our analysis is a form of group functionalism that was once prevalent in anthropology. There is no connection between that literature and our work. Traditional functionalism did not adequately account for individual-level or group-level processes. The modern theory of the evolution of cooperation links game-theoretic models of individual-level processes to dynamics arising from intergroup competition (for example, refs. 3 and 4) and is an active area of research in biology and social sciences.

Baumard and Liénard misunderstand this theory. For example, they claim that if individuals are damaged by a defection, then they are "second parties," and imposing punishment is self-interested. However, punishment is self-interested only if the long-term benefit to each punisher is larger than his cost of

punishment, which is unlikely in large-scale collective action. We present detailed quantitative data indicating that raiding parties are large and include participants from several age groups, settlements, and territorial sections.

We question their claim that status and reputational benefits are sufficient to explain cooperation. Rewards and punishments can support costly but mutually beneficial cooperation by self-interested actors; but they can also support a vast array of other behaviors. Explaining cooperative behavior requires an account of why cooperative acts generate good reputation and non-cooperative acts elicit punishment. For example, Baumard and Liénard believe that rewarding warriors in proportion to their contribution is a "clear signature of self-interested behavior." However, reputation systems can potentially motivate men to fight in many ways—for dominance, nepotistic profits, or sectarian allegiance. Allocation of loot in proportion to contribution would be a clear signature that the reputation system in place maximizes the efficiency of the collective enterprise. There are two main explanations for this kind of outcome, and they both invoke between-group processes. In ancestral environments, modest background levels of genetic variation among groups may have led to a psychology that predisposes people to adopt such norms (5), or competition among culturally variable groups may lead to their spread (3). Our data fit more comfortably with the latter hypothesis, but the issue is far from settled.

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The authors declare no conflict of interest.

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