ARBITRARY HIERARCHY: A PRECEDENT FOR LANGUAGE?

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Arbitrary and Displaced Language

It is claimed that while certain of the design features of language are found in other animals' communication, only in that of humans are all features found simultaneously (Hockett, 1960). Here, focussing on one design feature (language's arbitrary nature), evidence from a computer model suggests that the two parts of Hockett's argument may be related. The model describes pressures which sustain the use of an arbitrary value in a society but which in doing so preclude the use of the value for displaced reference (another design feature). This suggests that in addition to optimizing pre-existent features, the evolution of human language may have involved resolving conflict between features which were mutually exclusive, a hallmark of transitional change (Maynard-Smith & Szathmary, 1997)

Hierarchy Formed by Historical Asymetry

In many species individuals are organized into a transitive hierarchy. This reduces the cost of aggression in cases of competition for limited resources when the lower-ranked individual in an encounter becomes less likely to escalate conflict with the higher-ranked individual. How such hierarchies are formed is difficult to explain because models have shown that the probability of a group forming a transitive hierarchy based on individuals' Resource Holding Power (Parker, 1974) is very low. An explanation in terms of historical asymetries has been proposed (Van Doorn, Hengeveld, & Weissing, 2003). The idea is that when deciding whether to contest or concede a resource individuals are influenced by the outcomes of previous encounters. Encounters experienced or observed by the individual are used to determine this winner-loser effect. A hierarchy based on winner-loser effects is said to be arbitrary because individuals do not fully exploit their RHP but accept their place in the hierarchy based on a limited number of escalated conflicts despite the fact that this record of their conflicts may not accurately represent their RHP. An explanation for this is that the cost paid in injury resulting from the aggression required to make further discovery may be greater than the benefit that results from improvement in rank.

Model

This explanation was examined by means of individual based computer simulation. In a two dimensional world individuals move randomly in search of limited resources, if two alight on the same resource the possibility for conflict is created. The outcome of this encounter is determined by individuals playing the Hawk/Dove game (Maynard Smith, 1982) in which an individual must either contest the resource and risk aggression or cede it. Two sources of information are available to players to help decide which move to play: the opponent's RHP rank which correlates with the likelihood of winning an escalted conflict should one arise; and the opponents social rank which is assumed to be created by winner-loser interactions. A parameter determines the extent of variance between RHP rank and social rank. Individuals are able to detect that they have been placed in a position ranked lower than their RHP merits. Individuals are selected for reproduction according to fitness determined by the benefit of a higher ranking and the cost of aggression. The evolutionary outcome when individuals can improve their arbitrarily assigned position, by leveraging RHP, was tested. Within a limited range determined by the cost of aggression relative to the value of resource, and the degree of variance between RHP rank and social rank, the strategy that respects the arbitrary hierarchy is stable against invasion by the RHP strategy, beyond this range individuals that ignore the social arrangement predominate in the population and a hierarchy determined on the basis of physical characteristics is formed.

Significance for Language Evolution

It is often asked in the context of language evolution why an individual should benefit from respecting an arbitrary symbolic order when tangible evidence presents a more reliable alternative (Knight, 2008). In the current case social coordination on the arbitrary determination raises the cost of challenge to it sufficiently to render the strategy disadvantageous . Despite the fact that interactions are dyadic and that no norm is inserted exogenously into the model, the society is able to sustain an arbitrary determination, one which it pays individuals even with full knowledge, to respect. It is suggested that the same dyadic interactions, were they to occur in isolation from the social context, would result in the replacement of the arbitrary determination by the logic of individual physical superiority. Here there is a paradox: the same inertia in hierarchy which underwrote the arbitrary agreement may preclude its re-presentation, this is because displacing its use implies disruption to the current instance of hierarchy. Considered in isolation from other design features, a precedent for arbitrary language can be found, more challenging is to explain how arbitrary value and displacement can coexist given that the current model succeeds in producing one only by precluding the other.

References

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