A MODEL OF THE EVOLUTION OF FREQUENT SOCIAL COMMUNICATION

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Nonhuman primates monitor their social network through direct contact and observation, maintaining a model of their groups dominance hierarchy (Bergman et al., 2003). In dense populations this social monitoring may be the primary function of vigilance behaviour and should increase with group size and density (Hirsch, 2002). One widespread method of social monitoring involves individuals extracting social information from signalling interactions between conspecifics (*Social Eavesdropping*) (Peake, 2005). Information acquired in this way could reflect the group's social structure (Cheney & Seyfarth, 2005) and may also display many properties of human language (Seyfarth et al., 2005). Some species go further while eavesdropping by uttering specific vocalisations that may function as a comment on the interaction to other group members (Brumm et al., 2005).

"A crucial step in language evolution occurred when individuals came under strong selective pressure to communicate their thoughts, as opposed to simply extracting information from the calls of others" (Seyfarth et al., 2005). Language enables this further mechanism for social monitoring, allowing the exchange of social information beyond contact and observation, and may have evolved for this purpose (Dunbar, 1996). Human language use differs from the above accounts of nonhuman primate communication in certain ways: the ability to refer to individuals and events remote in space or time (*Displacement*) (Hockett, 1960); and, perhaps unique to humans (Tomasello, 1999), the tendency to frequently share thoughts and feelings with others (*Mitteilungsbedürfnis*) (Fitch, 2010).

Previous simulations have shown that larger group sizes can increase the probability of choosing to exchange social information (*Gossip*) over engaging in physical contact (*Grooming*) (Slingerland et al., 2009). They consider the tradeoff between gossip and grooming in an unstructured population. I propose a computational model of communication in a structured, dynamic population of agents that monitor their social network, to show the conditions under which the frequent exchange of social information can evolve. The population consists of a number of

agents embedded in a social network. Agents observe interaction events between other agents and can communicate these events to their neighbours with a certain variable probability. Agents receive fitness based on the number and quality of interactions they participate in, and knowledge of interactions that they have gained through observation or communication. In addition, this knowledge determines who the agents communicate and interact with. The model demonstrates the effect of group size and population structure on the probability of communication. Group size can be the selective pressure that drives the frequency of communication, where contact or observation is not sufficient to maintain a stable social network.

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