BROADCAST TRANSMISSION, SIGNAL SECRECY AND GESTURAL PRIMACY HYPOTHESIS

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In current literature, a number of standard lines of evidence reemerge in support of the hypothesis that the initial, "bootstrapping" stage of the evolution of language was gestural. However, one specific feature of gestural communication consistent with this hypothesis has been given surprisingly little attention. The visual modality makes gestural signals more secret than vocal signals (lack of broadcast transmission). The high relevance of secrecy is derived from the fundamental constraint on language evolution: the transfer of honest messages itself is a form of cooperation, and therefore not a naturally evolutionarily stable strategy. Consequently, greater secrecy of gestural communication constitutes a potentially important factor that should not fail to be represented in more comprehensive models of the emergence of protolanguage.

The idea of gestural primacy (in the evolution of language), in its various forms, has attracted numerous modern supporters (Hewes 1973, Armstrong et al. 1994, Corballis 2002, among many others), as well as several sceptics (e.g. MacNeilage & Davis 2005), with a small but notable minority denouncing it as a non-issue (Bickerton 2005). Its proponents adduce a wide range of evidence, focussing on the rigidity of preexisting primate vocal communication, iconicity of gestures, sign language acquisition, cortical control of the hand, and many others. However, one very interesting feature of gestural signals, the greater potential secrecy resulting from the lack of broadcast transmission, has so far remained unexplored, despite its strict relevance to the evolutionary context. At the same time, we have found it to be neglected in standard psychological, linguistic, and ethological approaches to nonverbal communication in humans (Feldman and Rimé 1991, McNeill 2000; Atkinson and Heritage 1989; Eibl-Eibesfeldt 1989).

1. Definitions and caveats

It is important to voice a number of caveats at the outset. Firstly, we follow Hewes (1996) in giving the pivotal term *gesture* a relatively broad interpretation. In the present context, "gestures" are primarily defined as the voluntary communicative movements of the arm, hand and fingers. Somewhat less centrally, they also include elements of proxemics, posture and orientation, facial expressions, and gaze direction. On the other hand, gestures as understood here do not refer to the articulatory gestures involved in speech production, nor to non-intentional bodily signals (affective gestures), although they may form a continuum with the latter.

Secondly, it must be emphasised that the present paper deals specifically with the very earliest stage of the phylogenetic emergence of languagelike communication. We subscribe to the widely held position that language as known today was preceded by a "simpler" protolanguage. We remain noncommittal as to the exact nature of protolanguage (e.g. holistic versus atomic), but assume it to be distinguished by the lack of generative syntax, but the presence of the conventional sign (*sensu* Zlatev et al. 2005).

Thirdly, it should be noted that this text concerns broadcast transmission only with respect to its consequences to secrecy ("privacy", "addressee discrimination"). The general implications of broadcast transmission of a communication system are much wider, including such aspects as independence from visibility conditions and line of sight, but they lie outside the scope of the present paper[1].

2. The fundamental constraint on the evolution of communication

A standard, intuitive approach to explaining the absence of language in nonhuman primates is to look to their cognitive, conceptual or physical limitations (relative to humans). Such a position implicitly assumes a natural motivation to exchange honest messages, only held back by the lack of suitable means of expression. This, in turn, is rooted in an intuitive view on the naturalness of cooperation, additionally backed up by the group selectionist mindset popular in the first half of the past century. From that perspective, the

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[1] It is worth noting that once the argument becomes framed in terms of the *advantages* of one transmission channel over the other (as is often the case), it instantly loses its relevance to the issue of gestural primacy. The question of which communication system is more efficient is logically independent from the question of which communication system is more natural to evolve in an ancestral primate: "which is better" is fully dissociable from "which came first".

presence of extensive cooperation between nonkin in humans is expected; it is the *lack* of such cooperation in other primates that becomes the theoretical problem in want of an explanation.

The above explanatory pattern has been reversed by the introduction into evolutionary theory of the gene's eye view (Dawkins 1976) and game-theoretic logic (Maynard Smith 1982). However, the relation between *cooperation* and *communication* remains complicated, with communication often seen essentially as a mere means for establishing the cooperative behaviour proper (e.g. Gärdenfors 2002). It takes another vital step to realise that the exchange of honest messages is a special case of communication *that is itself a form of cooperation*. As such, it requires special conditions for emergence (such as kinship, byproduct mutualism, group selection, reciprocity – see e.g. Dugatkin 2002), and generates specific predictions as to its nature (Krebs and Dawkins 1984).

Communication in general is constrained by the honesty of signals. Since receivers are selected not to respond to dishonest messages – ones that fail to be reliably correlated with their "contents" – in the absence of signal honesty communication breaks down. Honesty can be guaranteed in two different ways, reflecting two models of social interaction. They result in two distinct kinds of signalling that characteristically differ in their expensiveness (Krebs and Dawkins 1984; see also Noble 2000, who nevertheless generally endorses this conclusion). Typically the interests of the individuals and their genes are conflicting, and communication spirals into an arms race between "costly advertising" and "sales resistance". Here, honesty of a signal is certified by its being expensive and thus difficult to fake. The costs incurred on the signallers are diverse and involve minimally the expenditure of valuable resources such as time, energy, attention – but they can also include attracting predators, warning potential prey, or otherwise handicapping the animal in performing a simultaneous action (see also point 4).

However, in cooperative interactions, honesty is intrinsically present, and need not be backed up by signal expensiveness. In such a model, selection pressures act *against* signal expensiveness, favouring the emergence of "cheap" signalling. In particular, this is relevant to signalling in language, which follows the latter pattern of communicative interactions.

To sum up, the emergence of language-like communication necessarily presupposes the cooperative spectrum of the payoff matrix. Furthermore, it strongly predicts the signals used in such a type of communication to minimise their conspicuousness as well as all other kinds of costs.

3. Broadcast transmission

The concept of broadcast transmission was defined by Hockett (1977) as one of the design features of language. The idea of broadcast transmission captures a basic trait of verbal communication, which results from its dependence on the vocal-auditory transmission channel. Under canonical conditions, a vocal signal travels in all directions from its source, its detectability being restricted only by the distance from the sender (and the sensory equipment of potential decoders). This fact has a number of consequences, but in the present context, it is important that a vocally coded message is available indiscriminately to all individuals within the hearing range. The signaller is normally unable to confine the scope of addressees of its message.

It is of interest to note that this problem was recognised as early as Hockett himself (1977: 131): "The situation is like that in bidding at bridge, where any information sent to one's partner is also (barring resort to unannounced conventions, which is cheating) transmitted to opponents. There must be many ecological conditions in which this public nature of sound is potentially contrasurvival."

In this respect, gestural communication stands in a clear contrast with vocal communication. Its dependence on the visual mode, despite being limiting in other ways, does not lead to broadcast transmission, allowing the sender to select the addressees of the message.

4. The costs of signalling in (proto)language

Language is a communicative system distinguished by its very high flexibility in the range, kind and complexity of transferred messages. This is founded on *detached representation* (Gärdenfors 1996), which affords linguistic communication with essential independence from contextual, thematic, etc. constraints. This is a qualitative difference from nonlinguistic communication systems, and we assume it to be characteristic of protolanguage, at least to a considerable extent. The use of conventional signs endows protolanguage, despite its limited compositionality/productivity, with the ability to represent states, events, relations, etc. in the world in a rich form that can be assigned, or at least effectively interpreted in terms of, truth values[2].

As stated in point 2, all signalling is costly, principally in ways that are directly related to the production of the message, rather than to its "content".

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[2] This need not imply an explicitly propositional representation format. For a possible format see e.g. Hurford (2006).

Nevertheless, signalling may bear yet another type of consequences that rise to prominence in increasingly language-like forms of communication. These pertain to the content of the message. In so far as other parties are capable of acting on the disclosed information in ways harmful to the signaller, this reduces the signaller's fitness and therefore can be conceptualised as a cost.

Such costs may be negligible for most kinds of animal communication. This changes radically in protolanguage, which enables its users to convey a qualitatively different kind of information: rich information about the location and ways of access to food and other resources or about the history of social interactions (the "who did what to whom"). Such information constitutes valuable knowledge, and the evolutionary costs on the individual unintentionally divulging it to "eavesdropping" competitors and opponents are proportional to its high value.

It must be especially emphasised that the above constraint is particularly relevant to the early stages of the development of language-like communication, where the cooperative context of communication is fragile. This is so because – as is well known – language introduces or facilitates a range of normative mechanisms, such as reciprocity and punishment, that bolster cooperation; cooperation and language co-evolve. Therefore, the ability to discriminate between the receivers of the message would have been particularly important in the "bootstrapping" phase of the emergence of protolanguage.

5. The secrecy of gestural signals

Gestural communication has so far been little studied with respect to signal secrecy. However, secrecy resulting from the lack of broadcast transmission appears to be a prominent trait of the use of gestures in present day humans. When gestural communication occurs between speakers capable of vocal communication, it is likely to follow from the effort to constrain the number of addressees, and is a strong indicator of a conflict of interests with a third party present in the vicinity. A strong link between the use of gestural communication under default audibility conditions and the need of secrecy, motivated by a conflict of interests, is supported by diverse lines of circumstantial evidence, some of which are enumerated below:

– parenthetical signals that qualify, or even contradict, the vocally transmitted information, are often designed to be inaccessible to part of the receivers of the vocal message (e.g. a conspiratorial wink accompanying a vocal statement) – see Scheflen 1972;

- in contexts involving team competitions, the secrecy of tactical decisions is secured by reverting to the gestural mode, e.g. by taking advantage of the blocked line of sight of their opponents – see fig. 1;
- thieves operating in public places are known to depend on gestures to coordinate their actions in a manner designed to minimise conspicuousness;
- indigenous people of the Kalahari Desert resort to sign language during hunting; this case represents a markedly different type of secrecy from the ones described above: here, the use gestures is not motivated by the intention to hide the content of the message but by the intention to hide (from prey) the very act of communication.

Figure 1. Signals used in a team-competitive context (beach volleyball).

As already noted, secretive use of gestures has not been given attention in communication studies. Our work should be seen as a preliminary attempt to bridge this gap. Given the speculative nature of our claims, we have designed a set of role-play experiments and hope that, in the wake of them, we will be able to give these claims a more empirical footing.

6. Conclusion

The argument outlined above is conceptually simple. The specific thesis advocated here is that the use of gestures counters the disadvantage incurred by the "broadcast transmission" feature characterising vocal communication. We suggest that this apparently slight disadvantage becomes magnified in more human-like interactions relying on more language-like communication, where the cost of divulging valuable information becomes an important factor. The gestural mode of communication, making use of the visual channel of

transmission and thus being more secret, allows one to choose the receivers of its messages more discriminately.

The above argument, which can be referred to as the "gestural secrecy argument" is limited in its scope. It does not constitute a separate scenario of the evolution of protolanguage; rather, it identifies a potentially powerful factor that should be included into existing scenarios. Also, the argument does not address the central issue of why communication in hominids took a cooperative course in the first place. Still, it lends certain support to gestural rather than vocal theories of language origins, showing them to be more economical in the above respect. Further necessary research includes the incorporation of the factor of signal secrecy into more formal modelling of (proto)language origins, as well as empirical studies of signal secrecy in present-day gestural communication.

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