

GRADUALISM IN THE EVOLUTION OF OSTENSIVE COMMUNICATION

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Most human communication is ostensive, and language use is the paradigmatic example. Here we offer a novel hypothesis about its gradual evolution in humans. We describe the graded distinctions between ostensive communication and other forms of intentional manipulation of mental states. On this basis, we show how ostensive communication could have evolved as a gradual empowerment of other social cognitive abilities to manipulate the mental states of others. We then describe the sort of social ecology in which ostensive communication is adaptive and evolutionarily stable. Specifically, we propose that cognitive processes specialised for ostensive communication will evolve only in a partner choice social ecology, where audience are able to withdraw their trust and select their informants with a high degree of possibility. We conclude with a novel suggestion about the nature of much non-human primate communication.

1. Introduction

According to many lines of argument, linguistic communication, and indeed many instances of non-linguistic communication too, such as exaggerated movements, pointing, and so on, is founded on a capacity of mind to express and recognize informative intentions, commonly called *ostensive communication* or an *interaction engine* (Sperber & Origgi, 2000; Levinson, 2006; Tomasello, 2008; Scott-Phillips, 2015). In describing this capacity, different theoretical perspectives differ in some of the detail but all agree that it is a nuanced and powerful means of social interaction, which emerges early and reliably in human development and which is grounded, one way or another, in social cognitive abilities to represent others' mental states (mindreading).

There is however a relative dearth of detail about evolutionary continuity. A common criticism is that human communicative abilities are often presented with few graded distinctions, making discussion of their gradual evolution difficult (e.g. Bar-On, 2013; Townsend et al., 2017). One approach to this problem has been to identify supposedly minimal cognitive requirements for ostensive communication (Moore, 2017a; 2017b). Others have sketched outlines of how ostensive communication could indeed evolve in a gradual manner (e.g. Sperber, 2000; Wharton, 2006; Scott-Phillips, 2015) – but these accounts lack detail, particularly about the sort of social ecology in which human communicative abilities might evolve.

Here we delineate key graded distinctions within ostensive communication, and their relevance to issues of evolutionary gradualism. We first (§2) distinguish four distinct subsets of manipulative intention (Figure 1), elaborating on each with examples. We then (§3) use this framework to describe the sort of social ecology in which the various cognitive processes involved in ostensive communication might co-evolve and be stable. We conclude (§4) that the emergence of ostensive communication in humans was driven not by the emergence of a wholly different mode of interaction, but instead by a shift in social ecology towards greater emphasis on social reputation and partner choice, which caused existing great ape social cognition to become increasingly specialised for the task of expressing and recognising informative intentions.

Note that while our analysis is focused on the production side, a complementary analysis of the comprehension side is also possible (and is not simply a mirror of the production side), but is omitted for reasons of space.

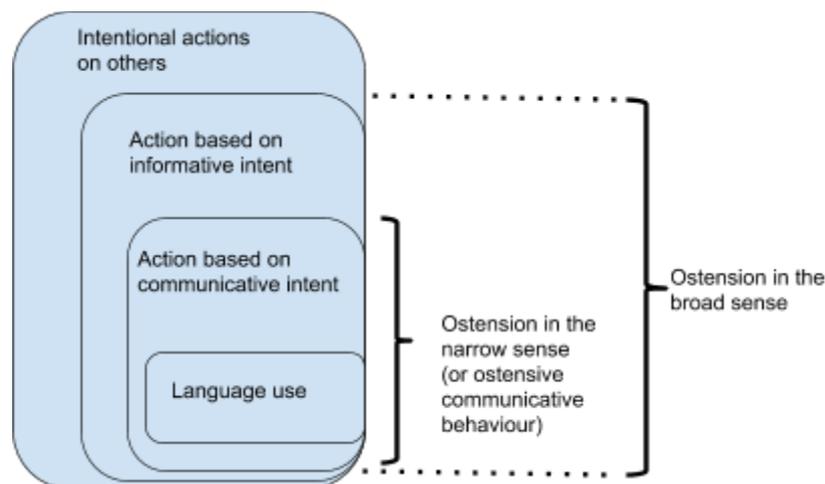


Figure 1. **Four embedded subsets of manipulative intention.** We elaborate on the contents of each in §2. See footnote 2 for the distinction between ostension in broad and narrow senses.

2. Embedded subsets of manipulative intention

Biological life is fundamentally interconnected: whatever organisms do, they cannot help but have effects on the world around them, including other organisms. In many cases effects on other organisms are merely incidental, but sometimes they are functional. Such effects are often called ‘manipulation’ (and

this word is used regardless of whether the effect is beneficial to the manipulated organism; see Krebs & Dawkins, 1984; Maynard Smith & Harper, 2003). The mechanisms that produce manipulative effects are many and varied, and are often not intentional. They might instead be, for instance, only physiological, as in the case of, say, butterfly wing patterns; or chemical, as in the case of, say, quorum sensing (see Scott-Phillips et al., 2014). Here we focus only on intentional manipulation, distinguishing four embedded categories and their effects on others.

2.1. Intentional action on others

The broadest set are behaviours that are intentional and manipulative. For instance, experimental studies show how orangutan mothers will, if necessary, use their offspring as physical tools (Völter et al., 2015). Because of their small size, infants can reach food in locations that the mother cannot reach, so mothers can (and do) use them to reach the food, with the mother then consuming the food herself. Intentional manipulation can also aim at internal and mental states: some forms of startling, frightening and arousing others can all be manipulative in this way. Note, however, that they are not necessarily directly aimed at transmitting information, making others acquire beliefs, or induce any other *epistemic* change to others' mental states.

2.2. Action based on informative intent

In the second set are behaviours that are intended to inform others, and which can do so without overtly bringing attention to the informative intention itself.

An individual might dress in a smart and conservative way, as a means to inform others of her competence and professionalism yet without bringing excessive attention to oneself. Conspicuous consumption is intended to provide evidence of wealth and other markers of status. In the presence of others we might adopt a bodily posture that suggests, say, social ease and competence; and while this can be done in an overtly intentional or otherwise exaggerated way, it need not be. More generally, impression management, in which individuals present themselves in ways intended (subconsciously or otherwise) to generate and maintain a positive image in the eyes of others, but without overtly bringing attention to this informative intent, is a ubiquitous and important feature of human social life.

Such behaviour can generate a degree of shared knowledge about the actor's informative intent. However while shared knowledge is a common outcome, it is not necessarily so, and in fact in some special cases the actor might have

strategic motives to actively keep her informative intent hidden or at least deniable. A criminal who plants misleading cues in a crime scene is acting on informative intent while simultaneously hiding that intent. More innocently, a dinner guest who wishes to have more wine but, recognizing it would be impolite to ask directly, might wait until her hosts' attention is elsewhere and then move her empty glass to a conspicuous location where it will, in due course, be noticed (Grosse et al., 2013). Public acts of public generosity might sometimes fall within this category also.

Looking comparatively, we take it as plausible that informative intentions exist in other primates and possibly some other species too. The key comparative questions are, in our view, whether any non-human species acts in the ways described in the next section.

2.3. Action based on communicative intent

In this third set are behaviours performed not only with an intention to inform an audience (as per §2.2) but, more than this, to make the actor's informative intent mutually known (and not just shared). Such behaviour is also known as overt intentionality or ostensive communication (but see §5).

To see the difference between this set and the one above, consider two possible ways in which Mary might satisfy her intent that Peter be informed that some berries are edible. One way is to do this is to simply eat the berries in Peter's company (without bringing any particular attention to the fact that she is doing this). In that case Mary has an informative intention which she acts on by providing evidence¹ that the berries are edible, without giving any overt evidence that she is acting on an informative intention. Instead she relies on Peter attending to her behaviour and hence drawing the inference that the berries are edible. This behaviour belongs in the second embedded subset (i.e. in §2.2). There is however an alternative. Mary might not eat the berries at all, but instead mime eating them, perhaps with exaggerated movements and while tapping her tummy. Here she has the same informative intention but provides evidence only about the intention itself, and not directly about the berries as such. Such behaviour, which makes her informative intentions mutual knowledge between Peter and Mary, belongs in the third embedded subset.

Mutual knowledge about informative intent generates meaning. This was Grice's key insight, e.g. “‘*A* meant something by *x*’ is (roughly) equivalent to ‘*A* intended the utterance of *x* to produce some effect in an audience *by means of* the recognition of this intention’” (1957, p.385, italics added). Several studies in

¹ Evidence independent of recognition and interpretation of Mary's informative intent.

experimental semiotics illustrate this effect in a dramatic way, by showing how behaviours produced in exaggerated ways can generate mutual knowledge about informative intent, and hence bootstrap the emergence of meaning and communication systems (e.g. Scott-Phillips et al., 2009; Newman-Norlund et al., 2009; de Ruiter et al., 2010).

However, while we have presented the distinction between this subset and the one above as categorical, it is more likely to be graded. In some cases, as with Mary's mimes or when using language, the recognition of the informative intention is essential for the observer to acquire the intended piece of information (else Peter might just think that Mary is just behaving strangely). In some other cases the recognition of the informative intention play only a small or helping role for the observer to acquire the piece of information. Suppose, for instance, that Mary eats the berries, and does so maintaining clear but not exaggerated eye contact with Peter, with some small amount of extra definition in her bodily movements. In this way she provides clear evidence that the berries are edible (as per §2.2) but also some limited evidence of her intention that Peter believe that the berries are edible (as per this section).

The possibility of graded distinctions between this set and the one above creates space for shaded differences between human ostensive communication and the social cognition of other great apes. Humans are highly competent ostensive communicators with correspondingly specialised cognitive processes (Sperber & Wilson, 2002). However we see no fundamental or inherent cognitive limitation to the expression of informative intentions in non-humans, at least in some tentative or otherwise imperfect way. In particular, informative intentions could in principle be expressed and recognised with general (not specialised) abilities of mental metarepresentation (mindreading), an ability that humans appear to share with several great ape species (Call and Tomasello, 2008; Krupenye et al., 2016). If so, then the gradual evolution of ostensive communication would involve the gradual evolution of cognitive processes dedicated to that goal.

This raises the question of why there should be any differences at all between human and non-human communication. We shall suggest that, rather than any deep cognitive limitation, social-ecological factors constrain the contexts in which action based on communicative intent is both stable and beneficial; and hence that absent such contexts, cognitive processes specialised for the expression and recognition of informative intentions are unlikely to evolve as an ordinary part of the cognitive phenotype. We develop this claim in the next section (§3), after we have described the final embedded subset, regarding language itself.

2.4. Language use

The fourth, innermost set features the same intentions as the previous set (§2.3), but is distinguished by the way in which those intentions are satisfied. Actors can make informative intentions mutually manifest (common ground) in many ways (e.g. overemphasis, mimicking, etc), including the use of culturally evolved conventions the very function of which is to help make informative intentions manifest. Pointing and nodding are examples, but the most productive means are languages: systematically structured sets of morphemes, phonemes and other constituent parts. Put simply, it is the culturally evolved function of linguistic items to help make informative intentions manifest, and hence to help make ostensive behaviour more accurate and efficacious than it otherwise would be (Origgi & Sperber, 2000; Scott-Phillips, 2017).

3. The social ecology of ostensive communication

We suggested above that the basic cognitive processes that make ostensive communication possible might be shared between great ape species, to some degree at least. At the same time, even if any non-human species does communicate in a broadly (or ‘proto’) ostensive way,² they clearly do not do so as habitually or with the same fluency as humans. Why might this be? Here we offer an answer based on differences in the social ecologies in which humans and non-human primates each live. Specifically, we suggest that the cognitive processes involved in the production of ostensive behaviours are stable only in social ecologies with high levels of partner choice i.e. those in which individuals choose between prospective partners for future social and collaborative activity.

In particular, action based on communicative intent (§2.3) will be adaptive if the audience extends, at least in a tentatively and provisional way, a presumption of cooperative intent towards the communicator. Returning to the example of Mary not eating berries but instead miming and tapping her tummy, we said that this behaviour provides evidence of her intention that Peter believe that the berries are edible – but that is true only if Peter presumes some cooperative intent on her part. If he did not then her behaviour would not motivate a search for the information that makes it worth attending the ostensive

² Within pragmatics the word ostension was first used in a precise and constrained (narrow) way, for the actions described in §2.3 and §2.4 (Sperber & Wilson, 1986/1995). Since then a sizable literature has developed, studying ostension from many perspectives including development and evolution (e.g. Gómez, 1996; Csibra, 2010; Tomasello, 2008; Moore, 2013). In the course of this progress the word has broadened in scope to sometimes include behaviours from one level further out (§2.2).

behaviour. Thus, action based on communicative intent provides benefits by increasing (massively) the communicator's capacity to manipulate mental states.

Prospective audiences can also benefit, if they are provided with relevant information – but why should that be the case? Presumptions of cooperativeness towards others are prone to exploitation and, absent other considerations, they will cause the system to collapse. And indeed such presumptions are often gamed. Lying is an attempt to exploit them, suggesting that behaviour is worthy of attention and interpretation when it is in fact not.

At the ultimate level this problem is resolved, in several species, by reputational effects (Lachmann et al., 2001; Scott-Phillips, 2008). If audiences can choose communication partners based on past reputation, communicators will tend to be honest, maintaining the stability of the system. At the proximate level the problem is resolved (in humans) by a suite of cognitive processes that filter ostensibly communicated information, defending against the risk of misinformation (Sperber et al., 2010; Mercier, 2020).

Collectively known as epistemic vigilance, this suite of cognitive processes enables the stabilisation of ostensive communication in two ways. First, they impose a check on what is understood in communication, so that it might be distrusted. In other words, they differentiate comprehension from acceptance. This reduces the (expected) cost of extending a presumption of cooperativeness towards communicators, because it prevents much potentially misleading information from actually misleading. Second, epistemic vigilance allows audiences to identify misleading communicators, and hence adjust the attention and trust they are willing to grant.

Crucially, this second effect of epistemic vigilance has substantive negative consequences for unreliable communicators, who gradually lose the possibility of manipulating others' minds by means of ostensive communication – but only in a partner choice social ecology, in which individuals can gain and lose reputations, and can choose between prospective partners for future social and collaborative activity. Absent such an ecology, the cognitive processes involved in communication are highly prone to exploitation, misinformation and instability; but within it, it becomes the communicators' own interest to make it worthwhile for prospective audiences to attend to action that is based on communicative intent (Scott-Phillips, 2010; Sperber, 2013). Furthermore, the informative intent is made *mutually* manifest. This makes the communicator accountable for the relevance of what she communicates, further reinforcing the effects of partner choice (Bonalumi et al., accepted).

6. Conclusion: Some light on evolutionary gradualism

Humans have cognitive processes specialised for the core aspects of ostensive communication (e.g. Origgi & Sperber, 2000; Sperber & Wilson, 2002; Sperber et al., 2010; Csibra and Gergely, 2011; Sperber, 2013). But these various processes are all mutually dependent on one another and as such must have co-evolved, with audiences' cognitive traits constituting the social ecology of communicators', and vice-versa. A key question for language evolution is how and why this co-evolution might occur in a gradual manner.

We suggest that the answer to this question does not lie in identifying some deep cognitive limitation to non-human primates, nor in describing supposedly more minimal forms of ostensive communication (e.g. Bar-On, 2013; Moore, 2017b) – an approach which, in our view, misses the very thing that needs to be explained, namely the mentalizing inferences that are the foundation of ostensive communication in the first place. Instead, the cognitive specialisation we see in humans is largely absent in non-humans because the sort of social ecologies in which non-human primates live do not facilitate the stability of such processes. Human social ecologies involve a (much) higher degree of partner choice (Barclay & Willer, 2006; André & Baumard, 2011; Heintz et al., 2016). This is a necessary condition for the mutual stability of communicative intent and audience presumptions of cooperativeness, and hence for the gradual evolution of cognitive processes specialised for these tasks. Integration of these arguments with other ecological perspectives on the evolution of human social cognition (e.g. Tomasello et al., 2012; Sterelny, 2012; Whiten & Erdal, 2012; Moore, 2017b) is an important task for future research.

We finish with an analogy, elaborating on the idea that non-human primates might communicate in a broadly ostensive way, but without specialised cognitive processes. Consider humans swinging from trees. Our bodies are not especially well-suited to this task. We lack the specialised biological apparatus of other primates and we do not develop the relevant dispositions as an ordinary part of ontogeny. At the same time, there is no deep or fundamental barrier. Many humans can swing from trees in some ways and to some extent, and this basic ability can be refined and enhanced with training: in other words, in the right ecology. We tentatively suggest that ostensive communication in other primates might be similar: not impossible and not wholly absent, but unspecialised, somewhat disfluent, not a reliable feature of the ecology – and not part of the ordinarily developing cognitive phenotype.

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