Nonhuman Primate Communication, Pragmatics, and the Origins of Language

by Thomas C. Scott-Phillips

Comparisons with the cognition and communication of other species have long informed discussions of the origins and evolution of human communication and language. This research has often focused on similarities and differences with the linguistic code, but more recently there has been an increased focus on the social-cognitive foundations of linguistic communication. However, exactly what these comparisons tell us is not clear because the theoretical concepts used in the animal communication literature are different from those used in the corresponding literature on human communication, specifically those used in linguistic pragmatics. In this article, I bridge the gap between these two areas and in doing so specify exactly what great ape communication tells us about the origins of human communication and language. I conclude that great ape communication probably does not share the same social-cognitive foundations as linguistic communication but that it probably does involve the use of metacognitive abilities that, once they evolved to a more sophisticated degree, were exapted for use in what is an evolutionarily novel form of communication: human ostensive communication. This in turn laid the foundations for the emergence of linguistic communication. More generally, I highlight the often-neglected importance of pragmatics for the study of language origins.

The origin of human communication and language is a topic that has exercised many generations of scholars (Stam 1976). Since Darwin, an important source of data has been comparisons between linguistic communication and the communication systems of other species (Fitch 2010). A great deal of research has thus focused on the extent to which nonhuman primates' natural communication systems have the same or similar properties as human languages (e.g., Arnold and Zuberbühler 2006; Seyfarth, Cheney, and Marler 1980*a*). More recently, it has been argued that despite these similarities, many forms of great ape communication are probably based on different cognitive mechanisms from human language, and hence that the evolutionary conclusions we can draw from comparisons with the surface form of these systems (e.g., their "syntax," "semantics," etc.) are either unclear or limited (Deacon 1997; Rendall, Owren, and Ryan 2009; Tomasello 2008; Wheeler and Fischer 2012). Consequently, the focus of much current research on great ape communication is the extent to which it is based on social-cognitive mechanisms the same as or different from those that underpin linguistic and other forms of human communication.

However, even here it remains unclear exactly what these comparisons tell us. On the one hand, empirical research on great ape communication has placed considerable emphasis on the question of whether signals are used "intentionally" or not. On the other, the theoretical frameworks used by contemporary pragmatics to describe and study formally the expressive flexibility of human communication and the social-cognitive mechanisms that make it possible are much richer than simply intentionality. In particular, the idea of ostension is central to pragmatic theory but is little considered in the comparative literature. (Pragmatics is a branch of linguistics. It is often characterized as the study of meaning in context, to be contrasted with semantics, which is the study of meaning in an idealized, isolated sense. Another way to think of pragmatics is that it is the study of the communicative basis of language use.) I shall define it in detail later, but an informal gloss of "ostensive communication" is to say that it is intentionally overt communication. As such, ostensive and intentional communication are related concepts, but they are not the same thing. As a result of this disjoint, although there is a great deal of data that is potentially informative, exactly what conclusions we should draw is at best unclear.

In this article I bridge the gap between theory and data in the comparative study of human and nonhuman primate communication. In the next section I briefly survey the literature on whether or not nonhuman primate communication can be classified as intentional. I then introduce a key distinction for contemporary pragmatic theory between the ostensive model of how communication works and the alternative code model. I discuss whether great ape commu-

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nication operates according to the code model or the ostensive model and how it compares with human communication in this respect. I conclude that unlike human communication, great ape communication is probably a form of coded communication, albeit of a particularly sophisticated variety. I then use this analysis to argue that ostensive communication is most likely an evolutionary novelty in the human lineage that evolved as an exaptation of increased social intelligence (exaptations are adaptations that evolved as an offshoot of some other adaptation; e.g., bird wings evolved as an offshoot of heat-regulation devices). Languages then emerged as tools that enhance the efficacy and utility of ostensive communication. A key general point to emerge from this analysis is the generally underappreciated importance of pragmatics and social cognition for the study of language origins.

Comparative Research on Intentional Communication

Comparisons between linguistic and nonhuman primate communication have a long history. The first playback experiments were performed as far back as 1892, that is, more or less as soon as technology made such research possible (Radick 2007). In these experiments, the vocalizations of animals are recorded and then played back to other members of the same species so that their effects can be systematically studied and hence compared with linguistic communication. Probably the most well-known playback experiments are those that were used to document the alarm calls of vervet monkeys (Seyfarth, Cheney, and Marler 1980*a*). Those studies made a particular impression because the alarm calls were observed to share some important properties with words; in particular, that they identify specific things in the world, and their form appeared to be symbolic (i.e., there is no formal relationship between the acoustic properties of the signal and the phenomenon that the call is associated with). Consequently, these calls were, initially at least, interpreted as being referential in the same way that words are (Seyfarth, Cheney, and Marler 1980*b*). Using the logic of the comparative method, some researchers thus suggested that calls such as these are in fact evolutionarily related to words (e.g., Hurford 2007; Zuberbühler 2005). However, it has since been recognized that words and monkey alarm calls rely on quite different cognitive mechanisms (Deacon 1997; Wheeler and Fischer 2012). The term "functional reference" was adopted as a way to reflect this fact while still drawing attention to the comparison with language. While productive for a time, there is now increasing recognition of the limitations of this approach, not least the fact that because the underlying mechanisms are different, the evolutionary implications of these comparisons are unclear (Rendall, Owren, and Ryan 2009; Wheeler and Fischer 2012).

Partly in recognition of this, some current research focuses on the extent to which great ape communication shares the same social-cognitive basis as linguistic communication (Fitch, Huber, and Bugnyar 2010; Tomasello 2008). One prominent question in this literature is whether or not signals are used "intentionally"—a notion that contrasts with signals that are produced in a more "reflexive" or "automatic" way. Intentionality is a notion with a long philosophical history, and its meaning is difficult to capture precisely (it is often concisely glossed as "aboutness"). Its typical usage in the animal communication literature is perhaps best captured with a summary of the criteria used in empirical research to identify intentionality. The following proxies are the most commonly used (Liebal et al. 2014): (1) social use (sensitivity to the presence and composition of an audience), (2) gaze alternation (signaler looks back and forth between social partner and some object), (3) sensitivity to attentional state (signal is adjusted depending on the attentional state of the audience), (4) use of attention-getters (behaviors used to gain the attention of an audience), (5) persistence and elaboration (continued use of a behavior until its objectives have been met and the use of alternative or modified signals in case of failure), (6) flexible use (use of the same signal for multiple ends and/or multiple signals for the same ends; i.e., means/ends dissociation), and (7) response waiting (after signaling, waiting for an appropriate response).

What is worth noting about this list is that all of these criteria are about whether or not a signal is used in a goal-directed ("intentional") way. This is, then, a question about how signals are used and specifically about whether signals are used in the pursuit of a cognitively represented goal or not. Whether this is an appropriate use of the term "intentional" or whether the above criteria are appropriate ones are matters that could be disputed, but these are separate questions with which I am not concerned here. I will adopt these criteria in this paper.

So, is great ape communication intentional? This is a question of active research interest on which there is not universal agreement. Most researchers would agree that their gestural communication is intentional. However, whether great ape vocal communication is intentional is more disputed (Liebal et al. 2014). The dominant view has for some time been that it is not (see, e.g., Call and Tomasello 2007; Pollick and de Waal 2007). However, recent data question this conclusion (Schel et al. 2013).

However these questions are settled, there are, with regard to the origins of human communication, other aspects of communication that are at least as important as intentionality, if not more so, but that have received far less attention. This is despite (or perhaps because of) the existence of a rich and informative body of theory about them. Specifically, the notion of ostensive communication is central for linguistic pragmatics and for the social cognition of communication, but it does not much feature in current comparative discussion. In order to introduce this concept, the next section makes a key distinction between coded and ostensive communication.

Two Models of Communication

An intuitive view of how communication works is as follows. Information is encoded, sent along a communication channel, and then decoded at the other end. If the algorithms for encoding and decoding are appropriately calibrated to one another, then what is encoded at one end is identical to what is decoded at the other end. The result is that information has been transferred from a signaler to a receiver. This way of thinking about communication is called the code model. It combines at least two ideas of how communication works. The first is the idea that signals are messages that are packaged up and sent along some channel to be unwrapped at the other end. This is called the conduit metaphor (Reddy 1979). The second idea is the information-theoretic approach to communication developed by Claude Shannon (1948) in which signals are seen as strings of information that are to be transmitted along a noisy channel. It is not difficult to see how the conduit metaphor and information theory combine to form the core of the code model.

The code model is highly intuitive and can be used as a way to describe many instances of communication in a very simple and general way. Here is an example. Many species of bacteria communicate by a process called quorum sensing in which individual bacterial cells produce small diffusible signal molecules and monitor the concentration of these molecules in the local environment. In this way, quorum sensing allows individual cells to communicate their presence to other cells, and hence it allows groups of cells to act in a population density dependent manner (Darch, West, and Winzer 2012; Ng and Bassler 2009; Williams et al. 2007). Such interactions satisfy standard definitions of communication and can be described in terms of a code. The encoding algorithm is something like "if in environment X, produce molecule Y," and the decoding algorithm is something like "if the concentration of molecule Y is above the threshold *t*, then perform behavior Z." Informally at least, many researchers in many different disciplines think of communication in these terms. More formally, communication is often defined in terms of the code model (e.g., "the transmission of information from one animal to another. Information is encoded by one individual into a signal. When received by another animal, this information undergoes decoding" [Green and Marler 1979:73]; see Rendall, Owren, and Ryan 2009 for a review of such definitions).

However, the code model is not the only way in which we can think about communication. In fact, it cannot be, because the code model is unable to handle the case of everyday language use (Grice 1957, 1969, 1975). The discipline of pragmatics has consequently developed an alternative to the code model typically called the ostensive-inferential model (or just ostensive model for short; Sperber and Wilson 1995). Here, the production and comprehension of signals does not involve encoding and decoding of a message but instead the provision and interpretation of evidence of intentions. This evidence can come in any form (e.g., points, shrugs, vocalizations including language use; see also "The Ostensive Foundations of Linguistic Communication"). The listener must then take this evidence and draw an inference about the signaler's intended meaning. Signalers and receivers thus perform distinct but complementary jobs in ostensive-inferential communication: the former provide evidence (this is ostension); the latter interpret it (this is inference). As mentioned above, this evidence is evidence for the expression of intentions, specifically communicative and informative intentions. A small digression is necessary to explain exactly what these are. We will then be able to articulate very clearly the difference between coded and ostensive communication, and this will in turn allow us to see exactly what great ape communication can and cannot tell us about the origins of language.

An informative intention is the signaler's intention to change the audience's beliefs or other mental representations. If, for example, I point to an object just out of reach, I intend for you to believe that I would like you to pass me the object, and my point provided evidence for this. Similarly, if I ask a friend whether they would like to go to the cinema, I have an intention that my friend believes that I would like to go to the cinema. Colloquially, the content of an informative intention is the information that it provides. Note that an informative intention is not simply an intention to inform. It is more specific and rich than that: it is an intention to inform by virtue of affecting the audience's mental state.

A communicative intention is the signaler's intention that the receiver recognize that the signaler has an informative intention. When I point to objects just out of reach, my point takes a particular form, both clear and deliberate. This differentiates it from an incidental point, the by-product of some other, noncommunicative behavior (e.g., looking at your watch). In this way, the point expresses not only my informative intention (see above) but also, and equally importantly, the very fact that I am trying to communicate at all. It signals signalhood. In doing so, it provides evidence not only for an informative intention but also for a communicative intention. Note again that a communicative intention is not just an intention to communicate but is something more precise than that: it is an intention that the audience recognizes that one has an informative intention, that is, an intention to manipulate their mental states. An intention to communicate could conceivably involve an intention to communicate in some other, nonmental way.

We are now able to define "ostensive communication" (see also Sperber and Wilson 1995). Ostensive communication is the expression and recognition of communicative (and hence also informative) intentions. (The reason why the expression and recognition of a communicative intention implies the expression and recognition of an informative intention is that the former is by definition embedded within the latter; put another way, the content of a communicative intention is an informative intention [see above].) Ostensive behaviors are those that express communicative intentions. Anything at all

could, in principle, do this: I could wave my arm, waggle my feet, or even just lift my little finger in an ostensive way, that is, in a way that expresses a communicative (and hence also an informative) intention. Eye contact and speech are two particularly common ways to do this (Csibra 2010; Senju and Csibra 2008).

Ostensive communication is made possible by metapsychological abilities (Origgi and Sperber 2000). (Metapsychology is often also called "theory of mind," "mind reading," or "mental-state attribution.") In other words, the capacity to express and to recognize mental states, and in particular the intentions and beliefs of others, is logically before ostensive communication: individuals missing the former will be unable to engage in the latter. This is true almost by definition: if one cannot entertain others' mental states, then one cannot recognize them or provide the right sort of evidence to allow others to do the same for their own mental states. The extent of the metapsychological abilities required is the subject of some dispute, but the fact that they are necessary for ostensive communication in some way or another is not (e.g., Sperber 2000; R. Moore, "Acting with and Understanding Communicative Intent," unpublished manuscript).

We are now able to unambiguously state the difference between coded and ostensive communication. It is a difference in the internal mechanisms that makes communication possible (Sperber and Wilson 1995). On the one hand, coded communication systems are made possible by the existence of associations (between states of the world and actions and between actions and corresponding reactions). On the other hand, ostensive communication systems are made possible only by the capacity of their users to express and to read intentions and beliefs and hence to reason about those mental states; in other words, by metapsychology.

Is there a third type of communication with a different foundation still? None has been proposed: "there just is not to this day . . . a third type of explanation of the very possibility of communication" (Origgi and Sperber 2000:149). We should be clear that this is not an empirical question but a conceptual/philosophical one. The question is, in what way can communication even exist? There are at present two well-developed answers to this question and no more. As such, any claim that a particular communication system (e.g., linguistic communication; great ape communication) does not fit within either the code model or the ostensive model requires behind it a new, noncode model, nonostensive model account of how communication works. To develop such an account would be a major philosophical enterprise, and I know of no substantive proposals of this kind. In the next section, I explain how linguistic communication is a type, albeit an especially special and important type, of ostensive communication.

The Ostensive Foundations of Linguistic Communication

How does linguistic communication relate to this distinction between coded and ostensive communication? Clearly, there are reliable associations (i.e., "codes") between signals and their meanings. The word "dog" is reliably associated with canine animals, for instance (by definition, the literal meaning of "dog" is "a canine animal"). (Of course, dogs are not necessarily present when the word "dog" is used; this is unlike most animal signals.) At the same time, this is certainly not the whole story. Linguistic communication often expresses far more than the literal, "decoded" meanings of what is said. Indeed, the manner in which something is said also helps to express the speaker's intended meaning. Even very simple utterances, such as "Thank you," can express a wide and diverse range of different intended meanings. To determine between these, we must reason about our conversational partner's intentions, and speakers express these with the use of supralinguistic tools such as intonation and prosody, among others (Wharton 2009).

How, then, do the linguistic code and the human capacity for ostension and inference interact with one another? One possible answer to this question is as follows: the development of widely shared associations between signals and meanings—codes—is what makes linguistic communication possible, and the human capacity for ostension and inference then makes it especially powerful, that is, able to express an extremely wide range of propositions. This is a widely held assumption, both within linguistics in general and in evolutionary and comparative approaches to language in particular. Perhaps the clearest illustration of this is the way in which communication has been modeled in the many computational and mathematical models that have been a prominent feature of language evolution research over the past 20 or so years (see, e.g., Steels 2011 for a recent review). In these models, communication operates by, and indeed is made possible by, associations between, on the one hand, states of the world and signals and on the other hand between signals and corresponding responses. This is the very definition of a code model. This influence can also be seen in the way that researchers describe linguistic communication: "the vocal-auditory *channel* has some desirable features as a medium of communication: it has a *high bandwidth*. . . . However it is essentially a *serial interface*. . . . The basic tools of a *coding scheme* employing it are an *inventory of distinguishable symbols* and their *concatenation*" (Pinker and Bloom 1990:713, italics added). In short, the typical assumption is that languages are, at bottom, rich coding schemes, and ostension, inference, and indeed pragmatics in general are bonus extras, albeit very useful ones.

This assumption is wrong. In fact, it is precisely upside down (Origgi and Sperber 2000; Sperber and Wilson 1995; Tomasello 2008). That is to say, pragmatics makes this type of communication possible in the first place, and the devel-

opment of the linguistic code makes it expressively powerful. As such, it is the linguistic code that is the bonus add-on.

Linguistic meaning underdetermines speaker meaning (Atlas 2005; Carston 2002; Recanati 2004). What this means is that the meaning a speaker intends when they produce an utterance cannot be determined by analysis of the literal meaning of the utterance alone. The existence of underdeterminacy cannot be in doubt: obvious examples are sarcasm and irony, in which the intended meaning is in many respects the opposite of what is literally said, but there are many other examples, such as understatement, similes, and indirectness. What is less appreciated is how far this underdeterminacy extends. Consider an utterance as superficially simple as "Higher." The literal meaning is entirely clear, but this is insufficient to determine the speaker's intended meaning. Similarly, "It's raining" is, on a literal reading alone, hugely ambiguous. Where is it raining? When?

The problem here is not the tractable one that literal meanings may correspond to more than one of a still finite number of speaker meanings and that we must choose between them. It is far more serious than that. For any literal meaning, there is an infinite number of possible speaker meanings. To illustrate, consider again "Thank you." Here are some possible speaker meanings: "I am grateful," "I love you," "This is a pleasant surprise," "You're an idiot!," "Can I get back to what I was doing please?," and so on. Various contextual and supralinguistic factors determine which of these is intended and indeed inferred. There are many more possible speaker meanings, too. Infinitely many, in fact—and that is the reality of underdeterminacy. If you doubt this, then here is the challenge for you: describe an utterance and a corresponding list of possible speaker meanings that is wholly exhaustive in the sense that there are no other possible speaker meanings whatsoever, regardless of changes in context, delivery, and so on. A great deal of research in pragmatics has shown that this task is impossible: it is always possible to add another possible speaker meaning to the list (Atlas 2005; Carston 2002; Recanati 2004).

The consequence of this underdeterminacy is that the linguistic code cannot make linguistic communication possible. The existence and ubiquity of underdeterminacy means that linguistic utterances cannot, on their own, specify speaker meaning. Hence, they are unable to make any sort of communication possible. To put the point another way, as codes, languages are very defective indeed. As a way to unambiguously or even probabilistically refer to things in the world, they are, on their own, ineffectual (Origgi and Sperber 2000).

What languages can do is make ostensive-inferential communication far more expressive than it would otherwise be. An ostensive point can be coupled with the utterance "Look over there!" An ostensive waggle of feet could be coupled with "My foot is really itchy." And so on. Note that this is all made possible by the fact, noted above, that the linguistic code underdetermines a speaker's intended meaning. As such, the range of speaker meanings that can be efficiently expressed with language is not limited to the extent of the linguistic code (Piantadosi, Tily, and Gibson 2012; see also Scarantino 2010 and Wheeler and Fischer 2012, who emphasize that this is an important difference between human and nonhuman communication). This analysis of linguistic communication as being a matter of ostension and inference that is made powerful by the linguistic code is supported by a wealth of developmental and neurological evidence (see, e.g., Papafragou 2002; Wilson 2005).

There is, then, a critical difference between the codes used in the code model and the codes used in language. The former makes a type of communication possible, one that is restricted to a finite set of possible messages. Linguistic codes, however, are quite different. They do not make communication possible. Instead, they are added to a foundation of ostension and inference, and in doing so they make that type of communication incredibly powerful (Origgi and Sperber 2000; Wharton 2003). Scientific terminology should reflect this difference. This can be done with the terms "natural codes" (the codes that make code model communication possible) and "conventional codes" (the codes that make ostensive communication expressively powerful; Wharton 2003). A failure to make this distinction can lead to the assumption that the difference between the two different types of code is a difference of degree (albeit a very large difference) and not one of kind. This assumption is wrong: the difference is one of kind.

The implication of this for evolutionary issues is that because language is based on a foundation of ostension and inference and not code, then the appropriate comparisons to make are not with the natural codes of great ape communication but rather with the social-cognitive mechanisms that underpin ostensive-inferential communication (Deacon 1997; Tomasello 2008). It was the evolution of these abilities that made possible a form of communication onto which we have added a rich suite of conventional codes. As such, if we are able to determine the extent to which great ape communication is or is not ostensive, then we will be able to determine whether the difference between language and great ape communication is the existence of ostensive-inferential communication itself or rather the addition of conventional codes to a preexisting ostensive-inferential base. As such, we should now like to ask, what does the current literature tell us about such questions?

Intentional Communication and Ostensive Communication

Unfortunately, we cannot immediately address the issue of whether great ape communication is ostensive or not. Research on the social-cognitive foundations of great ape communication does not focus directly on ostensive communication and the mechanisms that make it possible but rather on the related and arguably more empirically tractable notion of intentional communication. This raises the question of

exactly what the difference is between intentional and ostensive communication. Is intentionality part of ostensive communication or something different altogether? We must address this question before we ask whether great ape communication is ostensive or not.

I earlier noted that the study of intentional communication is the study of how signals are used and specifically whether or not they are used in a goal-directed way ("Comparative Research on Intentional Communication"). In contrast, the defining feature of ostensive communication is not any aspect of how signals are produced but rather what the signals express. To repeat, ostensive communication is defined as the expression and recognition of communicative and informative intentions. We thus have a distinction here between what is communicated (intentions) and how something is communicated (intentionally). These two questions are clearly related, but equally clearly, they are not the same.

As such, it is logically possible for signals to be intentional but not ostensive. Here is an example. Mary is picking and eating berries. She wants Peter, who is watching her, to understand that the berries are edible and tasty. Here are seven particular facts that might be true of Mary's behavior: (i) she only picks and eats the berries when Peter is around; (ii) as she eats the berries, she alternates her gaze between Peter and the berry bush; (iii) if Peter is not looking at her, she stops eating the berries until she has his attention again; (iv) if Peter is not looking, she sometimes coughs or does something else that might direct his attention toward her; (v) if Peter does not seem to grasp that the berries are edible, Mary repeats her efforts; (vi) on other occasions Mary has used similar behavior to indicate something different, such as that the berries are especially tasty; and (vii) after she has picked and eaten the berries, Mary waits to see what Peter's reaction is. As you will no doubt have noticed, these are the seven criteria commonly used to identify intentional communication ("Comparative Research on Intentional Communication"). If all of these are true, then Mary's behavior is intentional by the terms of that field of study.

However, and most importantly, there is nothing in the above description that (necessarily) makes Mary's behavior ostensive. Instead, Mary's behavior is only ostensive if and only if it expresses her informative and communicative intentions (see above). For example, she might eat the berries in an overly stylized way, exaggeratedly patting her tummy as she did so. To put the point another way, it is possible for Mary's behavior not to be ostensive yet still satisfy all of the above criteria. Under such circumstances her behavior would be intentional but not ostensive. Note, however, that the opposite is not the case: it is not possible for a signal to be ostensive but not intentional. As such, ostensive communication is necessarily intentional, but the opposite is not true. One consequence of this is that it is possible that intentional communication is an important evolutionary step toward ostensive communication (but see below). At the same time, it is not the same thing as ostensive communication. Ostensive communication is not simply a fancy term for what primatologists have studied under the banner of intentional communication. Having established this, we can now return to the critical question of whether great ape communication is ostensive or not.

Does Nonhuman Primate Communication Use Ostension and Inference?

Is nonhuman primate communication made possible by ostension and inference, as human language is, or by the existence of natural codes? For communication to qualify as ostensive it must involve the expression and recognition of communicative and (hence) informative intentions. As such, if a communication system is ostensive, then there are four things that must be shown: the expression of communicative intentions, the recognition of communicative intentions, the recognition of informative intentions, and the expression of informative intentions. Strictly speaking it is not quite right to split things up in this way: informative intentions are embedded within communicative intentions ("Two Models of Communication"), and so to express/recognize a communicative intention is necessarily to also express/recognize an informative intention. However, it is still useful to make these distinctions simply as a way to organize our analysis so long as we do not lose sight of this fact when we draw our conclusions. So, our question is, do great apes engage in all or even any of these behaviors? And how do they compare with human children in this regard?

I begin with the expression of informative intentions, that is, the production of behavior intended to affect the audience's mental state. There is good experimental evidence that when they communicate, children do indeed intend to change their audience's mental states. Specifically, if they make a request for an adult to pass them, say, a ball, but that request is satisfied only fortuitously (i.e., if the adult misunderstood, but the child coincidentally obtained the ball anyway), then children (18-, 24-, and 30-month-olds) will correct the adult's misunderstanding nevertheless (Grosse et al. 2010). This shows that their intention is not simply to affect the adult's behavior (i.e., to get the ball) but rather to change mental states (which will in turn affect behavior). To my knowledge, no similar experiment with chimpanzees has been conducted.

Next, we need to address the recognition of informative intentions. The precise experiment that would most directly address this question has not, to my knowledge, been conducted with either children or great apes. The question for such an experiment would be, if an adult experimenter directs a request (or command) toward, say, another experimenter, and this request is satisfied only fortuitously, does the child/ape show any sign of understanding that the adult's informative intention has in fact not been satisfied (even though their material goal has been satisfied)? For example, if the requester had not noticed that the request had been satisfied only fortuitously, perhaps the child would point this fact out

to them. If they did so, that would be good evidence that they recognize that the requester had an informative intention. that is, that the goal was not simply to have the request satisfied but to have it satisfied by virtue of changing the audience's mental state. I predict that children would succeed at an appropriately designed task of this sort.

The third of the four behaviors to consider is the recognition of communicative intentions, that is, of the fact that a signaler has an informative intention or, more informally, of the fact that a signaler wishes to communicate in the first place. When asked of children, this question has been approached in a number of different ways, and these studies consistently show that children are indeed able to recognize others' communicative intentions (e.g., Behne, Carpenter, and Tomasello 2005; Gräfenhain et al. 2009; Moore, Liebal, and Tomasello 2013; Tomasello, Call, and Gluckman 1997). In one demonstration of this, the experiment is set up such that the child must look for a missing object, which is in a box. In the experimental condition, an adult indicates this location ostensively with a directed point to the box accompanied by an alternating gaze between the child and the box. In the control condition, the adult's behavior is superficially similar but is not in fact ostensive: the adult still points, but only as an incidental consequence of looking at her watch. Only in the ostensive condition do the children (14-, 18-, and 24-month-olds) follow the point and hence fetch the object (Behne, Carpenter, and Tomasello 2005). This is good evidence that children can recognize and act on others' communicative intentions. Even stronger evidence would be to observe the same pattern of results with a novel behavior that, unlike pointing, children are wholly unfamiliar with.

The corresponding experiment with chimpanzees or any other nonhuman primate has not, to my knowledge, been conducted. One reason for this is that chimpanzees in general struggle to follow the points of others, even when motivated to do so (e.g., Herrmann and Tomasello 2006; Tomasello, Call, and Gluckman 1997; see below). Any task that involves the differentiation of different types of points is thus redundant. It may, however, be possible to conduct experiments with the same basic design as the study above but instead of points, using a different type of communicative behavior (e.g., ostensive begging, to be contrasted with incidental hand gestures that have a superficial similarity to begging).

The final behavior to consider is the expression of communicative intentions. There is general agreement that the best evidence for this is hidden authorship (Csibra 2010; Sperber and Wilson 1995; Tomasello, Call, and Gluckman 2007). Suppose that I am a guest at a dinner party, and I finish my glass of wine and would like more. However, suppose also that it would be impolite of me to directly ask my host for this. Instead, I move my empty glass surreptitiously (perhaps, say, when my host is out of the room), so that my host will, soon after, see the wine glass and hence come to understand that I have finished my wine. Here, I intend that my host understands that I have finished my wine, but I also intend that she does not know that I intend that she understands that I have finished my wine. In other words, I intend$_1$ that my host does not understand that I intend$_2$ that she understands that I have no more wine. The first of these intentions (intend$_1$) is not strictly speaking a communicative intention (because it is not an intention to express an informative intention), but it is still an intention that has the same relationship to a corresponding informative intention (intend$_2$) that a communicative intention normally has. In this way, hidden authorship comprises good evidence of an understanding of what a communicative intention consists of and what it means to express one.

Children are able to hide authorship and understand when it is appropriate to do so. In a recent experiment, children were placed in a situation in which information that they had would help an adult but where that help was unwanted by the adult. Children (both 3- and 5-year-olds) found ways to inform the adult anyway while simultaneously hiding the fact that this is what they were doing. They did this more often under these circumstances than in a control condition in which their help was not unwanted (Grosse, Scott-Phillips, and Tomasello 2013). This is good evidence that children understand what a communicative intention is, how it is expressed, and the role it plays in communication. To my knowledge, nobody has conducted a similar experiment with any other species. Indeed, it is actually quite difficult to imagine what a suitable experimental design might look like, but if this methodological issue could be resolved, a direct comparison between great apes and human children could be very informative.

One type of behavior that great apes do engage in and that seems superficially relevant to this discussion is attention-getting: behavior that seems to serve no other function than to direct the attention of an intended audience to some subsequent behavior (which may or may not be communicative). Examples include slapping the ground, thumping the chest, or simply throwing things at the intended audience. The appropriate use of these is, recall, one of the criteria that is often used to identify whether or not a signal is used intentionally. However, this is not ostensive communication. Even if they are used intentionally, attention-getters are only attempts to direct the attention of another individual. This does not amount, at least not necessarily so, to the same thing as an intention to make it apparent to the audience that you have an informative intention (to change the audience's beliefs or other mental representations). As such, although it is possible that attention-getters involve some degree of metapsychology and in that respect are relevant to our general concerns here, they are not in and of themselves evidence of the expression of communicative intentions.

In sum, then, there are several open empirical questions about whether great ape communication is ostensive. For all four aspects of ostensive communication (the expression of informative intent, the recognition of informative intent, the recognition of communicative intent, and the expression of

communicative intent), there are experimental studies that could potentially prove conclusive but for which we simply do not yet have the definitive data.

It is instructive to consider why these key experiments have not been conducted. One reason is methodological: there are significant practical issues associated with all of these experiments, and some of these may be insurmountable (e.g., hidden authorship). It should, however, be possible to overcome at least some of these. There may also be a more fundamental reason why these studies have not been conducted: skepticism that great apes will actually succeed in the relevant tasks. Any such skepticism is justified, because great apes perform poorly in various tasks that seem less cognitively demanding than those discussed above. For instance, in a task generally known as the object-choice task, an experimenter hides a prize (food for chimpanzees; a toy for children) in one of several opaque buckets. In a control condition, the experimenter knocks over the bucket with the prize in it, so the prize is visible. The buckets are then presented to the participant who, predictably, chooses the one with the prize. In the experimental condition the experimenter does not knock the bucket over but instead simply points to it. Here, children choose the correct bucket, but, even after extensive training, captive chimpanzees choose at random (e.g., Herrmann and Tomasello 2006; Tomasello, Call, Gluckman 1997). The persistent failure of captive chimpanzees in this task and the almost complete absence of pointing behavior among wild chimpanzees must place serious doubt on whether or not they could succeed in the sorts of tasks, discussed above, that would most clearly illustrate command of the various different aspects of ostensive communication. This may explain, especially when combined with the various methodological challenges, why the key experiments have not been conducted: negative results are difficult to interpret and difficult to publish, and if this is what researchers most likely expect, they are left with little incentive to pursue such research.

I thus read the absence of the relevant studies as an implicit, collective acknowledgment that great apes would probably fail such tasks and that hence their communication is not ostensive. I will therefore assume, for the remainder of this article, that great ape communication is not ostensive. This assumption could be overturned if great apes could be shown to succeed at the sorts of tasks described in this section. However, for the various reasons given above, this outcome seems unlikely.

Does Nonhuman Primate Communication Use a Natural Code?

If great ape communication is not ostensive, then does that imply that great ape communication operates according to the code model? There is, after all, no other account of the very possibility of communication ("Two Models of Communication"). In this section I will develop arguments as to why the code model may be a good description of great ape communication. I should immediately make it clear that a communication system built on natural codes need not be simple or unsophisticated. On the contrary, a system of this sort could, in principle, be rather sophisticated indeed. In fact, we shall see whether this is probably the case with great ape communication.

Currently there is a live debate about the origins of great ape gestural communication (see Liebal and Call 2012 for a review). For some time now, the main explanation of great ape gestures has been a process called ontogenetic ritualization, in which a behavior takes on a communicative function by virtue of its repeated use in the interactions of two (or more) individuals (Call and Tomasello 2007). Some researchers have argued that great ape gestures originated exclusively or at least predominantly in this way (e.g., Call and Tomasello 2007). Others have recently taken issue with this claim. The argument raised is that if the gestures were ontogenetically ritualized, then the actions involved should closely match those of the presumed original actions, but detailed analyses of great ape gestures suggest that this is not the case (Genty et al. 2009; Hobaiter and Byrne 2011*a*). The authors of these analyses thus argue that most gestures are part of a species-typical repertoire (Genty et al. 2009; Hobaiter and Byrne 2011*a*). Debate continues: those who advocate the ontogenetic ritualization hypothesis have recently produced new analyses in which they track the process of ontogenetic ritualization over time and hence show that it is responsible for the creation of at least some great ape gestures (Halina, Rossano, and Tomasello 2013).

Whether gestures are part of a species-wide repertoire or originate through ontogenetic ritualization, the end result is, according to both lines of argument, pairs of associations that together make a form of communication possible (one association is between states of the world and signals; the other is between signals and responses), in other words, a natural code. We do not yet have a complete list or understanding of the extent of these codes partly because of the methodological challenges involved, and the most recent data suggest that the repertoires may be significantly larger and more complex than previously thought (see, e.g., Cartmill and Byrne 2010; Genty et al. 2009; Hobaiter and Byrne 2011*a*). Whatever this line of research reports in the future, the key point for the present issues is that the central debate in this area is only about how these codes originate. That they exist is not in dispute, and there is no suggestion that these are conventional codes (that simply make an existing form of communication more powerful). Rather, these are natural codes that make a type of communication possible.

Having said that, these codes do seem to be used in a flexible and hence expressively powerful way. Indeed, the flexible use of an existing code is one of the criteria used to identify whether or not a signal is intentional (see above). Correspondingly, flexibility also seems to exist on the receiver's side (as it must: if there is signaler flexibility, there must also be receiver flexibility, because otherwise the re-

ceivers would not be able to interpret signals successfully). For example, detailed analysis of wild East African chimpanzee communication shows that their responses to gestural communication take into account the signaler's general behavioral intentions (Roberts, Vick, and Buchanan-Smith 2012).

What makes this flexibility possible? One plausible answer is metapsychology. There is now good evidence that great apes are aware of what others know and intend (Call and Tomasello 2008; but see Penn and Povinelli 2007 for a more skeptical view). We do not yet know whether they make use of these abilities in signal comprehension. Conclusive demonstration of this, in the form of a playback experiment, would be difficult to achieve in the gestural modality because of the methodological difficulties involved, but it could perhaps be achieved in the vocal domain. Some present playback studies can be interpreted in these terms, but they are not yet conclusive, and further experiments are necessary (see, e.g., Arnold and Zuberbühler 2013; Engh et al. 2006).

If this is correct, then what we have in nonhuman primate communication is a system made possible by a natural code and made expressively more powerful by the existence of metapsychological abilities that allow the code to be used in a flexible way. This is, interestingly, the very opposite of human language, which, recall, is made possible by mechanisms of metapsychology and is made powerful by mechanisms of association (table 1).

How could we tell the difference between these two different types of communication system? In a system made possible by association and enhanced by metapsychology, we should expect to see a finite set of more or less loosely defined prototypes (this is the natural code) that can be used in flexible ways (this is the effect of metapsychology). In contrast, the users of a system made possible by metapsychology should be able to use any behavior at all for communicative ends, because they can perform it in a way that makes it apparent that this is what they are doing. Associations would then make it possible to use this ostensive communication far more precisely than otherwise. If this set of associations is large enough, then the users of this system will be able to express almost any proposition they wish. Linguistic communication is certainly of this latter type. In contrast, the most recent and detailed studies of the chimpanzee gestural communication suggest that it is of the former type: "adult chimpanzees have a multifaceted and complex repertoire of manual gestures, organised around prototypes, within which there is considerable variation" (Roberts et al. 2012:586–587; see also Cartmill and Byrne 2010 on orangutan gestures). This finding is precisely what we should expect to find in a system that is made possible by associations and expressive by metapsychology. In other words, great ape gestural communication is very likely to operate according to the code model, although it is a particularly sophisticated instance of that type of communication.

If great ape gestural communication operates in this way, then great ape vocal communication almost certainly does too. While there is some debate over whether great ape vocal communication is intentional or not (see above), there is no suggestion that it is, in general, significantly more cognitively sophisticated than great ape gestural communication; the question is rather whether it is as sophisticated. As such, great ape vocal communication might be best described in the same terms as great ape gestural communication, or it may operate under a less flexible natural code. What is not suggested as a possibility is that it is ostensive while gestural communication is not.

The Evolution of Ostensive Communication and Language

Working with the conclusion that some forms of great ape communication are natural codes made expressively more powerful by metapsychology, if one also adopts the naive view that linguistic communication also operates according to the code, albeit in a context-dependent way, then a simple Darwinian story of its evolution presents itself, and that is that a relatively small, simple code that is enhanced by limited metapsychological abilities evolved into a much larger, more complex code that is enhanced by rich metapsychological abilities: "we may see in [monkey] alarm calls a skeletal version of our own shared codes" (Hurford 2007:260). From this point of view, nonhuman primate communication is, effectively, a lightweight form of linguistic communication.

However, this naive view of linguistic communication is, as I have discussed, the wrong way around (see "The Ostensive Foundations of Linguistic Communication"). When we turn things the right way around, what does that imply for the origins of language?

Because ostensive communication is predicated on mechanisms of metapsychology, then it is the evolution of these mechanisms that is critical to its origins (Sperber 2000). In other words, the emergence of ostensive communication must

Table 1. Difference between human communication and great ape communication

Communication type	What type of mechanism makes it possible?	What type of mechanism makes it expressively powerful?	Reference
Human communication (ostensive-inferential model)	Metapsychology	Association	Origgi and Sperber 2000
Great ape communication (code model)	Association	Metapsychology	Roberts et al. 2012

have involved the evolution of ever more sophisticated forms of metapsychology, and social cognition more generally, until they became sufficiently advanced to make ostensive communication possible (Frith and Frith 2010; Sperber 2000). What would have caused this change to occur? There is now a large body of both theory and data that suggests that from an evolutionary perspective, primate intelligence is to a significant degree explained by the highly social nature of primate life (Brothers 1990; Byrne and Whiten 1989; Dunbar 1998; Humphrey 1976). Numerous modifications, refinements, and qualifications to this basic picture have been proposed, and these details remain a matter of active research, but the basic idea that a great deal of primate social intelligence is explained by the complexity of their social lives is widely accepted (e.g., Dunbar and Schultz 2007; Holekamp 2007; van Schaik, Isler, and Burkart 2012). This body of work explains why humans, who are extremely social even by primate standards, would have evolved particularly sophisticated forms of social cognition. Once sufficiently advanced, this social cognition could have been put to new use in ostensive communication (Frith and Frith 2010).

Early instances of ostensive communication would almost certainly have been very painstaking and haphazard at first. However, given the expressive capacity and hence utility of ostensive communication, a number of cognitive adaptations that make ostensive communication operate smoothly and efficiently would probably have followed (Csibra and Gergely 2011; Sperber and Wilson 2002). A parallel development would have been the emergence, through repeated interaction and cultural transmission, of conventional ways in which to use ostensive communication, conventions that would in time become ossified into words, grammars, and the other constituent parts of languages. How this process occurs and whether there was any subsequent evolution of a dedicated cognitive faculty for language are the major explananda for evolutionary linguistics (Evans and Levinson 2009; Scott-Phillips and Kirby 2010).

General Discussion

The importance of pragmatics and social cognition for the origins of language is in general not as widely recognized as it should be (Scott-Phillips 2014). The index to the recent *Oxford Handbook of Language Evolution* lists only 8 pages under the heading of "pragmatics" and none under "ostension" (Tallerman and Gibson 2012). By way of contrast, 213 pages are listed under "syntax" and related terms and 145 pages under "meaning" and related terms. Consequently, comparative research has often focused on whether the communication systems of other species have some of the same surface properties as languages (e.g., reference, syntax), and comparative questions about pragmatics have been relatively neglected. Where comparative research has come closest to pragmatics is in the study of intentional communication, but even this is little studied (37 entries in the index) in comparison with those features of language that behave more like a code (e.g., "syntax," as above).

Correspondingly, I have argued that the focus of much comparative research on the evolution of human communication and language has been at least somewhat misplaced. There are two main manifestations of this. The first is that research concerned with the social-cognitive foundations of communication has not focused on the most fundamental questions, about whether great ape communication is ostensive, but instead on the related but different notion of intentionality. Intentionality is important, and these data are informative, but unlike ostension (and inference), intentionality is not the defining feature of human communication. Research on the intentionality of great ape communication should not lose sight of this fact.

The second and more serious manifestation of a misplaced focus is the attention given to the codes used in nonhuman primate vocal communication. This line of research is predicated on an assumption that these codes are the same sort of thing as the linguistic "code." This assumption is false and should be recognized with the contrasting terms "natural code" and "conventional code" ("The Ostensive Foundations of Linguistic Communication"). Instead, when our questions are about the origins of human communication and language, the right comparisons to make are with the cognitive mechanisms that make human ostensive communication possible in the first place, that is, about metapsychology. Investigation of the extent to which great ape communication is intentional can potentially speak to this question, but it is hard to see how the same could be true of, say, whether nonhuman primate communication is combinatorial (as languages are; e.g., Zuberbühler 2002). The mistake here is to take the Darwinian lesson that biological form changes gradually and to assume that it applies to function, too. Animal codes and linguistic codes are both used for communication, and so, it is often assumed, it is parsimonious to conclude that one grew out of the other. But this is not right. Wings and legs are both used for locomotion, but one did not evolve from the other. Biological form changes gradually, but a new function can arise quite suddenly as an exaptation of traits that have been previously selected for other purposes.

One broader question about these issues is how they relate to the vibrant discussion that has taken place in the animal signaling literature in recent years around a set of general conceptual questions such as "What do animal signals mean?" and "What role does information play in communication?" (see Stegmann 2013). On the one hand are researchers who argue that it is productive to think of communication in terms of information transfer (Seyfarth et al. 2010); on the other hand are researchers who argue that such thinking is a hindrance to proper understanding and that we should instead think of communication in terms of how signals influence the behavior of others (Rendall, Owren, and Ryan 2009). Recognition of the difference between the code model and the ostensive-inferential model does not logically commit us

to any particular position in this debate, but it is worth noting that viewing animal communication in terms of information transfer encourages us to think of human communication in terms in the code model. This may in turn leave us blind to the ostensive character of linguistic communication when in fact evolutionary research on human communication would be enhanced by an increased focused on this.

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Comments

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Scott-Phillips argues that ape gesture is best characterized as a *natural* code—a communication system in which conveying and interpreting intentions takes a backseat to encoding and decoding species-typical signals. He contrasts this with human communication, which he argues is made possible through ostension and inference (OI) and made powerful by the addition of a *conventional* (read *learned*) code. We largely agree about the features of ape gesture but disagree about the relationship between code and OI systems in ape communication (and human evolution). What does it mean to say, as Scott-Phillips does, that X makes communication *possible* and Y makes it *powerful*? I question the utility of this two-tiered picture in which the code and OI systems are layered differently in apes and humans. I would reframe the discussion as one of emphasis, focusing on the degree to which ostension and inference are employed in a particular species, modality, or single communicative act.

Ape gestural communication is characterized both by its flexibility and by the striking similarity in gestural repertoires across groups. An ape might modify her gesturing to account for the visual attention, behavioral state, or history of communicative success with her partner. However, her individual gestures would be largely similar to those used by all other members of her species. This does not imply that ape gesture is a hardwired system entirely without learning: gestures might be based on heritable prototypes "tuned" during development (Hobaiter and Byrne 2011*b*), or they might arise from common actions ritualized into gestures resembling their shared roots (Halina, Rossano, and Tomasello 2013). Is ape gesturing better characterized by its limited repertoire or by its sophisticated use? If we focus on the abilities that make the system flexible, the discontinuity with human communication narrows.

Scott-Phillips divides the monolithic OI system into four subcomponents: the expression and recognition of informative and communicative intentions. However, the possibility and consequences of having only some of the subcomponents are never considered. Would a species that expressed and recognized informative intentions be characterized as having *only* a natural code system if it were unable to meet the experimental criteria for hidden authorship? This question gains significance when you consider that recipients arguably do more work than signalers in primate communication (Seyfarth and Cheney 2003). In fact, primates generally display more sophisticated abilities when interpreting and predicting others' behavior than they do in other-directed action. For example, they are able to learn complex tasks through observation despite scant evidence of ostensive teaching (Moore 2013*b*). The burden placed on these learners is not unlike that faced by recipients of communicative signals. It is clear, then, that some types of inference can exist in the absence of ostension. But what would evidence of *I* without *O* indicate? Is it possible to have a "partial" OI system?

The ability to recognize goals and intentions is a core area of research in comparative cognition. Though Scott-Phillips differentiates intentionality from ostension, studies that do not make the same distinction may nevertheless bear on his argument. For example, apes can sometimes distinguish signals produced purposefully from those resulting from accidents (Call et al. 2004). In one study, an experimenter signals the location of hidden food by dropping a marker onto a container either purposefully or accidentally (Call and Tomasello 1998). Apes (and human children) interpret the *purposeful* action as a signal for the hidden reward—that is, as a communicative act. The design of this study is structurally similar to the Behne, Carpenter, and Tomasello (2005) study used as evidence that children recognize communicative intentions. Does it demonstrate that apes have the same ability?

Two terms I found noticeably absent from Scott-Phillips's discussion of comparative cognitive abilities are "ontogeny" and "prosociality." First, apes raised in more humanlike environments (so-called enculturated apes) often out perform others on tests of social cognition and communication (Lyn, Russell, and Hopkins 2010; Russell et al. 2011; Tomasello and Call 2004). Though enculturated apes do not demonstrate full OI abilities, the malleability of these skills suggests that they are not determined by species alone. Second, the experiments Scott-Phillips describes as demonstrating OI abilities in children (even studies of hidden authorship) all rely on prosocial interactions in which the experimenter's goals are not at odds with the child's interests. Apes (at least chimpanzees) may demonstrate greater metapsychological abilities in competitive scenarios (Hare and Tomasello 2004). Primates employ such abilities during misdirection and tactical deception (Byrne and Whiten 1988), and the presence of these manipulative

behaviors relates to increased neocortex size across species (Byrne and Corp 2004). Indeed, producing a communicative act in order to mislead or deceive another individual involves an understanding of mental states and intentions not unlike that underlying OI communication.

Scott-Phillips weaves together literature from a wide range of fields to make a compelling case for the importance of ostension in language origins. It is clear that humans are unusually ostensive (and prosocial) creatures, but Scott-Phillips underestimates the role of OI-like abilities in apes' gestural communication, understanding of intention, and strategic manipulation.

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Scott-Phillips emphasizes and clarifies some important points. For example, comparative communication research would benefit from moving toward a pragmatic rather than a semantic framework given that animal—and much of human—communication is designed to occur in context rather than abstracted. This point has recently been embraced as a promising framework by primate gestural and vocal communication researchers such as Wheeler and Fischer (2012), Arnold and Zuberbühler (2013), and Liebal et al. (2014). Scott-Phillips also helpfully formulates ostensive-inferential communication into potentially testable chunks.

One point not made clear by Scott-Phillip is to what extent human communication requires or uses the ostensive-inferential model of communication rather than the simpler code model. When we do use the former, how often do we fail by misunderstanding each other? Why do we fail—is it poor ostension or poor inferencing? If failure rates are high, or there is considerable individual variation as suggested by the results of Grosse et al. (2010), does this mean we are still (in an evolutionary sense) not so good at ostensive-inferential communication? What social cues do individuals use to compensate for their weak areas? Empirical testing of these points could determine how good we really are at being ostensive-inferential communicators, defining the range of natural human variation from which to compare other species.

It is not yet clear that primates are incapable of Scott-Phillips's definition of ostension. As he states, the relevant experiments have simply not yet been conducted. But recent studies indicate that they are worth conducting. A chimpanzee vocalization, the alert hoo, shows some markers of intentional production (Schel et al. 2013), and signalers emit alert hoos more to others who are ignorant as opposed to knowledgeable of a hidden threat (Crockford et al. 2012). Also, chimpanzees (Wittig et al. 2014*a*) and monkeys (Bergman et al. 2003; Engh et al. 2006; Wittig et al. 2007*a*, 2007*b*) are aware when calls are probably directed to themselves. Finally, receivers behave as if they infer likely consequences from calls, with their responses varying depending on the signaler, the call type, call context (Price and Fischer 2014), their own recent social history (Wittig et al. 2007*a*, 2007*b*, 2014), and knowledge of third-party relationships (Bergman et al. 2003; Crockford et al. 2007; Wittig et al. 2007*a*, 2007*b*, 2014*a*).

However, whether signalers express their informative or communicative intentions and whether receivers demonstrate recognition of others' informative or communicative intentions needs to be tested. Such experiments in apes will be challenging, probably requiring pretrials to ascertain suitable contexts for testing. The begging scenario suggested by Scott-Phillips is a good one, particularly given that food sharing in chimpanzees may be a cooperative event (Wittig et al. 2014*b*), and as such cooperative-style communication might be more likely to be instigated. One can imagine, for example, that if a beggar received meat through an intentional donation, he might acknowledge receipt of the meat by food grunting. If on the other hand, the beggar had received meat by the donor accidently dropping it, he might remain silent. If such a differential vocal response occurred reliably, one could then ascertain whether the beggar's food grunt was produced to acknowledge that his communicative intent had been fulfilled rather than for some other reason. Using the same scenario to check for recognition of another's communicative intention, one could ascertain whether in the accidental context the beggar would reliably double check the face of the donor for more information. If so, one could test whether the beggar was double checking in order to determine whether the donor had intended to give the meat or for some other reason, such as ascertaining the likelihood of receiving aggression. It is conceivable that the donor might show recognition of the beggar's communicative intention by returning the beggar's look, producing food grunts or reassurance gestures.

As well as determining whether apes "pass" or "fail" the ostensive-inferential tests, it is also important to ascertain what cognitive and social aspects of ostension and inference apes do or do not use. One way to assess whether there is a continuum between ape and human communication would be to cross-check whether the cognitive strengths and weaknesses displayed by apes during communication reflect those displayed by humans, albeit to a different degree.

Finally, Scott-Phillips asserts that human communication is not an evolutionary sequel to animal communication but is different in kind. Although interesting, this along with many other theories about the evolution of language remains a theory until empirically tested. The current hold up is the dire shortage of empirical studies on nonhuman primates that can address these theories.

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Animal Gestural Communication Is Not Just a Code System

A main thesis of Scott-Phillips's article is that there are two major types of communication, which he calls the code model and the ostensive model. Human communication follows the ostensive model. In the section "Does Nonhuman Primate Communication Use Ostension and Inference?," he argues that nonhuman primate communication is not ostensive. From this he concludes that "great ape communication is probably a form of coded communication, albeit of a particularly sophisticated variety."

Scott-Phillips's line of reasoning builds on the assumption that the code model and the ostensive model, as he describes them, are exhaustive. I want to challenge this by outlining a noncode, nonostensive account of communication. Following Zlatev, Persson, and Gärdenfors (2005),[1] I call this form dyadic mimesis. I also present some evidence that great ape gestures fall into this type of communication.

The dancing of bees is an example of a sophisticated form of coded communication (von Frisch 1967; Gallistel 1990) that maps dancing behavior onto distance and direction to a nectar finding. Great ape communication, however, is not of the same type. For one thing, the bees' system is inflexible, but the apes' gestures can be adapted to the context (Roberts, Vick, and Buchanan-Smith 2012). The question is how the difference should be analyzed.

Based on Donald's (1991) notion of mimesis, Zlatev, Persson, and Gärdenfors (2005) propose a distinction between dyadic and triadic mimesis. In brief, a communicative act is an act of *dyadic mimesis* if it is under conscious control (*volition*) and the action *represents* something. A communicative act is an act of *triadic mimesis* if it also fulfils the *communicative sign function* that the subject intends for the act to stand for some action, object, or event for an addressee and for the addressee to appreciate this. The latter condition seems to be the same as Scott-Phillips's criterion for ostensive communication, so I believe that his concept can be identified with triadic mimesis. The communicative sign function is in essence what is involved in both declarative pointing and verbal or sign language. Apes that have not been "enculturated" (cross-fostered) are poor at these skills, though some rudiments have been observed in captive gorillas (Tanner and Byrne 1996) and bonobos (Savage-Rumbaugh, Wilkerson, and Bakeman 1977).

I want to explain why communication in the form of dyadic mimesis should not be identified with Scott-Phillips's code model. Bees' dances are not acts of dyadic mimesis because the dancing presumably is not under volitional control.[2] As Scott-Phillips notes, it is debated whether primate vocal communication is volitional. The available evidence suggests, however, that great ape gestures are acts of dyadic mimesis. In such gesturing, one finds representation in the sense that there is correspondence between the gesture and its "meaning," in most cases the *action* that the gesturer wishes the addressee to perform. Intentional gestures are produced with the goal of eliciting a particular behavioral outcome in the addressee. In turn, an addressee may make inferences about the meanings of the gestures. However, the "meaning" of a particular gesture may depend on whether the gesture is produced within a grooming or in a mating context (Roberts, Vick, and Buchanan-Smith 2012).

Intentional and volitional use of gestures has been reported for all great ape species (Tomasello and Call 2007). In the wild, chimpanzees gesture more often in the presence of others and gesture more to individuals who attend to them (Roberts, Vick, and Buchanan-Smith 2012). They also persist in gesturing if the behavior of the addressee does not match their goals (Cartmill and Byrne 2010; Liebal, Call, and Tomasello 2004). This suggests that gestures are produced to influence others. However, this does not entail that the gestures fulfil the communicative sign function: a gesture may be performed to influence the behavior of the addressee, not the state of mind of the addressee.

The difference between a coded form of communication, dyadic mimesis, and triadic mimesis (alias ostensive communication) also shows up in terms of what forms of metapsychology (theory of mind, intersubjectivity) are required. Scott-Phillips seems to judge all forms of metapsychology alike. No metapsychology is required for coded communication. For dyadic mimesis, the one who gestures must understand that the attention of the addressee is directed toward the gesturer (Gärdenfors 2003; Zlatev, Persson, and Gärdenfors 2005). Such "second-order attention" is well testified among great apes (Hare et al. 2000). In this sense, great ape gestures involve second-order mentality (a claim on the attention and behavior of the addressee) but not third-order mentality, because there is no appeal on the addressee to understand the gesturer's own mentality.

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1. Unfortunately, this paper was only published in a local series, so Scott-Phillips cannot be blamed for not being aware of it. It is publicly available at http://www.lucs.lu.se/LUCS/121/LUCS.121.pdf.

2. In the terminology of Zlatev, Persson, and Gärdenfors (2005), the dance is a form of protomimesis.

Apes Engage in Ostensive Referential Communication

I cannot but agree with the author that in order to understand the origins of human communication, it is crucial to focus on the emergence of ostension as one key evolutionary event (see Gómez 1994, 1996, 1998 for previous proposals about this). However, my conclusion was then, and still is now, radically different: apes are capable of basic forms of ostensive communication.

One reason for this divergence may lie in different conceptions about the nature of ostension. The author assumes ostension is a metapsychological process based on the ability to engage in complex mental attributions (e.g., mutually embedded computations of the type "I want you to notice that I want you to notice that I want that object"; see Sperber 1994). In this view, ostension is a particularly virtuoso exercise in metacognition or theory of mind that might indeed be exclusive of humans. My suggestion, however, is that ostension is a more primitive type of mental phenomenon initially linked in evolution to joint attention situations, where two organisms monitor each other's attention and behavior in relation to an event or object. Ostension occurs when one of the organisms "deliberately and openly" (to use Grice's [1957] original description of communicative intent) addresses its referential behavior to the attention of the other.

The challenge from an evolutionary point of view is to explain how this ability to "deliberately and openly" share reference and intentions has emerged, what it consists of, and how it is expressed and detected. Ostension is linked to the mutual attention component of joint attention and is typically (but not exclusively) expressed through behaviors such as eye contact between the interacting individuals. This requires no complex computation of embedded mental states (at least no explicit representation of them; see Gómez 1994, 1996 for a detailed argument).

The author is right in pointing out some confusion in the literature about the different senses of the term "intention" and the criteria of intentionality in communication. One must distinguish between criteria of intentionality as goal-directedness (e.g., persistence and elaboration of signals) and criteria of communicative, ostensive intent (i.e., signals showing that a behavior is "deliberately and openly" addressed to the other's attention). Gaze alternation and attention-getting (dismissed in the paper as mere indicators of goal-directedness) can however be indicators of ostension if they include "eye contact" to establish truly mutual attention (Gómez 1994, 1998). Observational and experimental evidence suggests that apes use such ostensive cues in their communicative exchanges.

Some of the best demonstrations of ostensive communication in apes occur in what we can call "nonnatural communicative situations," where they have to go beyond their repertoire of natural signals. For example, captive apes actively provoke mutual attention with humans when using signals such as hand pointing to request things, much as human infants do. They can transform manipulative behaviors (e.g., taking a human by the hand) into communicative signals by a combination of action schematization and eye contact with the addressee even if the addition of eye contact does not significantly affect the success rate of their requests (Gómez 1994, 2010). Observational and experimental evidence suggests that apes can control the information they make available to the attention of others, for example, when approaching a contested piece of food, and that they can make inferences about what others will do based on what competitors have or have not seen (Hare, Call, and Tomasello 2006; Kaminski, Call, and Tomasello 2008). Moreover, apes can choose the *relevant* piece of information to be communicated, taking into account what others know or ignore. Thus, apes who learned to point to the location of hidden food for a keeper to retrieve with a tool and give to them did, when the tool was misplaced in probe trials, spontaneously point to the hidden instrument for the keeper, thereby demonstrating a "relevant" use of their referential gesture (Zimmermann et al. 2009).

This is not simply intentional communication in the sense of a goal-directed use of coded signals. By coordinating *referential* (e.g., pointing) and *ostensive* (e.g., eye contact) signals, sometimes alongside additional natural signals (e.g., vocalizations), apes go into the realm of ostensive communication. What is remarkable about ape communication is precisely how easily they can go beyond their natural communicative repertoire ("naturally selected meaning") and generate novel communicative behaviors out of ordinary behaviors to communicate in "nonnatural" ways.

In sum, I argue that when we consider the available evidence, instead of assumptions about the results of experiments not yet conducted, apes demonstrate basic forms of ostensive communication, suggesting that this crucial step in the emergence of human communication has a longer evolutionary history that the target paper suggests.

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> Intentional communication is first of all meeting of attention. (Gómez 1991)

The last century has seen a plethora of fantastic and visionary theories to account for the origins of human language, even resulting in a ban by the Société de Linguistique de Paris (1865) and the Philological Society of London (1873). Today, we still do not know why or how language evolved, but debates center predominantly on the factors triggering its evolution (Pika and Bugnyar 2011) and/or the sociocognitive

requirements (e.g., cooperation, intentionality, referentiality, or Mead's loop; McNeill 2012; Tomasello 2008).

Scott-Phillips adds to this debate by stressing the importance of pragmatics for studies of language evolution. The field of pragmatics is based on concepts of Saussure, who distinguished between the linguistic code (*langue*) and the concrete instances of the use of this code (*parole*). Borrowing from relevance theory (Sperber and Wilson 1986), the selection of signals is seen to be based on the recognition of communicative and informative intentions within the communicative context, while the linguistic code itself provides only insufficient means for deciphering an utterance. Although precursors to this communication system may be found in nonhuman primate communication, Scott-Phillips concludes that this so-called ostensive-inferential system represents an evolutionary novelty in the human lineage.

Although history has taught us numerous times that "uniquely human abilities" are mainly found when there is a lack of data and insight, we sympathize with Scott-Phillips's approach of welcoming pragmatics into the study of comparative research. However, our views diverge on a number of issues, outlined below.

First, the linguistic code cannot be divorced from an ostensive-inferential system, as Scott-Phillips and radical pragmatists suggest. Contrarily, the two concepts represent different sides of the same coin in any complex communicative system. The importance of code for language meaning has been well demonstrated by the studies of Chomsky (1957, 1995) and other renowned linguists, who showed that code *can* work as an independent system. It is thus difficult to imagine why ostension should have laid the groundwork for the evolution of language when so much of what is perceived as characteristic for human language is contained in pure code (i.e., syntax). The fact that code is generally underdeterminant does not imply that determinacy is not possible but merely reflects the tendency to adapt language in accordance with the pragmatic (contextual) situation (Bach 2012; McKellin et al. 2007). Furthermore, the "underdeterminacy paradigm" faces serious criticism from syntacticians who see context sensitivity of an utterance as a product of the particular syntax (binding) underlying the utterance (Stanley 2000). We believe that an ostensive-inferential system *was* crucial for the development of human language but that code must have been interwoven with it from the beginning.

Second, while "ostensive behavior" is seen by other researchers as a way to express and assess communicative intent (Gómez 1996), Scott-Phillips defines it "as the expression and recognition of communicative and informative intentions." By using the term with explicit reference to "informative intent" (and thus the recognition of underlying psychological processes or mental states), he thus artificially raises the bar to label the behavior as uniquely human. Contrarily, following the approach of Gómez (1996), ostension has been convincingly shown to play a crucial role in the gestural communication of great apes (Bard 1992; Gómez 1991; Leavens 2004; Pika 2012). For instance, great apes use eye contact *before* the use of a gesture (Gómez 1996) and take into account the attentional states of their interaction partners (Call and Tomasello 2007). They thus make sure the receivers are "prepared" for the inferential work that is entailed in the communicative instance before the actual signaling begins (e.g., Hostetter, Cantero, and Hopkins 2001; Pika, Liebal, and Tomasello 2003; Poss et al. 2006). In addition, the ability to use signals in a referential way is of particular relevance to the discussion of ostensive communication (Pika 2012). Intentional pointing, for instance, requires both interactants to be aware of the communicative and informative intentions involved in the communication (Gómez 1996; Sperber and Wilson 1986). Pointing for conspecifics has been demonstrated for chimpanzees (Pika and Mitani 2006) as well as common ravens (Pika and Bugnyar 2011). A fully developed theory of mind is not a *conditio sine qua non* for this, but simpler cognitive processes, such as first-order representations in terms of shared attention, may be at work (Gómez 1998).

Finally, we would like to draw attention to another interesting issue concerning inferential-ostensive communication: the question of how receivers can make the correct inferences from the information that the signalers provide. What contextual cues are perceived as "relevant" by the receiver in deciding on the meaning of the communicative message? Determining how receiver understanding is achieved in ostensive-inferential communication in nonhuman animals can potentially shed light on new facets of the study of language evolution, which has been focusing predominantly on the signaler's point of view.

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A Common Intentional Framework for Ape and Human Communications

Scott-Phillips argues that ape gestural communication is not ostensive-inferential because this requires grasping intentions to change an interlocutor's mental states and complex sets of "informative" and "communicative" intentions. As a result, even when ape gestures resemble our own and are used with similar functions (e.g., Genty 2014; Moore 2014*a*), the psychological processes underlying them are likely to be fundamentally different.

A more plausible alternative is that proponents of the ostensive-inferential view (Grice 1989; Sperber and Wilson 1995; Tomasello 2008; and Scott-Phillips, here) have systematically overstated the cognition that it requires. If this is true, there may be no reason to deny that ape communication is ostensive-inferential. In plotting the evolution of intentional com-

munication from our last common ancestor with the other ape species, we need therefore suppose no radical overhaul of early hominin social cognition before the advent of recognizably human forms communication.

Scott-Phillips offers two arguments for concluding that ape gestural communication is not ostensive-inferential. These concern (1) the contents of "informative intentions" and (2) intentional structure. Both should be rejected (Moore 2014*b*; R. Moore, "Enacting and Understanding Communicative Intent," unpublished manuscript).

Concerning (1), Scott-Phillips claims that "informative intentions" are intentions to "manipulate their mental states"—especially belief. This claim is mistaken, because not all utterances are informative, and because informative utterances need not presuppose a concept of belief.

Communicative intentions can aim at both informing others and at bringing them to act (Grice 1989). In the latter case, I might tell you "Stop hitting me!" with the intention that you *stop hitting me*. Here my goal is to manipulate your actions, not your mental states. One might retort that I really intend that you *believe that I want you to stop hitting me*—a paradigmatic case of mental-state manipulation. It is not clear, however, why the former intention would not suffice.

In addition to intentions that aim to produce action, communicative intentions can aim to change others' knowledge states. Even where such informative goals are present, though, they can be articulated in more or less psychological terms. For example, in addition to pointing to get you to *believe that there is a snake* (richly mentalistic), I might also point to get you to *look at the snake* (less mentalistic). For the question of whether actions are communicative, these differences seem irrelevant. Although intentional communication works by producing changes in an audience's mental states, *communicators need not intend to produce these responses under a mentalistic description.*

Given this, chimpanzees' apparent lack of a concept of belief (Call and Tomasello 2008) is no obstacle to their being ostensive-inferential communicators. It is uncontroversial that they understand both others' intentions in action (Call, Carpenter, and Tomasello 2005) and what others have and have not seen (Hare et al. 2000). Their gestural acts may aim at changing these even if not full-blown belief states.

On (2), the question of intentional structure, Scott-Phillips argues that ostensive-intentional communication requires grasping complex sets of intentions: "the expression of communicative intentions, the recognition of communicative intentions, the recognition of informative intentions, and the expression of informative intentions." He suggests several experimental paradigms that would present evidence of the relevant intention understanding. However, his designs set the bar unnecessarily high. For example, hidden-authorship studies test not only subjects' understanding of the difference between informative and communicative intentions but also their being able and motivated to inhibit them selectively. Chimpanzees would probably fail to do this, not least because of their poor inhibition control. However, so too would infants, who are uncontroversially ostensive-inferential communicators. On the subject of recognizing communicative intentions, Scott-Phillips suggests that apes should respond differentially to ostensively and nonostensively produced novel signs. However, two-year-old children do not always do this (Moore et al. 2014). Since this is not because they fail to understand communicative intentions but because they understand them flexibly, analogous findings on ape subjects would need to be interpreted cautiously.

On alternative accounts (Moore 2014*b*; R. Moore, "Enacting and Understanding Communicative Intent," unpublished manuscript), recognizing communicative intentions requires just knowing how to address a communicative act to another and knowing when one is being addressed. Evidence for the former would be evidence that apes address their gestures differently to attentive and inattentive individuals, something for which there is already abundant evidence (Liebal et al. 2004; Povinelli et al. 2003). Evidence for the latter might be provided by different patterns of attention to individuals who are and are not addressing them. With respect to informative intentions, production requires only knowing how to produce gestures in pursuit of certain goals, while comprehension requires being able to grasp the goals underlying others' gestures. Again, there is already good evidence that apes do this (e.g., Pelé et al. 2009; Yamamoto, Humle, and Tanalan 2009), albeit in fairly limited ways (Herrmann and Tomasello 2006; Moore 2013*a*).

Because neither of Scott-Phillips's arguments succeeds, he presents no good reasons to doubt that apes are ostensive-inferential communicators, albeit ones of rather limited ability.

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Is Language Special? Surely Not!

Understanding the origins and evolution of language is a major challenge. Historically, progress was stifled by the facile assumption by generations of linguists and philosophers (and too many anthropologists) that language is special, unique, without substantive precedent in the communication systems of closely related primates. This tack thus dismissed the challenge rather than embracing it! Latterly, the challenge has been more enthusiastically embraced by primatologists explicitly endorsing continuity between humans and our nonhuman primate counterparts. This group has taken the opposite tack, assuming that language is not really so special and, hence, that its rudiments can probably be found in the communication systems of nonhuman primates and possibly beyond.

Scott-Phillips, in embracing the challenge himself, tacks between these two positions and in the process charts some real progress. He makes clear that if the former conceit of linguists, philosophers, and anthropologists was misguided, so too is the enthusiasm of many current primatologists. He argues that much recent research in primate communication is misplaced because it is preoccupied with surface-level similarities in the *informational code* of language, for example, semantics and syntax. It has thus failed to appreciate important differences in underlying social cognitive abilities in human and nonhuman primates, related to intentionality and ostension, that motivate and sustain communication differently in the two groups and that make communication in one richly meaningful and in the other quite meaningless (points with which Michael Owren and I wholly agree, e.g., Owren, Rendall, and Ryan 2010; Rendall and Owren 2013; Rendall, Owren, and Ryan 2009).

To wit, as Scott-Phillips importantly notes, meaning in language derives only in part from the semantic code—the conventional association between a word and its referent. It derives as much, or more, from the pragmatics of language use—how words are actually used, in context, and the variable informative and communicative intentions this entails in speaker and listener alike. This is the domain of intentionality and ostension, overlapping abilities that together undergird routine language use and capture the awareness humans have of the meaningfulness of their own communications. We can, for example, mean what we say ("Pass the salt.") but also mean what we do not say ("Maybe ask HER where she was last night."), say what we do not mean (my title), and even mean without saying anything at all (the pregnant pause). In the process, our meaning can be wholly modified, supplemented, inverted, or negated from that which is carried in the surface semantic code, a critical point primate researchers seem not to appreciate.

In contrast, and continuing future appeals notwithstanding, intentionality is largely absent in primates save possibly some of the great apes . . . maybe (Call and Tomasello 2008; Penn and Povinelli 2007). They do not generally understand one another as mental agents. Hence, they do not *know* what others *know*, or, possibly, even that they can *know*. Hence, their communications do not involve an *intention to inform*, much less to manipulate others appreciation of one's *communicative intent* and thereby modify the *meaning* of communications. As Scott-Phillips argues, the ostension-inference dynamic, so central to the meaningfulness of language, is an evolutionary add-on, contingent on but not redundant with intentionality. Lacking even intentionality, ostension is a nonstarter for primates. So, in short, and in marked contrast to human language users, nonhuman primates simply do not appreciate the communicative potential of their own communications.

Consequently, while some of their vocalizations, like the now famous alarm calls of vervet monkeys, have been parsed as anticipating the semantic code of language because they seemed to be produced in relatively specific contexts (a finding itself now in doubt; Price 2013), this parsing, as Scott-Phillips emphasizes, conflates natural codes, routine among animals (and computers), with the conventional code instantiated in language. Further, it also vastly underanticipates the meaningfulness of language, which is, in fact, only minimally predicated on the basic signifier-signified relationship instantiated in a natural code.

All of this invites an important follow-up question. If the communication systems of primates (and other animals) do not work by intentionality, ostension, semantics, and meaning, then how exactly do they work? This is something Scott-Phillips obviously cannot take up in this essay, nor can I here, but it is an active area of research that offers many possibilities, both classic and contemporary (e.g., Owings and Morton 1998; Owren and Rendall 2010; Ryan 1990; Smith 1977). Notably, some of these possibilities may constitute so-called third alternatives to the *code* and *ostension-inference* models of communication Scott-Phillips suggests currently exhaust the logical possibilities (Owren and Rendall 1997, 2001; Ryan 1990). Further, some also provide fertile ground for studying the biological foundations of language, highlighting alternative points of potential continuity with animal systems but in ways that do not deny or trivialize but rather embrace the special qualities of language (Nielsen and Rendall 2012; Rendall and Owren 2010).

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The millennia-long debate regarding what separates humans from animals has repeatedly stressed the importance of a meaningful language. Aldous Huxley once asserted, "Thanks to words we have been able to rise above the brutes." However, following observations that closely related primate species vocally reference external events, the possibility that semanticity may actually be built on phylogenetically old cognitive building blocks gained increasing credibility. As such, the chasm thought to separate *us* from *them* became one more of degree than kind.

But of course, contemporary pragmatics has indicated that meaning in language cannot be captured by a simple code-like model of communication. Paul Grice highlighted this by distinguishing between two forms of meaning: natural ($\text{meaning}_{\text{N}}$) and nonnatural ($\text{meaning}_{\text{NN}}$). $\text{Meaning}_{\text{N}}$ involves one thing reliably predicting another (thunder *means* a storm), whereas $\text{meaning}_{\text{NN}}$ involves situations where meaning is intended to be informative and communicative: the ring of the bell in a pub is intended to *mean* you should realize now is last orders. Moreover, when receivers hear the

bell they know the landlord intends to communicate that people know last orders is now. According to Grice, linguistic meaning, as in language, is of the nonnatural kind: it involves the expression and recognition of communicative and informative intentions and is underwritten by metapsychological abilities that enable mental-state attribution (Grice 1982).

Given the apparent differences between the intention-based semantics of language and the "natural" meaning of primate vocalizations (alarm calls predict predators), one recent approach has aimed to understand how flexible or "intentional" primate communication is (Arbib, Liebal, and Pika 2008; Slocombe and Zuberbühler 2007). But this is where Scott-Phillips argues important distinctions have failed to be made. The author notes while signal flexibility shows goal-directed behavior, it has little to do with language's intention-based semantics, which is less associated with *how* signals are used and more with what we *mean* to communicate using signals (namely our informative and communicative intentions). Scott-Phillips contends there is no current evidence for the latter, what he highlights as ostensive-inferential communication, and empirically testing for it in animals is not simple. One might hope with time we will be able to shed light on this issue and demonstrate homologous ostensive-inferential capabilities in apes. Scott-Phillips is less optimistic, claiming this scenario is founded on the incorrect assumption that the natural communicative code in primates is the evolutionary antecedent of the linguistic code (Hurford 2007). The author takes the alternative position that the two are entirely unrelated. First, the linguistic code is conventional, which primate signals are not (Wheeler and Fischer 2012), and second, this conventional code was probably a de novo evolved trait in humans that when superimposed on our ostension and inference capacities made language the powerful communicative system we employ today. The author's approach is certainly interesting and timely, falling in line with the growing trend to focus more on pragmatics in animal communication (Price and Fischer 2014; Wheeler and Fischer 2012). However, we foresee a few issues when digesting the take-home message. First, it is not completely clear how Sperber and Wilson's ostensive-inferential framework (Sperber and Wilson 1995) highlighted by Scott-Phillips here really differs from Grice's discussion of "intentional communication." From the outside, it seems that the ostensive-inferential approach is a reformulation of Grice's intentional communication paradigm with the exception that it puts greater emphasis on making the communicative intention overt to the audience. To avoid confusion, perhaps it would have been easier to first resolve exactly how Grice's framework can be applied to animal communication before providing yet another similar approach. Second, the conclusion that ostensive-inferential communication is absent in primates may be premature. Recent research employing novel experiments suggests chimpanzees understand the communicative value of their own alarm calls, using them to inform ignorant receivers regarding the presence of danger (Crockford et al. 2012). While it appears here only the intention to inform is demonstrated, these data still suggest metapsychological abilities underlie ape communication. Given the central role of mental-state attribution to ostensive-inferential communication, what are we to do with such observations? How do they fit in with the assumption that ostensive-inferential communication is uniquely human? In line with this, the conclusion we found most provocative was the emphasis on the shortcomings of using primate vocalizations (or "code") as evolutionary precursors of language. While there is some suggestion that human language grew out of the basic communication system used by our last common ancestor with apes (Hurford 2007), this is primarily related to the production mechanisms underlying the vocal control we see in human language (Lameira, Maddieson, and Zuberbühler 2014). Any inferred continuity regarding referentiality or syntax is, alternatively, in the form of shared cognitive mechanisms and not necessarily linguistic structures (Liebal et al. 2014). Even if, as Scott-Phillips suggests, the primate code is evolutionarily unrelated to human conventional codes, studying linguistic-like structures in primates (but also animals more generally) can still indirectly unpack the evolution of such abilities, primarily the socioecological conditions promoting their evolution (Collier et al. 2014). For example, one dominant hypothesis in language evolution links communication with cooperation. By focusing on highly cooperative species and their communicative code, we can empirically test these hypotheses with statistically independent data points. This in turn can ultimately help us build a tentative narrative describing how and why language abilities evolved in the hominid lineage. If nothing else, this is an endeavor worth pursuing.

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Functions and Mechanisms of Communicative Behaviors in Humans and Nonhuman Primates

Scott-Phillips gives a provocative take on what nonhuman primate communication tells us about the evolutionary origins of language and provides further reasons why we should be skeptical that phenomena such as functional reference and combinatorial communication are evolutionary precursors to linguistic reference and syntax. From the beginning, the concept of functional reference was meant to be agnostic about whether the underlying mechanisms involving their production and perception were the same as those that underpin linguistic reference while drawing attention to their functional similarity (Marler, Evans, and Hauser 1992). Scott-Phillips concisely explains why using this logic to draw a direct evolutionary connection between functional reference and lin-

guistic reference is flawed: while an evolutionary connection should be fully expected in the proximate (cognitive) mechanisms that underlie communication, there is little reason to expect such continuity in a given trait's function, as new functions can suddenly arise from mechanisms already in place. This seems obvious enough, making it hard to see why a cognitively agnostic framework came to be so influential in the search for linguistic origins in our closest relatives in the first place.

Accumulating evidence suggests that the initial agnosticism regarding the cognitive mechanisms was wise given that at least the production of vocalizations traditionally considered functionally referential appears to be underpinned by very different mechanisms from those underpinning human linguistic utterances but the same as those underpinning other vocalizations (Wheeler and Fischer 2012). Further, as Scott-Phillips points out, *all* animal communication, not just functionally referential communication, is underpinned by a "natural code" (a modification and extension of Grice's [1957] idea of "natural meaning"; Wharton 2003) based on spatiotemporal associations between the signals and some relevant phenomena in the world (e.g., a predator, the signaler's subsequent behavior, etc.). This contrasts with the "conventional codes" that give meaning (Grice's "nonnatural meaning") to words wherein the only spatiotemporal association is with the speaker's intent to communicate about the word's referent. The two coding systems clearly function similarly, but their underlying mechanisms differ in kind, making gradual evolution from one into the other appear rather unlikely.

This insight seems to throw cold water on a widely held contention among students of primate communication, myself included, that the difference between humans and other primates with regard to the perception end of the communication process is only one of degree even if we concede that the difference on the production end is one of kind (Seyfarth and Cheney 2010; Wheeler and Fischer 2012). After all, although the production and usage of nonhuman primate vocalizations is almost completely innate, receivers often require experience to respond appropriately to a given signal, suggesting that associative learning allows receivers to understand what a signal indicates and possibly evokes a mental representation of the indicated phenomena. Perhaps there is in fact a degree of continuity here with the way young children learn the meanings of their first words, but learning words clearly requires mechanisms far more complex than associative learning, and words do not lose their meaning when spoken in the absence of their referents the way that nonhuman primate calls do (Deacon 1997). Thus, although it seems likely that the cognitive abilities necessary to form such mental representations must be in place in order for the more complex mechanisms necessary for language comprehension to evolve, the latter would indeed seem to differ in kind and not degree from the former.

Similarly, the cognitive mechanisms used by nonhuman primates and other animals to account for context to infer appropriately what a received signal indicates (the focus of the relatively new field of "animal pragmatics"; Arnold and Zuberbühler 2013; Price and Fischer 2014; Scarantino and Clay, forthcoming; Wheeler and Fischer 2012; see also Seyfarth and Cheney 2014) may be only a prerequisite but not precursor to the mechanisms employed by receivers in linguistic communication. But given that the cognitive mechanisms involved in human behavior are often much simpler than we tend to attribute (Shettleworth 2010) and that language use surely draws on a greater range of cognitive mechanisms than those that Scott-Phillips focuses on, it seems premature to completely rule out potential mechanistic continuity in this and other regards. The potential link between animal and linguistic pragmatics is one that still seems well worth investigating. Such research may end up showing that the two are only similar in function but not underlying mechanisms. It may also show that it is so taxonomically widespread that its occurrence among nonhuman primates should not be considered "special." But if nothing else, research into animal pragmatics, like that of functional reference, will teach us more about the cognitive mechanisms involved in animal communication. Eventually we will be able to dismiss that path as another red herring or perhaps find evidence of continuity in the cognitive mechanisms underpinning human (linguistic) and animal (nonlinguistic) communication in realms unassociated with mental-state attribution.

Reply

In my target article, I described a key distinction for contemporary pragmatic theory between two different models of communication: the code model and the ostensive-inferential model. Human communication is ostensive-inferential—linguistic communication is a special case of this—but, I argued, nonhuman primate communication is probably not. As such, the difference between human communication and nonhuman primate communication is a difference of kind and not simply of degree. If correct, these facts imply that there is no direct evolutionary relationship between nonhuman primate communication and human linguistic communication. Two of the commentaries (Rendall, Wheeler) largely endorse this conclusion. All the commentators discerned that if correct, this conclusion undermines some of the central assumptions and motivations that underpin a great deal of research on nonhuman primate communication.

Many of the theoretical objections raised in the commentaries share a common theme. As the citations I used made clear, my analysis was conducted within the context of relevance theory (RT; Wilson and Sperber 2012; see Clark 2013 for an introductory text). RT is a cognitive approach to pragmatics, but it is certainly not the only theoretical framework available. On the contrary, it is not even the most well known:

there is greater awareness of the (neo-)Gricean approach. This is true both in general and in particular among researchers focused on nonhuman primate communication. Luef and Pika, Gärdenfors, and Moore all, in one way or another, question the RT foundations of my analysis, and Townsend and Sievers question whether RT is really so different from the neo-Gricean approach. Let me therefore begin by outlining the main differences between RT and the neo-Gricean approach.

There are two fundamental differences between RT and the various Gricean and neo-Gricean approaches to pragmatics (see Sperber and Wilson 2012 for a more detailed but still concise discussion of the differences between these frameworks). The first is that RT argues that the explicit side of communication is just as inferential as the implicit side. Everybody accepts that there is often or always a gap between literal meaning ("what is said") and speaker meaning ("what is meant") and that this gap must be filled by inference. In other words, we use inference to go from what is said to what is actually meant. This is the implicit side of communication. The explicit side of communication is about how we determine literal meaning in the first place. In other words, how do we go from a string of speech (or other communicative behavior) to what is said? One difference between RT and neo-Gricean approaches is that RT stresses that even this explicit side of communication is inferential and not based entirely on a coding/decoding process. This point directly addresses Crockford's request for clarification about the extent to which human communication is ostensive-inferential. According to RT, pragmatic stimuli can never be fully encoded even when expressed explicitly; and so, in short, all human pragmatic communication is ostensive-inferential. In other words, there is always an element of underdeterminacy in human pragmatic communication (Carston 2002). What RT explains is how this underdeterminacy is handled in everyday communication.

The second difference between RT and other approaches is in the nature of the expectations that guide the comprehension process. For Grice, and for the neo-Griceans that have followed him, these expectations consist of various maxims, principles, and other rules of behavior that speakers are expected to follow but that they can depart from on occasion as a legitimate means of communication. RT, on the other hand, argues that the very production of an ostensive stimulus raises in the hearer expectations of relevance, and these expectations are sufficient to guide the comprehension process. This insight—which is formalized as the "communicative principle of relevance"—derives directly from the ostensive-inferential model of communication that I outlined in the target article. In this way, RT provides an explanation of the principles by which ostensive communication must work. This is in contrast to Gricean and neo-Gricean accounts, which provide only post hoc descriptions of what speakers aim for. The benefits of this approach are clearly apparent in the wider literature: a vast range of linguistic and communicative phenomena have been successfully explained with RT.[3] I would also like to draw comparative pragmaticists' attention to the experimental work that directly tests the most fundamental tenets of RT (reviewed in van der Henst and Sperber 2004).

I will now address the three commentaries that directly reject aspects of RT. Luef and Pika reject RT's description of linguistic communication as a special case of ostensive-inferential communication in which the expressive potential of ostension is enhanced by a set of conventional codes. They do not, however, address the positive arguments in favor of this view. Rather, they make a number of assertions to the contrary, relying on cited literature to provide the details of the argument. Yet in each case, these references provide minimal support for the stated view, and they certainly do not address the many arguments made in favor of the analysis I presented (see "The Ostensive Foundations of Linguistic Communication" and references therein, in particular Origgi and Sperber 2000). Worse, in at least one case, the cited references do not even make the arguments that Luef and Pika claim they do. Specifically, Luef and Pika assert that the linguistic code "*can* work as an independent system" (i.e., without ostension and inference) and cite Chomsky in support, but Chomsky is famously uninterested in communication and has not shown or even claimed to show that the linguistic code is sufficient for natural, real-world, linguistic communication. On the contrary, where Chomsky has discussed communication, he has emphasized how ill-equipped, in his view, languages are for such ends (e.g., "for that purpose [communication] language is not well designed" [Chomsky 2002: 107]).

Gärdenfors questions RT's distinction between the code model and the ostensive-inferential model. In particular, he proposes that "dyadic mimesis" provides an alternative to both. However, dyadic mimesis seems to me to be a type of code model communication. Gärdenfors rejects this conclusion on the grounds that dyadic mimesis involves "volitional control." I do not see why this is relevant. Communication can be volitional and still operate according to the code model. What makes a system an instance of code model communication is that it is made possible by mechanisms of association ("Two Models of Communication"). There is no reason why this code could not be used volitionally. Indeed, that is part of what I propose occurs in much nonhuman primate communication ("Does Nonhuman Primate Communication Use a Natural Code?"). Put simply, Gärdenfors may well be correct that much nonhuman primate communication is volitional (and is hence an instance of dyadic mimesis), but that does not mean that it does not operate according to the code model.

Moore insists that informative intentions are not really what RT says they are, namely, intentions to manipulate mental states (his point [1]). RT includes extensive justification

3. See http://personal.ua.es/francisco.yus/rt.html.

of its definition of informative intentions, including arguments that directly address the specific points that Moore raises (Sperber and Wilson 1995, esp. 54–60). I do not have the space to enter into all the details here, but I will make one point (see also below, where I clarify the technical definition of an informative intention in terms of manifestness). Moore states that it is "not clear" that informative intentions, which are intentions to affect mental states, are needed to characterize ostensive-inferential communication. He argues that some typical cases of communication require only an intention to manipulate behavior. An intention to affect behavior is assumed to be cognitively less demanding than an intention to affect mental states. This assumption is questionable, but I shall put it aside for now. More important is the point that a characterization of informative intentions in terms of intentions to manipulate only behavior (and not necessarily mental states) is too broad. Specifically, it includes as communicative some behaviors that are clearly not. To use Moore's own example, both saying "Stop hitting me!" and moving (in a nonostensive way) to a place where you cannot hit me both satisfy a definition to affect the other individual's behavior. But only the former is communicative. It is precisely the intention to affect mental states that distinguishes communication from many other social behaviors.

I turn now to the comments that focus more on empirical matters. Crockford is more optimistic than I am that great apes may succeed at the experimental tasks I outlined in the target article ("Does Nonhuman Primate Communication Use Ostension and Inference?") and believes that such studies are worth conducting. Regardless of my own expectations of the results, I would certainly welcome any such studies, appropriately designed, and Crockford makes some useful observations about how this research might proceed. Moore and Cartmill both make the related point that in addition to testing for aspects of ostensive communication, the studies I propose test other skills, too, in particular a degree of prosociality. This is true, and as such I would also welcome the development of other experimental designs that remove these confounds. The studies I described are only meant to illustrate how the existence of ostensive-inferential communication could be shown. I do not claim that these studies are the only or even the best way to proceed. What is critical, however, is that any such new experimental designs still test the expression and recognition of communicative and informative intentions as defined in the target article (notwithstanding the point about manifestness, below). Only if such tasks are passed can we confidently conclude that nonhuman primates engage in ostensive communication. We do not presently have such data, and as such, Luef and Pika's assertion that ostensive behavior has already been "convincingly shown to play a crucial role in the gestural communication of great apes" is simply not true.

Cartmill and Gómez both survey data that, they argue, suggest that ostensive-inferential communication might exist in some partial forms in great apes. Moore proposes a similar idea. The possibility of minimal forms of ostension is, I believe, a conversation whose time has come. Informative and communicative intentions are often glossed in terms of mental states such as "belief," "understanding," and so on. I myself used these terms in the target article, for ease of exposition ("An informative intention is the signaler's intention to change the audience's beliefs or other mental representations"). However, their technical definitions, from RT, have in fact always been in terms of manifestness.[4] A proposition is manifest to an individual to the extent that she is likely to entertain and accept that proposition as true. An informative intention is, thus, an intention to make manifest or more manifest to the audience a set of assumptions, and a communicative intention is an intention to make it mutually manifest to audience and communicator the communicator's informative intention. Manifestness so defined is weaker than "belief," "understanding," and the other mental-state terms usually used to gloss the definitions of informative and communicative intentions. Manifestness is also, critically, a graded term: there are degrees of manifestness. Ideas that are only half understood are, in effect, only partially manifest. This gradedness opens up the possibility of minimal forms of ostension, that is, behaviors intended to increase the manifestness of an informative intention only somewhat or only in partially understood ways.

The experiments I discussed in the section of the target article titled "Does Nonhuman Primate Communication Use Ostension and Inference?" test whether the contents of informative and communicative intentions are made more or less fully manifest. As such, these experiments are appropriate tests of the existence of ostensive-inferential communication proper. What these experiments do not do is test whether participants are able to increase the manifestness of the contents of informative and communicative intentions in more minimal ways. It is, admittedly, not at all clear how manifestness could or should be operationalized for empirical research, but if this can be done, it would open the doors to a rich science of comparative pragmatics.

So, to respond directly to Cartmill, Gómez, and Moore, I am more sympathetic than they might expect to the idea of some limited forms of ostensive capabilities being present in nonhuman primates, but I do not think that we yet have any data to support this view. To be compelling, such data should be either positive results to the tests I outlined in "Does Nonhuman Primate Communication Use Ostension and Inference?" of the target article (of this I am skeptical, but it is of course an empirical matter) or the demonstration of minimal forms of ostensiveness as measured in terms of increased manifestness (this, too, is an empirical matter, and here I am more agnostic). There are serious methodological challenges associated with both possibilities.

4. See http://www.dan.sperber.fr/wp-content/uploads/Beyond-speakers-meaning-draft-2014.pdf for discussion of the role of manifestness in linguistic meaning.

Metapsychological abilities—abilities to reason about others' mental states—are clearly critical to ostensive communication in one form or another. Moreover, several of the commentaries point to data that, taken as a whole, make a good case that metapsychological abilities are employed in nonhuman primate communication (in particular Cartmill, Crockford, Gärdenfors, Gómez, Luef and Pika, and Townsend and Sievers). The question, as Rendall points out, is to work out exactly what role these abilities play in nonhuman primate communication. I suggested in the target article that this metapsychology is employed as a way to enhance the expressive capacity of a natural code. Unpacking this proposal further is, I believe, an important theoretical challenge. It is also possible that nonhuman primate communication involves minimal forms of ostension, as outlined above, but it should be stressed that the burden of proof lies with those who think this is so. What is clear is that these are all critical questions for any new science of comparative pragmatics.

I would like to conclude by addressing a topic that was raised, in one way or another, in pretty much all the commentaries: evolutionary continuity. As Rendall, Townsend and Sievers, and Wheeler all comment, if I am correct that the difference between nonhuman primate communication and human pragmatic communication is a difference in kind, then it follows that nonhuman primate communication and human pragmatic communication have no direct evolutionarily relationship with one another. As Wheeler notes, this conclusion "seems to throw cold water" on some of the key assumptions that motivate much research on nonhuman communication. However, we should not throw the baby out with this cold bathwater. Ostensive-inferential communication may not be continuous with nonhuman primate communication, but that does not mean that there is not evolutionary continuity at all. Instead, ostensive-inferential communication is probably continuous with nonhuman primate social cognition (Scott-Phillips 2014). Great apes are a socially intelligent family of species. Humans in particular have evolved particularly sophisticated forms of social intelligence, including advanced forms of metapsychology (Dunbar and Shultz 2007). It is these forms of metapsychology that provide the foundation for ostensive-inferential communication proper (Frith and Frith 2010). Put simply, human pragmatic communication is an exaptation of—and hence is evolutionarily continuous with—human social intelligence (Scott-Phillips 2014).

A science of comparative pragmatics is possible. And, from the perspective of language evolution, it is needed, because there is in that literature—I am confident the commentators will agree with me about this—a disproportionate focus on the syntax, semantics, and other topics associated with the linguistic codes at the neglect of pragmatics. In fact, when we take pragmatics seriously, it is possible to answer all the major questions that have been posed about the origins and evolution of human language (Scott-Phillips 2014).

I would like to conclude by thanking each of the commentators for their careful readings of my paper. Even where we disagree, I have found their comments stimulating and useful, and I am grateful for their engagement.

—Thomas C. Scott-Phillips

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