Psychological Review

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Online First Publication, June 2, 2025. https://dx.doi.org/10.1037/rev0000565

CITATION

Sperber, D., & Wilson, D. (2025). Rethinking ostensive communication in an evolutionary, comparative, and developmental perspective. *Psychological Review*. Advance online publication. https://dx.doi.org/10.1037/rev0000565

AMERICAN PSYCHOLOGICAL ASSOCIATION

Psychological Review

ISSN: 0033-295X

https://doi.org/10.1037/rev0000565

Rethinking Ostensive Communication in an Evolutionary, Comparative, and Developmental Perspective

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Ostensive communication (Sperber & Wilson, 1986/1995) involves both an informative and a communicative intention: The communicator draws attention not only to the information she intends to convey but also to her intention to convey it. This elicits an expectation of relevance in addressees that guides them in identifying the information communicated. This notion of ostensive communication has been influential in pragmatics, developmental psychology, and comparative psychology but also raises many questions. In the light of much relevant research, elaboration, and criticism over the years, we put forward a revised, broadened, more explicit, and more explanatory account of ostensive communication and of the role played in it by cognitive expectations of relevance and social expectations of cooperativeness. We distinguish two forms of ostension: In *basic ostension*, communicators give evidence of the information they intend to communicate, and in *mentalistic communication*, they give evidence of their intention to communicate that information. We interpret relevant comparative psychology findings (such as Gómez, 1996) as suggesting that a basic, nonmentalistic form of ostension may have evolved in great apes as a solution to the problems and opportunities presented by intentional communication. We discuss Csibra and Gergely's (2009) "natural pedagogy theory" claim that ostension is specifically adapted for the transmission of general knowledge to children. Correcting earlier pragmatic theories inspired by Grice (1989) including our own, we argue that typical verbal communication makes use of both basic and mentalistic ostension.

Keywords: communication, comparative and developmental psychology, evolution, mentalizing, relevance theory

Communication, as we will use the term, is a form of information transfer with unique evolutionary, cognitive, and social significance. It differs from other forms of information transfer through its reliance on a pair of mutually adjusted, complementary capacities in senders and receivers of information (as argued by Smith & Harper, 2003—see also Heintz & Scott-Phillips, 2023; Scarantino, 2013; Scott-Phillips et al., 2012; Skyrms, 2010; Smaldino, 2024). Senders have the capacity to provide information by producing appropriate stimuli that receivers can perceive (for instance, honeybee dances, scents marking territory, pointing gestures, or linguistic utterances). Receivers have the capacity to process these stimuli so as to acquire the information communicated.

We are using "information" broadly to cover not just descriptive information about what is the case (e.g., the information that the door is open) but also directive information about what to do (e.g., the information that the addressee is to close the door). A piece of information can be acquired not only by mentally representing and remembering it but also by acquiring other information from which it can be readily inferred when needed.

When a piece of information is either actively represented in someone's mind or can be easily activated, we say that it is "manifest" to them. Communicating implies making some information manifest to one's audience, not necessarily causing them to actively represent it (Sperber & Wilson, 1986/1995). Suppose, for instance, that, in a discussion about a coming election, Julia says that 16-year-olds like herself are mostly worried about global warming. By mentioning her age, she may intend to communicate implicitly that she will not be old enough to vote in this

Julian G. C. Elliott served as action editor.

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This research was funded in whole, or in part, by the European Commission (Grant ERC-2013-SyG), awarded to Dan Sperber. For the purpose of open access, the author has applied a CC BY public copyright license to any Author Accepted Manuscript version arising from this submission. The authors thank Josep Call, Nicolas Claidière, Gergo Csibra, Guillaume Dezecache, Gyuri Gergely, Christophe Heintz, Pierre Jacob, Thom Scott-Phillips, Denis Tatone, Tibor Tauzin, Michael Tomasello, Elizabeth Warren, members of the "Somics" ERC-2013-SyG Project, and members of the Relevance Researchers' Network for many useful discussions, suggestions, and criticisms.

Dan Sperber played an equal role in writing–original draft and writing–review and editing. Deirdre Wilson played an equal role in writing–original draft and writing–review and editing.

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election. Her utterance makes this fact manifest to her interlocutors, although they may mentally represent it only if and when it becomes relevant to them.

Two Modes of Communication

There is a widely accepted dogma that, for communication to take place, the sender and receiver must rely on a common code—that is, a set of signals (e.g., Eco, 1976; Saussure, 1916; Skyrms, 2010).[1] Signals can be extremely diverse—from chemical signals among bacteria to flag signaling among mariners. All cases of signaling rely on the capacity of senders to produce signals encoding the information to be conveyed and of receivers to decode these signals.

Of course, it has long been recognized that the information signals can be used to convey is not limited to the information they encode, as happens, for instance, when a word is used in a novel metaphorical sense. It is also generally recognized that objects and behaviors other than signals can be used to communicate information they do not encode. For instance, an executive can remind subordinates of their different positions in the hierarchy by making them wait before receiving them in her office. Still, such uses of time have been treated as a matter of course as signals in a "chronemic code," as if it went without saying that since communication is taking place, signals must be involved (Burgoon et al., 2021). More generally, whenever some perceptible item is used to convey information, it is automatically classified as a signal.

In *Relevance: Communication and Cognition* (Sperber & Wilson, 1986/1995), we challenged the dogma that communication necessarily involves the use of signals. We argued that there is another mode of communication, quite different from the signaling mode, which is uniquely important in human interactions.[2] We called this mode "ostensive communication," or "ostension" for short.[3] The notion of ostensive communication has since been widely used and discussed—and often misunderstood—in psychology, linguistics, philosophy, and beyond (e.g., Carston, 2002; Csibra & Gergely, 2009; Gómez, 1996; Leslie & Happé, 1989; Moore, 2016; Mussavifard, 2023; Planer, 2017; Planer & Sterelny, 2021; Reboul, 2017; Scott-Phillips, 2015; Sterelny, 2017; Warren & Call, 2022).

In ostensive communication, the communicator makes manifest to the addressee that she[4] is calling for his attention. Whereas in signaling, the stimulus used to communicate is a signal from which information can be decoded, in ostension, the stimulus that the communicator draws to the addressee's attention is a piece of evidence from which information can be inferred (on the variety of inferential mechanisms involved, see Mercier & Sperber, 2016, Part 2). Whereas signaling can only convey information encodable in the available repertoire of signals, the evidence used in ostension may be any perceptible object or event from which receivers can infer the information being communicated. This evidence may already be present in the environment, or the communicator may produce it on purpose. What ostension does is draw the addressees' attention to this evidence and elicit in them the expectation that the information communicated is relevant enough to be worth their attention.

The very idea of communicating by providing evidence raises an obvious problem. Whereas an unambiguous signal encodes a specific piece of information, any perceptible item provides evidence for an indefinite range of conclusions. How, then, can ostension be used to communicate just one or a small range of these possible conclusions? A pivotal claim of relevance theory is that ostension, by eliciting an expectation of relevance, guides the addressee's interpretation of the evidence toward the information being communicated (Sperber & Wilson, 1986/1995, pp. 46–50, 163–171, 260–278; Sperber & Wilson, 2002). We explain how this happens in the section entitled "From Attention Manipulation to Ostension".

Signaling and ostension are distinct modes of communication characterized by two different pairs of mutually adjusted capacities, as shown in Figure 1.

Although signaling and ostension are quite different modes of communication, they frequently combine. Signals are themselves perceptible items and can therefore be used ostensively as evidence (as opposed to encodings) of the information being communicated. When this happens, the expectation of relevance elicited by ostension makes it possible to disambiguate ambiguous signals or use a signal to convey information related to, but not identical to, the information it encodes. For instance, raised eyebrows are a signal of surprise that can be produced spontaneously or deliberately (Schmidt et al., 2009). Combined with eye contact, they may be used to ostensively communicate skepticism or gratitude rather than just surprise.[5]

In verbal communication, linguistic utterances—which are generally ambiguous and semantically incomplete and often not intended literally—are used ostensively to provide evidence of the speaker's meaning rather than to encode it (Sperber & Wilson, 1986/1995; Wilson & Sperber, 2012).

Here we put forward a revised, broadened, and more explanatory account of ostension and its role in communication, not just in linguistically competent humans but also in preverbal infants and nonhuman great apes. We start by distinguishing two forms of ostension (which can often combine): a basic, nonmentalistic form and a mentalistic one ("Ostension: Basic and Mentalistic"

[1] Saussure speaks of signs, Skyrms of signals, and Eco uses the two terms in different senses. They are sometimes treated as synonyms and sometimes distinguished in various ways. Here we will use "signal" throughout.

[2] Planer and Godfrey-Smith (2021) suggest that the "sender–receiver framework" approach to signaling developed by Skyrms (2010) could in principle cover what we call ostensive communication. It would, of course, be very interesting to see this suggestion developed to the point where it would provide an empirically applicable alternative to the relevance theory approach.

[3] The words "ostension" and "ostensive" come from the Latin *ostendere*, to show, display, exhibit. They had been used in quite different technical senses, for instance in liturgy (the "ostension" of sacred relics), philosophy of language ("ostensive definitions," a notion also used in work on the acquisition of word meaning, e.g., Lyn & Savage-Rumbaugh, 2000; Tomasello & Kruger, 1992), and semiotics ("ostensive signs," see Engelland, 2014; Gramigna, 2016; a notion also used in work on infants' gestures with objects, see Guevara & Rodríguez, 2023). Ostension used as a synonym for ostensive communication—the only sense in which we use the term—bears no close relation to any of these other technical senses.

[4] For ease of exposition, we will follow the convention of assuming a female communicator and a male addressee.

[5] An anonymous reviewer asks to what extent the interpretation of ostensive communicative acts relies on conventionalized behaviors and suggests as an illustration that, in some cultures, raising one's eyebrows may be a conventionalized expression of skepticism. Before any spontaneous communicative behavior can acquire a conventional interpretation, it has to be repeatedly given that interpretation by members of the community through spontaneous inference. We suggest that ostension and its role in inference are what explain the possibility of such conventionalization. Hence, conventionalization is not an alternative explanation to ostension.

Figure 1
Signaling and Ostension Are Characterized by Two Different Pairs of Mutually Adjusted Capacities

Mutually adjusted capacities in signaling:

(a) Senders have the capacity to produce signals that encode information.
(b) Receivers have the capacity to decode these signals and thus retrieve the information encoded.

Mutually adjusted capacities in ostension:

(a) Communicators have the capacity to
    i. produce a stimulus as evidence from which addressees can infer the information being communicated, and
    ii. elicit in addressees an expectation of relevance that guides their interpretation of the stimulus.

(b) Addressees have the capacity to recognize a stimulus as ostensively produced, and to interpret it in light of the expectation of relevance this recognition elicits in them.

section). To explain how ostension can elicit an expectation of relevance, we examine the relationship between attention and relevance ("Attention and Relevance" section). We then look at ostensive communication generally ("From Attention Manipulation to Ostension" section), in great apes ("An Evolutionary and Comparative Perspective on Ostension" section), and in human infants ("A Developmental Perspective on Ostension" section). In the "Verbal Communication Is Ostensive but Not Purely Mentalistic" section, we return to mentalistic ostension and its relation to basic ostension, with a focus on verbal communication. The relations among the various modes of communication we will discuss are displayed in Figure 2.

Ostension: Basic and Mentalistic

In ostension, the sender not only communicates some information to the receiver but also communicates that she is doing so intentionally. This "metacommunicative" (Bateson, 1972) aspect of ostension transforms the relation between sender and receiver into a more specific *communicator–addressee* relationship characterized by mutual expectations: the communicator expects the addressee to pay attention; the addressee expects the information being communicated to be relevant enough to be worth his attention. This is true not only of one-on-one, face-to-face interaction but also, for instance, of the relationship between the author of a book and its readers.

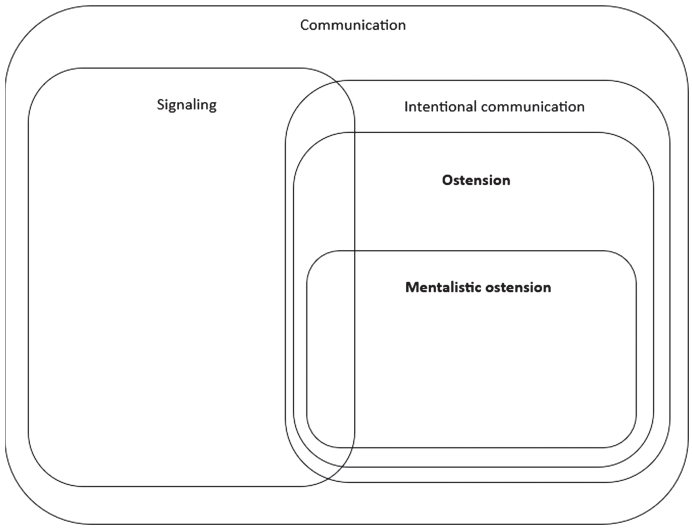
Unlike most animal signaling, ostensive communication is intentional and must be recognized as such by the addressee. It can therefore occur only among animals with the ability to act intentionally and recognize the actions of others as intentional. Unlike most animal species, humans and other great apes (i.e., bonobos, chimpanzees, gorillas, and orangutans, henceforth "apes") have these abilities (Tomasello, 2022). As a result, they satisfy a necessary (though not, of course, sufficient) precondition for ostensive communication.

What does it take to recognize ostensive behavior as intentional? Does it call for the complex form of psychological understanding that Premack and Woodruff (1978) famously called "theory of mind," also known as "mindreading" or "mentalizing" (we will use this latter term as recommended by Quesque et al., 2024, and use "mentalistic" as the corresponding adjective)? In the past, we assumed it did. Here we will distinguish (a) two forms of psychological understanding: basic "psychologizing" and mentalizing (i.e., mentalistic psychologizing) and (b) two forms of ostension: basic ostension (which relies on basic psychologizing) and mentalistic ostension (which relies on mentalizing).

A mental state has two components: a content, that is, the mental representation of some "situation" or "state of affairs," and a mental attitude to that content, for example, *believing*, *supposing*, *desiring*, *fearing* that this situation is actual, or *intending* to make it actual. Attributing a mental attitude to someone calls for the ability to categorize types of mental attitudes. Attributing a mental content calls for a formally distinctive, task-specific cognitive competence, the ability to metarepresent contents.

Contents cannot be properly described; they must be interpreted. To see why, consider the related case of "reported speech"—that is, the verbal attribution of an utterance to another speaker. In reported speech, a main clause such as "She said that" is typically followed by a paraphrase, summary, or explication of the speaker's meaning, which constitutes a contextually relevant *interpretation* of what she said. Similarly, mentally attributing a mental state involves attributing an attitude, say, a belief or an intention, to another individual and mentally constructing an interpretation of the content of that attitude. An interpretation of the content of a mental representation is itself a higher order

Figure 2
Ostensive Communication Among Other Forms of Communication



Communication: To transmit some specific information, the source produces stimuli that the receivers can process so as to acquire the information transmitted.

Signaling: The communicator produces signals that the receivers can decode so as to acquire the information communicated.

Intentional communication: The communicator acts with the intention of communicating some specific information to the receivers.

Ostensive communication: The communicator makes manifest to the receivers that they are being intentionally addressed and draws their attention to evidence of the information being communicated.

Ostensive-mentalistic communication: The ostensive communicator draws the addressee's attention to evidence of her intention to communicate some specific information.

NB: Here we neither exclude nor consider the existence of modes of communication other than signaling and ostension.

representation known as a "metarepresentation" (Leslie, 1987, 2000; Sperber, 1985, 2000; Wimmer & Perner, 1983), and also described somewhat confusingly by Dennett (1983) in terms of "higher order intentionality."[6] Mentalizing, as we use the term, consists of not only attributing a mental attitude to someone but also metarepresenting the mental content of that attitude.

To illustrate, suppose you see that Ted is worried, but you have no idea why. At that point, what you are attributing to him is just a worry, a mental attitude. This is basic psychologizing. When he then tells you that there is a ghost in the attic, you are in a position to interpret his mental attitude. You think Ted is worried *that there is a ghost in the attic*. In your thought, "Ted is worried" describes Ted's attitude; "*that there is a ghost in the attic*" metarepresents Ted's representation of the situation (here and below we will italicize metarepresented mental contents). Your thought as a whole is a

[6] As Dennett (1989, p. 271) himself noted with regret, ethologists inspired by his (1983) article have tended to conflate two homonyms: (a) The technical term "intentionality," borrowed from medieval metaphysics, which refers to the property of mental states of representing something (Jacob, 2023), and (b) the ordinary word "intentionality," which refers to the property of actions of being performed with intent. Treating these two distantly related homonyms as both referring to intentions as commonly understood, with just a difference in conceptual sophistication, has been a recurring source of confusion in the ethological literature on intentional communication. Here we only use "intention," "intentional," and "intentionality" in their ordinary sense.

mentalistic interpretation of Ted's mental attitude, consisting of a description of that attitude and a metarepresentation of its content.

Humans are fluent mentalizers. Nevertheless, they also make frequent use of basic psychologizing. They may attribute a mental state of a certain type to someone without metarepresenting its content, either because it is not relevant to them or because they do not have enough information to do so—for instance, you might infer from Ted's facial expression that he is worried and leave it at that. More directly pertinent here, humans commonly use such nonmentalistic psychologizing in identifying the intentional actions of others.

Say you see Tomoko hand an apple to Amir. Your mental representation of this event might consist of applying a *giving* schema (Tatone et al., 2015) and filling in the slots for the agent, beneficiary, and object of the giving with references to Tomoko, Amir, and the apple. Of course, an act of giving is defined less by the bodily movements of the people involved than by their intentions in performing these movements. Identifying Tomoko's interaction with Amir as an instance of giving entails taking her behavior to be intentional and makes it possible to draw a variety of probabilistic inferences about their attitudes and behavior toward one another without having to metarepresent Tomoko's intention or Amir's recognition of her intention.

Evidence that, in the minds of adult humans, actions and action sequences of a familiar type are often represented nonmentalistically with the aid of schemas or scripts (Kaufmann & Clément, 2014; Malle, 2004; Taylor et al., 2023) is quite relevant to our goal of better understanding the variety of ostensive behaviors. On the other hand, we do not see this evidence as doing much to further the goal of Taylor et al. (2023) of "de-intellectualizing theory of mind." Just as, from the fact that peripheral vision is mostly achromatic, it does not follow that color vision is difficult and optional in human visual perception, it does not follow from the fact that humans often resort to basic psychologizing that humans are not spontaneous mentalizers or that metarepresentations are intellectually challenging for them.

But what about infants? How do they understand the actions of others? Until 20 years ago, the dominant view was that infants lacked the ability to mentalize. All the same, there was plenty of evidence that they were able to represent an agent's actions as goal-directed. For instance, Woodward (1998) showed that 6-month-old infants saw the movement of a hand grasping a toy as a goal-directed action. Gergely and Csibra (2003; Gergely et al., 1995) showed that 1-year-old infants observing two-dimensional shapes on a screen moving in an apparently purposeful way were not only able to see these movements as goal-directed but also expected them to be efficient given their goal. According to Gergely and Csibra, infants who did so were adopting a "teleological" rather than a mentalistic stance.

There is rich evidence that infants spontaneously apply nonmentalistic action schemas in representing a variety of intentional actions. A good illustration is provided by Denis Tatone's experimental work on infants' understanding of giving (Tatone & Csibra, 2024; Tatone et al., 2015, 2021). This shows that with only minimal cues, 12-month-olds interpret the transfer of an object from one agent to another as an instance of a goal-directed action of giving on the basis of a *giving* schema—a schema that, as we have illustrated, is also used by adults. There is also rich experimental evidence (starting with Onishi & Baillargeon, 2005, reviewed in Scott et al., 2022, and discussed by Rakoczy, 2022) suggesting that in their first 2 years of life, infants are already capable of spontaneously drawing genuine mentalistic inferences. We see the two sets of evidence not just as compatible with each other, but also as mutually relevant and jointly suggesting that, in humans, both basic psychologizing and mentalizing develop from infancy.

And what about apes? Whether or not they have some ability to mentalize (a much-debated issue; see Krupenye & Call, 2019; Lewis & Krupenye, 2022), they may well possess a basic ability to psychologize that allows them to detect and differentiate several types of intentional action.

We are now in a position to argue that ostensive communication need not always involve mentalizing; in many cases, basic psychologizing is sufficient. For ostension to succeed, the addressees must, to start with, recognize it as an intentional behavior of a quite specific type: a communicative action addressed to them. Ostension is a highly familiar type of action that communicators are intent on making easily recognizable to their audience. In nonverbal communication, whether among humans or other great apes, there is a variety of ways to address others (eye contact in particular—see Csibra & Gergely, 2009; Gómez, 1996; Moore, 2016). In verbal communication, certain expressions can be used to communicate to the audience that they are being addressed (e.g., "Hey you!" or "My dear So-and-so"). Ostension, we suggest, is a type of action that might be identified through basic psychologizing, using an *ostension* schema.

Like the giving schema mentioned above, the ostension schema makes it possible to recognize instances of ostension without mentalizing: that is, without metarepresenting the content of the communicator's intention (see also Csibra, 2010). How early might such an ostension schema be acquired? There is rich evidence (some of which is reviewed in the "A Developmental Perspective on Ostension" section) that infants react appropriately when they are ostensively addressed. Can they also recognize ostension when they observe it as third parties? This is suggested by an experimental study by Tauzin and Gergely (2018), who show that 13-month-olds observing an unfamiliar interaction between two unfamiliar animated figures see it as an instance of ostensive communication and expect the communicator to transmit relevant information to the addressee.[7]

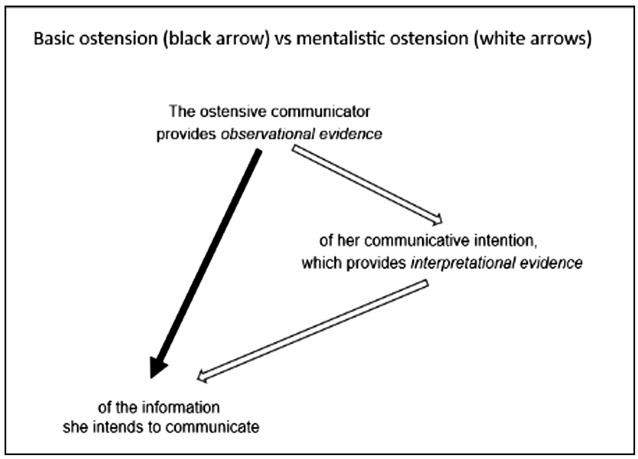
In our previous work, we focused on adult human communication, and in particular verbal communication, where, as Grice (1989) had argued, comprehension necessarily involves recognizing the content of the speaker's communicative intention and therefore mentalizing. We assumed this would be true of all forms of ostensive behavior, including ostensive showing (e.g., pointing), where we argued that what is communicated is not a meaning in Grice's sense of the term (Sperber & Wilson, 2015). We simply ignored the possibility that ostensive communication might not always require mentalizing—a possibility that, according to Gómez (1996), is instantiated among apes and that is also consistent with the work of Csibra and Gergely (2006, 2009, 2011) on the role of ostension in pedagogy and early cognitive development discussed in the "A Developmental Perspective on Ostension" section. Having failed to acknowledge the possibility of such basic, nonmentalistic ostension in our earlier work, we now want to consider it in detail.

[7] Note that in Tauzin and Gergely (2018), infants seem to use a nonmentalistic schema to identify the communicator's behavior as ostensive and to use mentalizing (more specifically, the attribution of a false belief to the addressee) to infer what relevant information is being communicated: basic and mentalistic psychologizing can be used concurrently.

As we have seen, the stimulus used in ostensive communication may be any perceptible item the communicator can draw to her addressee's attention, provided that by attending to it, he can obtain evidence of the information she is trying to convey. In some cases, simply by observing the stimulus, the addressee obtains what we will call *observational evidence* from which he should be able to infer the information being communicated irrespective of whether he attributes to the communicator the intention to communicate that specific information. In other cases (in verbal communication in particular), what the stimulus primarily provides is observational evidence of the communicator's intention to communicate some specific information. By using this evidence to metarepresent or, less technically, "interpret" the communicator's intention, the addressee obtains what we will call *interpretational evidence* of the information being communicated.[8] The role of observational and interpretational evidence in basic and mentalistic ostension is displayed schematically in Figure 3.

In successful *basic* ostension (black arrow in Figure 3), the addressee can directly infer the information being communicated from the observational evidence provided by the communicator (together with background information—a qualification that applies to all kinds of inference and that we will take for granted throughout). In successful *mentalistic* ostension, the addressee's inferential process goes through a distinctive intermediate step. What he can directly infer from the observational evidence provided is not the information being communicated, but the information that the communicator intends to communicate that specific information (first white arrow in Figure 3). The fact that the communicator has this intention provides interpretational evidence of the information she intends to communicate (second white arrow in Figure 3). In the "Verbal Communication Is Ostensive but Not Purely Mentalistic" section, we will argue that it is not only possible but quite common for ostensive behavior to provide both observational and interpretational evidence of the information being communicated. In other words, ostension need not be either purely basic or purely mentalistic; it can combine both forms.

Figure 3
Basic Versus Mentalistic Ostension: Two Inferential Paths From Ostensively Produced Observational Evidence to Information Communicated



The difference between basic and mentalistic ostension can be illustrated using cases of pointing (Gómez, 2007; Tomasello, 2010). Pointing is typically preceded by eye contact, a signal that, as noted above, encodes the communicator's intention to ostensively engage the addressee. The pointing gesture itself can be seen as a signal encoding the instruction to look in the direction indicated. What is ostensively communicated by establishing eye contact and pointing is not, of course, what these two metacommunicative signals encode, but relevant information that can be inferred from the observational evidence provided, either directly (basic ostension) or by first using it to infer the content of the communicator's intention (mentalistic ostension). Here is an illustration in two vignettes:

> *Pointing, Vignette 1:* A boy and his mother are in the living room; she is reading, he playing. The boy is looking for his tablet and says, "I wonder where my tablet is." His mother looks up, catches his eye, and points in the direction of the sofa. Visible on the sofa are a sleeping cat, an open book, several cushions, and the tablet he is looking for.

Following his mother's point, the boy looks at the sofa, and as soon as he sees the tablet, he looks no further. Why? Because following the point and seeing the tablet gives him the relevant information he expected. In this case, there is no need to metarepresent the content of his mother's intention. Of course, it may well become manifest to him that her intention in pointing was specifically to inform him *that his tablet was on the sofa*. Still, when the addressee of a point looks in the direction indicated and, in doing so, immediately acquires the information that makes the point relevant as expected, mentalizing, while possible or in some cases likely, is an effect of successful ostensive communication rather than a necessary condition for its success. This, then, is a case of basic ostensive communication, where the observational evidence provided is direct evidence of the information being communicated.

> *Pointing, Vignette 2:* A boy and his mother are in the living room; she is reading, he playing. The boy is looking for his tablet and says, "I wonder where my tablet is." His mother looks up, catches his eye, and points to her wristwatch. In no way does looking at his mother's wristwatch (which he is not close enough to read anyway) help the boy find his tablet.

How can the boy interpret his mother's point in a way that satisfies the expectation of relevance elicited by her ostensive behavior, even though it is not relevant to his present goal of finding his tablet? For this, the boy must start by taking his mother's pointing to her wristwatch as evidence of a mental state of hers, namely, her intention to inform him of some relevant information (presumably connected with the time shown on the watch). If he has been waiting all day to go to his friend's birthday party, then his mother's pointing at her watch is best explained as intended to inform him that the time has now come.

In the first vignette, his mother's pointing to the sofa gave the boy *observational* evidence of information directly relevant to him. In

[8] The terms "observational" and "interpretational" refer to the method by which evidence of the information being communicated is acquired: observation in one case, interpretation of the communicator's intention in the other. They do not refer to the kind of conclusions derivable from the evidence. Both mentalistic and nonmentalistic conclusions may be derived from either observational or interpretational evidence.

the second vignette, his mother's pointing to her wristwatch gave him observational evidence of her intention to inform him *that it is time to go his friend's birthday party*. This, then, is a case of mentalistic ostension, where the observational evidence provided leads first to interpretational evidence, which then leads to the information being communicated itself.

Basic ostension can only be used to communicate information for which direct observational evidence can be provided. Most of the time, the available observational evidence is evidence of features of the present local situation and its immediate spatial and temporal vicinity. This limits the range of what can typically be communicated by basic ostension. There is no such limit on the range of information that can be communicated by mentalistic ostension.

Addressing an audience with suitable mentalizing capacities, an ostensive communicator may provide observational evidence of the content of her own present communicative intention and thereby provide interpretational evidence about past, present, future, desired, hypothetical, or fictional states of affairs that she intends to communicate about. Of course, to achieve this, she must be able to provide adequate observational evidence of her intention to communicate this information to the addressee. This might be done in a variety of improvised ways, as illustrated by the case of the mother pointing to her watch. Still, in many situations, it would be hard or impossible to provide evidence of one's communicative intention were it not for language. Language makes it possible for the ostensive communicator to construct an utterance "on the fly" that provides the addressee with easily interpreted evidence of her communicative intention.

There are situations where the same information may be communicated by either basic or mentalistic ostension. For instance, in Vignette 1, rather than pointing, the mother could say, "On the sofa." In doing so, she would produce sounds that give the boy direct observational evidence not of the whereabouts of the tablet but of her meaning, that is, her intention to inform him *that the tablet is on the sofa*. Understanding this meaning then provides interpretational evidence of the whereabouts of the tablet. As this example illustrates, when the same information can be produced by either basic or mentalistic ostension, it may be equally easy for the addressee to retrieve that information either way. The fact that mentalistic ostension involves an intermediate step does not entail that it is harder to process than basic ostension. Indeed, in many situations, interpretational evidence is easier to process than observational evidence. If, say, the sofa was in a dark part of the living room and the tablet was hard to detect from where the boy stood, then following her pointing to the tablet might be more effortful than interpreting her meaning. Quite often, showing and telling at the same time (e.g., pointing to the sofa and saying, "Here, on the sofa!") is the most efficient way to communicate. In other terms, for fluent mentalizers, neither basic nor mentalistic ostension is intrinsically easier. Often, they can be combined to good effect, a point we will return to in the "A Developmental Perspective on Ostension" and "Verbal Communication Is Ostensive but Not Purely Mentalistic" sections.

Communicating ostensively involves two distinct intentions. We called them the "informative" and the "communicative" intention (Sperber & Wilson, 1986/1995). We now suggest that the communicative intention involved in mentalistic ostension is just a special case of the communicative intention involved in ostension generally (see Figure 4).

Sometimes our behavior happens, as an unintended side effect, to be quite informative to others who are observing it. For instance, having the lights on happens to inform passers-by that we are at home. When we actually intend to inform others by our behavior, we are acting with an informative intention. An informative intention is not by itself an intention to communicate, let alone to communicate ostensively. For instance, leaving the lights on to make it manifest to burglars that there are people at home is a behavior intended to inform (or misinform) others without communicating with them.

In order to make information manifest by communicating ostensively, the communicator has to act with a second-order informative intention—the intention to make manifest to the addressee that there is some information that she is trying to communicate to him. This second-order intention is what we call a "communicative intention." In the case of mentalistic ostensive communication, the communicative intention has a more definite content: It contains the informative intention as an embedded clause, and mentalizing is needed.

The communicative intention corresponds to the metacommunicative aspect of ostension. In the basic, nonmentalistic case (illustrated by Vignette 1 and corresponding to the black arrow in Figure 3), an ostensive communicator must make manifest to the addressee that she is addressing him with an informative intention.

Figure 4
Informative and Communicative Intentions

Informative intention: The intention to make a certain piece of information manifest to others.

Communicative intention (in ostensive communication generally): The intention to make manifest to addressees that the communicator is addressing them with an informative intention.

Communicative intention (in mentalistic ostensive communication): The intention to make manifest to addressees that the communicator is addressing them with the intention of making a certain piece of information manifest to them.

However, she does not have to make manifest to him the specific content of that intention, and he does not have to metarepresent that content: basic psychologizing using an ostension schema is enough. All that is needed for communication to succeed is for her ostensive behavior to draw his attention to observational evidence of the relevant information she intends to convey. Of course, if the addressee has the mentalizing abilities to do so, he might spontaneously infer that she intended to convey that information to him, but as noted above, a mentalistic inference of this type is not a necessary component of ostensive communication in general. Ostension in its basic form succeeds if the addressee infers from the observational evidence the information the communicator intended to convey, whether or not he attributes to her the intention to convey that particular information.

However, there may be no currently available observational evidence of the information the communicator intends to convey. What she might be able to do instead is produce observational evidence *of her intention* to communicate this particular information. By metarepresenting the content of this intention, the addressee acquires interpretational evidence of the information being communicated. In this case, communication is not only ostensive but also mentalistic, and the communicator's communicative intention has the more specific form shown in Figure 4. An example of such mentalistic ostension is given in Vignette 2: The mother intends to make manifest to the boy that she is acting with the intention of informing him *that it is time for him to go his friend's birthday party*. As long as he trusts her, interpreting her intention gives him adequate interpretational evidence of the information she intended to convey.

To avoid possible misunderstanding, we should stress that in mentalistic ostensive communication, what the addressee metarepresents is a quite specific kind of mental state of the communicator's, namely her communicative intention, with her informative intention embedded inside it (see Figure 4). Someone might communicate ostensively that she is in a certain mental state and thus cause the addressee to metarepresent this mental state—in other words, to mentalize—without resorting to mentalistic ostensive communication, that is, without causing the addressee to metarepresent her communicative intention. Here is an illustration:

> *Pointing, Vignette 3:* A boy and his mother are in the living room. He has been impertinent and she has been pointedly ignoring him. The boy is looking for his tablet and says aloud, as if talking to himself, "I wonder where my tablet is." His mother looks up, smiles, and points in the direction of the sofa, where his tablet is.

The boy might understand correctly that, by behaving in this way, his mother is giving him *observational* evidence not only of the whereabouts of his tablet but also of the fact that she is no longer cross with him for being impertinent. Her ostensive display of helpfulness is a case of basic ostension informing him of her state of mind.

What makes the distinction between basic and mentalistic ostension particularly relevant is that it makes it possible to develop a more fine-grained account of human communication (where both forms of ostension not only occur but also frequently combine) and to explore the possibility that ostension in its basic form may have evolved among nonhuman apes quite independently of mentalizing. On the other hand, we do not see the distinction as particularly relevant to the ongoing debate on whether human mentalizing is an early developing natural ability or an acquired cognitive skill that children take years to master and that is cognitively demanding even for adults. In the "An Evolutionary and Comparative Perspective on Ostension" section, we will show how this distinction is relevant to the study of ostension in apes, and in the "A Developmental Perspective on Ostension" and "Verbal Communication Is Ostensive but Not Purely Mentalistic" sections, how it yields better descriptions of human ostensive communication. Before turning to this, we must consider the relationship between attention, relevance, and ostension in more detail.

Attention and Relevance

Under what conditions are basic and mentalistic ostension adaptive? Adaptive in what ways? Do they make it possible to communicate more? Or better? And if so, how and at what cost? In relevance-theoretic pragmatics (which has so far considered only mentalistic ostensive communication[9]), a central part of the answer to these questions has been that by calling on the addressee's attention, ostension elicits an expectation of relevance that is well enough calibrated to guide the interpretation process, leading to better and richer communication. In comparative psychology (which has focused on basic, nonmentalistic ostension), the link between ostension and expectations of relevance has been generally ignored (with a few recent exceptions—see the "An Evolutionary and Comparative Perspective on Ostension" section). In developmental psychology (see the "A Developmental Perspective on Ostension" section), ostension has been seen as eliciting not a broad expectation of relevance but more specific expectations, in particular expectations of genericity and referentiality (Csibra & Gergely, 2009, 2011).

To flesh out the claim that ostension works not only by drawing the addressees' attention to some stimulus but also by eliciting an expectation of relevance, we look briefly at pertinent aspects of the psychology of attention.

As Eric Knudsen wrote in his review article on attention: "To behave adaptively in a complex world, an animal must select, from the wealth of information available to it, the information that is most relevant at any point in time" (Knudsen, 2007, p. 58). This selection is not made by considering and comparing the pros and cons of attending to every piece of information available. Instead, it takes the form of a multistage competition among neurally represented pieces of information for access to working memory. At any moment, the temporary winners are the representations with the greatest neural signal strength. The competition has been described as a "biased" one (Desimone & Duncan, 1995), where various factors may amplify some neural signals and inhibit others.

[9] We called this "ostensive–inferential communication" (Sperber & Wilson, 1986/1995). However, the label "inferential" was not distinctive enough, since many forms of nonostensive signaling involve inferences that are quite different from the domain-specific inferences involved in mentalizing (Arnold & Zuberbühler, 2013; Fischer & Price, 2017; Wang et al., 2023; Warren & Call, 2022). Moreover, many readers view inference on the model of conscious reasoning as a sophisticated process and wrongly attribute to us a highly intellectualized view of inferential communication in the style of Grice's. The much broader view of inference we subscribe to is spelled out in Mercier and Sperber (2016).

Simplifying somewhat, some of the factors that bias the competition are "top-down," while others are "bottom-up" (Awh et al., 2012; Beck & Kastner, 2009). Top-down factors include prior predictions and ongoing goals and interests. Prior predictions bias attention away from inputs that merely confirm these predictions and toward inputs that are inconsistent with them (so-called "prediction errors"; Schultz & Dickinson, 2000). Ongoing goals and interests bias attention toward inputs that might help to address them. Other biasing factors are "bottom-up," or stimulus-driven. For instance, loud noises, sudden nearby movements, or the sound of one's own name may be perceptually "salient," that is, represented with stronger neural signals from the start. Perceptual salience—the only kind of salience we consider here—is a psychophysical property: Some physical properties of a stimulus interact with the cognitive capacities and dispositions of the perceiver to make the stimulus more likely to preempt attention in general or in a given situation.

Such biasing factors combine to determine, at every stage in processing, which pieces of perceptual information will be processed in greater depth and may enter working memory. Inputs to working memory have been described as entering a "global neuronal workspace" (Dehaene et al., 2011); they are typically conscious (in the sense of "access consciousness"; see Block, 1995). Working memory is also fed by information retrieved from long-term memory. Neural representations in working memory are actively exploited and compete strongly with one another. Representations in working memory that are outcompeted may leave exploitable traces in long-term memory.

The idea that the goal of attentional processes is to select relevant information is found everywhere in the psychology of attention. Yet the notion of relevance being appealed to is hardly ever discussed, as if relevance were a simple and obvious property that psychologists can take for granted and the brains of humans and other animals can unproblematically detect in their allocation of processing resources.

Psychologists talk of "task relevance" or "behavioral relevance" and generally proceed as if the description of a task or an ongoing behavior is enough to make sense of "relevance" in any specific situation (Knudsen, 2018). In a typical experiment on attention, participants are presented with an array of stimuli, some of which the experimenter defines as "relevant." Animal subjects wanting a reward and human participants following instructions must select these "relevant" stimuli and ignore other stimuli defined as distractors. In real life, of course, deciding what might make a piece of information relevant is an important aspect of many tasks or is a task in itself (this is also true in a few experimental tasks, such as the Wason selection task; Sperber et al., 1995). There is often more than one goal at any given time. There may well be "outside options": that is, the possibility of opting for an altogether different course of action. Moreover, cognitive activity is not always task- or goal-oriented. In humans, it is often guided by interests with no immediate or short-term practical applications. So the competition for working-memory processing is not only among items relevant to a single ongoing task, but also among simultaneous tasks, or among alternative possible tasks or interests.

Moreover, all kinds of potential dangers, for instance, the presence of predators in the environment, may preempt attention, at least for a while, being more immediately relevant than the activity, for instance, feeding, that they are interrupting (Dukas, 2002). Inputs indicating emergencies typically benefit from bottom-up biases; in other words, they are often highly salient. The psychological literature—from comparative psychology to behavioral economics—wavers between, on the one hand, contrasting relevance and salience as two types of factors biasing attention and, on the other hand, recognizing that bottom-up salience biases indicate potential relevance just as much as top-down ones do, though it is not necessarily relevance to an ongoing task or activity (Bordalo et al., 2022; Indovina & Macaluso, 2007). We would argue that all the factors biasing attention, whether bottom-up or top-down, are relevance-related, but in order to make this argument, relevance must be defined in general terms, which psychology fails to do.

Relevance theory (Carston, 2002; Sperber & Wilson, 1987a, 1987b, 1986/1995; Wilson & Sperber, 2012) approaches relevance as a property of inputs to cognitive processes: The property that makes inputs more or less worth processing. No input is worth processing unless it is likely to yield some cognitive benefit. A cognitive benefit can be thought of as an improvement (e.g., an enrichment, updating, or correction) of the individual's ability to readily represent on appropriate occasions what is the case, what to expect, and what to do. Everything else being equal, the greater the cognitive benefit of processing a given input, the greater its relevance. Processing an input has a cost. Everything else being equal, the greater the cost of processing an input, the lower its relevance. Like other organs, cognitive systems have evolved under constant selective pressure for efficiency. We claim that, to a considerable extent, the efficiency of a cognitive system depends on how far it succeeds in selecting inputs for deeper processing as a function of their relative relevance. Hence the first of two basic "principles" of relevance theory:

> *Cognitive principle of relevance:* Cognitive systems tend to maximize the overall relevance of the inputs they process.

It is quite unlikely that this tendency to maximize relevance is achieved by a mechanism that computes the expected relevance of each competing input, ranks them, and selects the highest ranked ones. What seems more plausible is that the strength of neural signals is modulated at every step in information processing by brain mechanisms that locally implement bottom-up and top-down biases in attention. These mechanisms have evolved phylogenetically and developed ontogenetically so that the combined effect of the amplifications and inhibitions they induce tends to minimize opportunity costs whenever this is locally feasible. As a result, they favor processing more relevant inputs in greater depth and thus contribute to overall cognitive efficiency.

From Attention Manipulation to Ostension

With the emergence of brains more than half a billion years ago, animals started receiving a huge range of diverse sensory inputs, only a few of which could undergo deeper processing in the nervous system at any one time. What is called attention emerged with the function of selecting inputs worthy of deeper processing. Inevitably, attention became a target of manipulation in prey–predator, male–female, and other relations among organisms. New anatomical or behavioral traits evolved in many species of animals and plants, with the function of attracting (or distracting) the attention of members of the same or different species and thereby influencing their behavior.

Most sensory stimulations are almost immediately discounted. When a stimulus happens to be salient, its initial processing may be boosted to a point where it may be sustained by top-down biasing factors and go through further steps or else be discontinued. For instance, a predator may not pay attention to a weak indistinct noise among so many in the underbrush. However, if for some reason, say a change in pitch or rhythm, the noise becomes salient, the predator is likely to look and listen carefully enough to assess the possibility that it might be caused by a potential prey and either treat the noise as irrelevant and stop paying attention to it or else act on it (Dukas, 2002).

Attention manipulation typically works by raising the salience of specific stimuli. Some evolved signals are already salient or can be made salient by their emitter to attract the attention of receivers. For instance, many poisonous insects have salient "aposematic" body colors that signal their unpalatability to would-be predators. Male sea lions provide evidence of their strength to rivals during the mating season by producing rapid bursts of loud barks (Charrier et al., 2011). Plovers attract the attention of predators such as foxes to themselves and away from their nest and brood by simulating being injured, a textbook example of a deceptive attention-getting stimulus that neither is a genuine communicative signal nor mimics one (e.g., Gómez-Serrano & López-López, 2017).

By boosting the salience of a stimulus, ordinary attention manipulation attracts the attention of perceivers and makes it more likely *that* the stimulus will influence them. *How* it might influence them depends not so much on its salience as on other, more fine-grained properties of the stimulus, in particular its value as evidence of some situation that matters to the perceiver's goals or interests. Potential rivals of a male sea lion, for instance, pay initial attention to its barks because of their acoustic salience, but what may encourage them to confront him, or deter them from doing so, is the strength and pugnacity evidenced by these barks, and in particular how fast they come. A fox might pay initial attention to any potential prey on the ground; however, what may hold its attention is the plover's apparent inability to fly off and the preying opportunity this seems to offer. Making a stimulus salient may be enough to attract some initial attention to it. For this attention to persist to the point of influencing the perceiver's mental processes and behavior, some properties of the stimulus—not necessarily its most perceptually salient ones—must activate top-down factors in the allocation of attention.

Basic attention-getting may not be targeted at specific individuals, and even when it is, it does not metacommunicate to them that they are being addressed. A dominant male sea lion's barking provides salient evidence of the risk there would be in confronting him. On occasion, this barking may target an individual, say a younger male who is getting too close. Even so, the older male's barking, however loud, is not ostensive; it does not signal or otherwise indicate to the younger one that he is being addressed and given a part to play in a communicative interaction.

Ostensive behavior, by contrast, does not just attract the attention of others (contra Szufnarowska et al., 2014). It presents targeted individuals not only with information about some situation but also with the information that they are being addressed by a communicator who is calling for their attention and involvement. As we have seen, this metacommunicative feature is a defining feature of ostension. Ostension, understood in this way, is a game-changer in two respects: cognitive and social.

Ostensive Communication Has Distinctive Cognitive Effects

Given that attention spontaneously tends to select inputs with greater potential relevance (as implied by the cognitive principle of relevance), for ostensive stimuli to be effective, they must elicit an expectation of relevance in addressees. This claim, which we called the "communicative principle of relevance," is the second principle of relevance theory and is central to its account of ostensive communication. Here is a simplified version[10]:

> *Communicative principle of relevance:* An act of ostensive communication elicits an expectation of its own relevance.

We are suggesting that the disposition to produce ostensive stimuli and the disposition to react to them with an enhanced expectation of relevance are complementary, have evolved together, and may be enhanced or otherwise modulated in the course of cognitive development and different social and cultural contexts.

In general, the probability that information acquired through sensory stimulation will be processed at some depth in the sensory cortex depends on its relative salience. The probability that this sensory information—or rather the neural representation produced by several steps of processing—will end up being processed in working memory depends on the existence of top-down biases corresponding to current expectations or longer term goals and interests. All that ordinary attention manipulation can do is boost the salience of a stimulus.

Unless the addressee is already paying adequate attention to the stimuli produced by the communicator, ostension also involves boosting initial saliency. More importantly, unlike other forms of attention manipulation, ostension elicits an expectation of relevance. This expectation works as a distinct top-down bias that, on the one hand, increases the probability of working-memory processing and, on the other, guides this processing toward an interpretation matching the expectation of relevance elicited. Much of past work in relevance-theoretic pragmatics has been focused on studying how relevance guides the interpretation of explicit and implicit meanings.

Ostensive Communication Is a Distinctive Form of Social Interaction

Ostension plays a central role in what Levinson (2006) calls the "human interaction engine." By being not just a communicative but also a metacommunicative action, ostension calls the attention of addressees not only to the information communicated but also to the fact that the communicator is intent on communicating it to them. Ostension plays a less obvious but, if anything, even more important and distinctive social role through the expectations it elicits.

An individual who is being addressed ostensively may fail or refuse to pay attention. However, when both the communicator and addressee play their part, ostensive communication establishes some degree of mutual involvement between them. More precisely, it gives each ground to expect something from the other. At the very

[10] We do not develop here the further claim that the expectation of relevance is precisely calibrated in context, allowing the communicator to predict the addressee's interpretation (Wilson & Sperber, 2002, 2012), a claim that is experimentally testable (Van der Henst & Sperber, 2004).

least, the addressee expects the communicator to offer relevant information. The communicator expects the addressee to take this information into account. What makes the information conveyed by an ostensive act relevant to the addressee differs in the case of, say, an assertion or a request, and so do the ways in which the communicator expects the addressee to take that information into account. What the metacommunicative dimension of ostension does is make these expectations mutually manifest to the communicator and addressee.

Raising expectations in addressees and making one's own expectations manifest has the potential to make every move in the interaction evaluable as a case of expectation fulfilled or expectation frustrated. When communicator and addressee are likely to interact in the future, fulfilling one another's expectations may provide a social benefit, and frustrating them may incur a social cost. This situation is likely to arise if individuals tend to choose as partners in future interactions with others who have been more reliable (with them or with third parties) in the past. Such a "partner choice" policy is found in many species (Bshary & Noë, 2003). However, it is particularly developed among humans, where it typically takes on a normative or even moral character (Barclay, 2013; Baumard et al., 2013). Humans typically interpret mutual expectations such as those raised in ostension, as "commitments," a deontic notion that plays a central role in much philosophy of language and communication (Brandom, 1994; Geurts, 2019, 2022; Habermas, 1984).

Heintz and Scott-Phillips (2023) have discussed in detail how ostensive communication could evolve and complexify in the uniquely developed "partner choice ecology" of humans, where fulfilling one's commitments has major social benefits and failing to do so has major costs. Precisely because of the huge differences between the social ecologies of humans and other apes, Heintz and Scott-Phillips (2023) suggest that, in their normal social environment, apes do not engage in ostensive communication. Note that their discussion is about *mentalistic* ostensive communication, as most earlier discussions of the evolution of ostension (Origgi & Sperber, 2000; Scott-Phillips, 2015; Sperber & Wilson, 1986/1995; Wharton, 2006, 2009; Wilson & Sperber, 2012) have been.

Here we have argued that, as already suggested by Gómez (1996), ostension can and does occur without mentalizing. We suggest that ostension and mentalizing are two independent abilities, each of which, at least initially, evolved on its own, with mentalistic ostensive communication being the effect of a synergy between the two. If so, each of these two abilities should be defined and studied in its own right. This is, of course, what has happened with the study of mentalizing (where the occasional role of ostension may, if anything, have been underestimated).

An Evolutionary and Comparative Perspective on Ostension

We originally assumed that mentalizing evolved first and that ostension evolved as a way to exploit mentalizing in pursuit of communicative goals (Origgi & Sperber, 2000; Sperber & Wilson, 2002). We are now putting forward a quite different hypothesis: that ostension evolved independently of mentalizing as a way to address difficulties and take advantage of opportunities presented by *intentional* communication. In this perspective, it makes sense to reconsider the possibility that ostension might have evolved not just in the human lineage but before that, among common ancestors of all the great apes (or even earlier).

Intentional communication is rare. The vast majority of animals communicate through the instinctive and involuntary production of signals in response to internal states such as hunger or external events such as the presence of a predator. Still, some other animals, humans and other great apes in particular, are capable of communicating intentionally and, in doing so, of finely adjusting their behavior to their current goals. Because of its flexibility, intentional communication may seem much more advantageous, but is it?

Even among species that are otherwise quite capable of acting intentionally, intentional communication is rare. Why? Why does involuntary communication still play an important role in species that can communicate intentionally? For instance, a large part of ape communication is vocal; unlike gestures, vocal signals are not intentionally produced (with some exceptions; see Crockford et al., 2012; Schel et al., 2013). Even humans communicate important information through the spontaneous expression of emotions such as joy or anger, which they can inhibit or fake to a limited extent but cannot produce at will. This at least suggests that communicating intentionally has its drawbacks.

When communication relies entirely on signaling, what can be communicated is limited to what is expressible using the available signals. The ability to signal intentionally does not by itself broaden the range of what can be signaled. It merely makes it easy to use signals deceptively. This might at first be quite beneficial to the senders, but receivers who pay the cost of the deception might be less and less disposed to rely on signals that senders have produced for their own ends. So the evolution of intentional communication may be held back by two major problems—one of expressive power and the other of reliability.

The Problem of Expressive Power

In a signaling system, the only way to communicate information is by encoding it using the available signals. Animal signaling systems have limited repertoires of signals and little or no compositionality (Zuberbühler, 2020). This drastically limits their expressive power and hence the opportunities that using them intentionally may offer.

One might suppose that this problem of expressive power (discussed in Heintz & Scott-Phillips, 2023; Warren & Call, 2022) would be resolved by the evolution of richer repertoires of signals in the service of intentional communication. The in-principle possibility of such evolution has been demonstrated in formal models (Skyrms, 2010), and in lab experiments with humans tasked with solving a communication problem (Galantucci et al., 2012; Scott-Phillips et al., 2009). In the wild, however, the emergence of every single new signal and its stabilization across a population is not an easy matter (Origgi & Sperber, 2000; Scott-Phillips et al., 2012). This helps explain why naturally evolved animal signaling systems never seem to contain more than a few dozen functionally distinct signals.

The stimuli used in ostension, unlike those in signaling, may include not just existing signals but also any perceptible item, whether already present in the environment or producible on the spot, that might serve as evidence of the information to be communicated. The interpretation of such ostensive stimuli is carried out by attentional mechanisms geared to maximizing the relevance of the inputs they process and guided by the expectation of relevance that ostension itself elicits (see the "From Attention Manipulation to

Ostension" section above). Thus, what can be ostensively communicated is not limited to information encodable by signals already shared by the communicator and addressee.

Signals, being stimuli, can of course be produced and interpreted in ostensive communication. The expectation of relevance that guides the interpretation of ostensive stimuli makes it possible in particular to disambiguate ostensively used signals when they are ambiguous, to specify their import when they are vague, and, more generally, to communicate richer information than mere decoding would provide. This multiplies the expressive power of existing signals. Thus, ostension, whether basic or mentalistic, frees intentional communication from the narrow limits of signaling and broadens the range of what can be intentionally communicated. The broadening is much greater in the case of mentalistic ostension, especially when supported by language (see the "Verbal Communication Is Ostensive but Not Purely Mentalistic" section below), but basic ostension already provides intentional communication with considerably greater expressive power than plain signaling.

The Problem of Reliability

The evolution of animal signaling raises a well-known issue (Laidre & Johnstone, 2013; Smith & Harper, 2003; Searcy & Nowicki, 2005; Skyrms, 2010; Stegmann, 2013). Unless the interests of the sender and receiver are well aligned (as they are in social insects, for instance), senders might often benefit from producing deceptive signals. If deceptive signals become too frequent, receivers may be better off simply ignoring them, at which point producing them would no longer be advantageous. Under what conditions, then, can signals evolve and stabilize?

Some signals are intrinsically reliable, as, for instance, when an animal informs rivals of its strength using a signal that it takes great strength to produce. In other cases, the involuntary production of, say, an alarm signal provides evidence that the sender is in the sort of situation that normally triggers such signals, namely, the presence of a predator. This is not enough to make all such signals reliable. For instance, an alarm signal automatically triggered by the sighting of a predator might evolve so that it is also triggered in the absence of a predator by, say, detection of an opportunity to take advantage of some exceptional resource by inducing other members of the group to flee. However, if the deceptive uses of this signal occurred often enough to make it, on average, detrimental to its receivers, natural selection would select against it. Natural selection tends to stabilize signals that are, and remain on average, beneficial to their producers and receivers (at least in intraspecies communication).

There is a considerable literature on the role of reliability in the evolution of involuntary animal signals. Much less is said about the rarer case of intentionally produced signals (though see Scott-Phillips et al., 2012), where the problem of reliability is, if anything, even more challenging. The intentional production of a signal is not direct evidence of the situation it purports to inform its audience about since it can easily occur in the absence of that situation or fail to occur in its presence. Hence, signals that can be intentionally produced are not intrinsically reliable. How, then, could intentional communication be advantageous enough for both communicators and addressees to evolve?

Intentional communication may evolve when the communicators themselves, rather than the signals, are reliable enough. This typically happens when the information communicated helps to satisfy a common interest or achieve a common goal of the communicator and addressees and where deception would be disadvantageous to all. However, intentional communication is not limited to such cooperative interactions. It often happens in situations where communicators might benefit from deceiving, or at least misleading, their addressees. In these situations, how can communicators be reliable and be recognized as reliable by their addressees? Ostension helps make this possible.

Ostensive communicators draw the attention of addressees not only to the information communicated but also to their own communicative behavior. How far the expectations elicited by this behavior are satisfied or frustrated provides addressees with evidence of the communicator's reliability. This is particularly manifest in the case of human ostensive communication.

Humans depend massively on communication with others, and this leaves them open to the risk of being intentionally misinformed. By ostensively addressing their audience, human communicators not only elicit an expectation of relevance, but they also commit to the relevance of the information they convey, and in particular to the veracity of their assertions and the desirability of their requests and advice. To ensure that communication remains advantageous despite this risk, humans deploy a suite of cognitive mechanisms for *epistemic vigilance* and, in particular, keep track of the reliability of the communicator (Sperber et al., 2010). In these conditions, dishonest communicators stand to incur lasting reputational costs that may outweigh the short-term benefits of being dishonest.

Apes may be much less cooperative than humans, but mutualism and partner choice still play a role in their interactions (Mitani et al., 2000; Schino & Aureli, 2009; Schweinfurth & Call, 2019; Tokuyama & Furuichi, 2016). To what extent the sociality of apes involves commitments, norms, and reputational concerns, and in what ways, is subject to debate (e.g., Fitzpatrick, 2020; Heesen et al., 2021; Herrmann et al., 2013; Tomasello, 2023; Westra et al., 2024). In any case, partner choice is possible without any of these features as understood in the study of human sociality, as illustrated by the textbook example of partner choice, the mutualistic relationship between cleaner fish and client reef fish based on "individual learned optimization of own payoffs by both cleaners and clients" (Bshary & Raihani, 2013, p. 84).

It could be, then, that the intentional communicative behavior of apes elicits expectations without implying commitment, that they evaluate the fulfillment of these expectations in terms of individual satisfaction or frustration rather than social norms, and that they choose who to interact with based not on socially established reputations but on their own past interactions and observations. Even in the absence of socially shared norms and reputations, frustrating expectations that one has oneself elicited might be costly. In particular, making one's intention to communicate some information manifest and then misinforming one's addressees might, on average, be costly enough to make communicators generally honest.

The Evidence

We have suggested ways in which ostension might make intentional communication more effective among apes. But is this what actually happens? In the first place, is there any independent evidence that ape gestures are at least sometimes not only intentional but also ostensive? This question has occasionally been raised but not conclusively answered. As Zuberbühler and Gómez (2018)

point out, discussion on this topic tends to be hampered by failure to agree on what "ostension" means. Moreover, many such discussions (e.g., Moore, 2017; Townsend et al., 2017) revolve around Grice's theory of meaning and communication. In fact, our account of ostension was put forward as an alternative to Grice's theory of communication, which is based on what he called the "Cooperative Principle" and in which ostension plays no role at all, under this or any other name or description (Grice, 1989).[11]

Most references to Grice in discussions of communication among apes seem to be motivated by the desire to discredit the idea that intentional communication in apes is mentalistic and therefore involves higher order intentions on the part of the communicator and their metarepresentational recognition by the addressee. However, this idea is already quite generally rejected (for reasons detailed in Scott-Phillips, 2015). What is contentious is the idea that apes engage in a simpler form of ostension that does not involve metarepresentations. This idea was first proposed by Gómez (1996) and has been defended in particular by Moore (2016, 2017) on theoretical grounds[12] and Sievers (2017, 2022) on more empirical grounds.

To establish that communication among apes is genuinely intentional, psychologists rely on a series of criteria such as the communicator's sensitivity to the presence and reactions of an audience, attention-getting, eye contact, gaze alternation, plus persistence, elaboration, and flexibility of behavior. These fairly stringent diagnostic criteria, although not satisfied by all possible cases of intentional communication, are met by a subset of clearly identifiable cases. What Gómez, Moore, and Sievers at least implicitly suggest is that some of the very features that make intentional communication clearly identifiable as such *by scholars* are among those that help *apes* recognize in the first place that a conspecific is addressing them (and is therefore communicating not just intentionally but also ostensively). In fact, these features may be diagnostic of intentional communication precisely because they have the function of indicating to addressees that the communicator intends to communicate something to them.

Gómez (1996) argues that eye contact is the hallmark of ostensive communication: It provides the addressee with strong evidence not only of the fact that the communicator is acting intentionally but also that she is addressing him. Gómez illustrates this point with his study of the cognitive development of a hand-raised female gorilla named Muni. At the end of her second year, when Muni wanted something from her caretaker, she would first get his attention by touch, followed by gaze (Gómez, 1994, 1996), establishing what Gómez called visual "attention-contact." At that point, she would draw her caretaker's attention to some specific object, for instance, a closed door that she could not open on her own, and maintain attention-contact until her request was satisfied (or denied). Gómez suggests that Muni's behavior is an instance not just of intentional communication but of ostension. The closed-door Muni was drawing to her caretaker's attention could be used as evidence of an indefinite variety of conclusions. The first relevant interpretation to occur to her caretaker was that she wanted him to open it for her. This interpretation was self-evident to the caretaker, as it is to any reader of Gomez's account. What is not self-evident is what cognitive mechanisms make it self-evident, and what made Muni expect it to be manifest to her caretaker.

To show that some interaction between A and B is best described as a case of ostension, three features should be present: (a) Evidence that A is addressing B, which might be provided, for instance, by observing A establishing eye contact with B; (b) evidence that A is drawing B's attention to some stimulus, which might be provided, for instance, by A's alternating gaze between B and the stimulus; and (c) evidence that B's interpretation of the stimulus is guided by an expectation of relevance, which might be provided by comparing reactions to the same stimulus presented with or without ostension. This last kind of evidence, which is central in developmental work on ostension, is rarely considered in the comparative literature.

Many types of ordinary intentional communication among apes have a routine unambiguous interpretation and do not lend themselves to a deceptive use, as, for instance, when a juvenile begs its mother for food or an individual presents a regular grooming partner with the body part she wants him to groom. These gestures clearly involve addressing someone but can be interpreted without the guidance of an expectation of relevance, so if ostension is involved at all, it does not play much of a role.

For many other forms of gestural communication among apes, treating them as ostensive helps explain their effectiveness. Here is an example involving leaf-clipping, an attention-getting gesture that can be used for several purposes but has been most commonly observed in cases of courtship (Badihi et al., 2023):

> *Request for mating:* One of the ways in which male or female chimpanzees have been observed to indicate their desire to mate with a specific partner involves producing a noisy signal called "leaf-clipping," first observed by Toshisada Nishida at Mahale in Tanzania (Nishida, 1980). For instance, Nishida reports the behavior of an adolescent male in a tree displaying a penile erection, who shakes a branch while turning to face a young female in estrus below. He picks a leaf and rips it to pieces with his teeth, producing a crunching sound. She approaches. He moves toward the end of a branch. She comes closer and adopts the presentation posture. They copulate.

We speculate: By using leaf-clipping, the male draws the female's attention not only to his erection (which she has probably already noticed) but also to his intention to draw it to her attention, suggesting that this is relevant *to her*. Relevant how? By indicating that she in particular is welcome, and indeed encouraged, to take advantage of this mating opportunity. Interpreting the leaf-clipping as ostensive provides a plausible explanation of how the communicator succeeds in making a targeted request, which neither his displayed erection nor his leaf-clipping would have been enough to convey on its own.

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[11] Sometimes (e.g., Bar-On, 2013; Korta & Perry, 2020; Moore, 2017; Scott-Phillips, 2015), ostension has been taken as more or less equivalent to "overtness" as understood by Strawson (1964), who suggested that Gricean communicative intentions must be "wholly overt" (but see Grice, 1989, pp. 95–99). Overtness and ostension are two related but distinct notions with quite different theoretical roles. Ostensive behavior calls for attention and is therefore necessarily overt, but communicative behavior can be overt without calling for attention or being ostensive at all (as when you fill in an administrative form). In relevance theory, the notion closest to "overtness" is not ostension but "mutual manifestness" (Sperber & Wilson, 1986/1995, pp. 60–64). The deep differences between Grice's approach and relevance theory were discussed in detail in Sperber & Wilson, 1986/1995, pp. 171–191.

[12] Moore sketches a sensible description, similar to Gómez's, of ostensive communication among apes and human infants and argues in detail that it could be called "minimally Gricean." Unless "minimally" is to be understood as "not really," we disagree. This issue in Gricean scholarship, already raised by Gómez (1994) and central in Moore's writings, is beyond the scope of this article.

An even clearer case is an interaction observed by Sievers (2017) between Kato, a male chimpanzee, and Ruhara, a female, in the Budongo forest in Uganda:

> *Ostensive persistence:* Kato wants to initiate a consortship (i.e., a mating relationship where he and Ruhara would travel away from the group for a few days). He starts moving and waits for her, and when she does not respond, he moves closer, shakes branches, waits, shakes branches, does leaf-clipping, checks on her, repeats the sequence, waits. She comes down from her tree at last, produces a travel "hoo" (a call used to recruit others for joint travel; see Gruber & Zuberbühler, 2013), but does not move further. He shakes branches again and starts moving a few meters, she seems to follow but then stops. She lies down next to him, he grooms her, displays lip smacking. He starts moving again, stops, shakes branches, produces a travel hoo of his own. It takes several more such interactions—two hours in total—before she overcomes her hesitation and follows him for good.

Kato is not only showing Ruhara what he wants but also showing her that he is intent on showing this to her. She may not immediately grasp his intent, and he may not expect her to. In such cases, Sievers argues, "ostension can be established between the communicators on a trial-and-error basis, as opposed to traditional descriptions of ostension as a successful signal production and comprehension within one communicative turn" (Sievers, 2022, p. 8). Still, it may not have taken Ruhara that long to understand what Kato wanted. So what was the point of this prolonged sequence? Unlike a request for food, grooming, or quick mating on the spot, a request for consortship, which involves traveling away and may be dangerous, raises questions about what behavior to expect from the requester during the time spent together away from the group: How reliable a partner will he be?

Repeating the request in various ways and modalities and showing persistence, patience, and flexibility elicit a greater expectation of relevance than a simple request would have done and help satisfy this expectation by giving evidence of what to expect from the requester's behavior in the consortship itself. This is not encoded in any of the signals used. On the other hand, by behaving with ostensive insistence, Kato may be providing some evidence that he would be a reliable partner in the consortship. Alternatively, he may also be providing reliable evidence of how annoying he might become if she does not go. This illustrates how ostension might contribute not just to the content of the information conveyed, but also to its reliability.

Most ape gestures are multiply ambiguous (Hobaiter & Byrne, 2014; Hobaiter et al., 2022; Roberts et al., 2012). Many are not so much ambiguous as largely underdeterminate in their interpretation (as are many human gestures such as smiles or sighs). Certainly, the interpretation of a gesture is a function of the context, but saying this merely describes a cognitive problem that happens to be easily solved, rather than the cognitive procedure through which it is solved.

In human ostensive-mentalistic communication, ostension triggers a dedicated heuristic that selects the first possible interpretation on a path of least effort that satisfies the expectation of relevance raised by the communicative stimulus itself (Wilson & Sperber, 2012; see Sperber et al., 1995 for an experimental illustration). The output of this heuristic is an attribution to the communicator of the intention to communicate some specific content; in other words, it is an instance of mentalizing.

We suggest that this same interpretation procedure is also at work in basic ostension, except that the first interpretation that is relevant enough to the addressee, instead of being initially treated as information about the content of the communicator's communicative intention, is directly treated as information about the state of affairs she is communicating about (and, more specifically in the case of ostensive requests, about what the communicator wants the addressee to do). For instance, consider a leaf-clipping gesture in a context where the first relevant-enough interpretation that occurs to the female addressee is that the communicator wants them to mate: Since this interpretation satisfies the expectation of relevance his behavior has elicited in her, this is how she interprets the gesture. She does not have to entertain, or even be able to entertain, the metarepresentational thought that this is what the male intends her to understand he wants. In a different context, Ruhara interpreted Kato's leaf-clipping not as a request for immediate mating but as a reiteration of a request for joint travel away from the group and future matings. And yes, these interpretations may seem straightforward. But we suggest that what makes them straightforward is that ostension triggers a search for the first relevant-enough interpretation in the addressee.

Ostension may enhance the relevance of a piece of information by addressing it to a particular individual. A male chimpanzee, by adopting a body posture that displays his erection, makes manifest to onlookers that he is ready to mate. Addressing this information to a particular female using leaf-clipping and eye contact may motivate her by making her treat this information as specifically relevant to her.

Ostension may also increase the relevance of a piece of information by making some of its tentative implications part of the message. This is what seems to happen when Kato tries to recruit Ruhara. None of his gestures on its own encodes reliable information about how he might behave if she accepts his invitation (or rejects it). Multiplying gestures and vocal signals of various kinds do not *encode* this information either, but together, they make the whole interaction ostensive and offer her relevant evidence of his determination not just to initiate the consortship process but to go through with it.

So our suggestion is that while ostension may not always play a significant role in gestural communication among apes, it may well be a crucial resource for enhancing its communicative power when needed. It can be used, for instance, to narrow down the interpretation of a gesture, to motivate its addressee, or to convey relevant information that was neither clearly signaled nor evidenced in the context. If so, then the question is not whether the whole category of intentional gestures in apes is ostensive or not, but rather to what extent any particular use of such a gesture might be ostensive and to what effect.

Some recent experimental findings with captive apes provide more direct evidence that ostension elicits an expectation of relevance in the addressee.

Experimenters can address captive apes by calling them by name (which these apes are familiar with) and establishing eye contact, actions that are likely to make the communication ostensive if apes are sensitive to ostension at all. Does this ostensive behavior elicit an expectation of relevance? One testable prediction is that, if it does, it should make the apes more attentive, and in particular it should heighten their spontaneous tendency to follow the other's gaze. Here is a study (elaborating on Kano et al., 2018) that investigated this possibility:

Double-checking: Warren (2023) tested primates from several species of apes to see how being ostensively addressed might modulate their gaze-following. After giving an individual several pieces of food, she paused, got their attention by addressing them ostensively (or, in a control condition, attracted their attention to herself by non-communicative means), and then looked upwards and kept staring up for 10 seconds, when in fact there was nothing of interest to look at. The main prediction was that apes that had been ostensively addressed would be more likely to double-check: that is, having followed the experimenter's gaze, looked up and seen nothing of relevance, to look up and check again. This is indeed what Warren observed. This suggests, she writes, that "the ostensive display alone increased the presumption that the experimenter's gaze should contain relevant informational contents."

In a quite different study on the effects of ostension on how apes understand what they are shown, Marno et al. (2022) used a design adapted from an earlier study on ostensive communication with human infants (Marno & Csibra, 2015; see the "A Developmental Perspective on Ostension" below section):

Apes trusting an ostensive communicator more than their own observations: Two experimenters demonstrated to apes how to operate a food dispenser. One experimenter demonstrated an effective method and the other an ineffective one. When the two demonstrations differed only in effectiveness, most apes chose the effective method. However, when the experimenter using the ineffective method addressed the apes ostensively and the other demonstrator did not, the apes failed to prioritize the method they were able to recognize as effective. This suggests that the ostensive demonstration elicited an expectation of relevance that led a number of apes to see the demonstrator of the inefficient method as a better source of information, and the so-far-inefficient method as therefore somehow preferable.

The experimental evidence we have just summarized is too scanty to warrant any definite conclusion, but it does warrant taking seriously and exploring further the hypothesis that apes are sensitive to both the cognitive and the social aspects of ostension. On the cognitive side, ostensive behavior addressed to apes tends to elicit an expectation of relevance that helps them interpret vague or ambiguous signals and draw inferences that go beyond what these signals encode. On the social side, ostension may socially engage the communicator and addressee, elicit mutual expectations, and thus make intentional communication more reliable.

Together, the field observations and experimental evidence discussed in this section suggest that intentional communication among apes, rather than being either definitely ostensive or not, can be more or less ostensive on different occasions and in different ways. This suggestion will hopefully be relevant to the study of ape communication. It is definitely relevant to the study of ostension in general.

A Developmental Perspective on Ostension

While the existence of ostensive communication among apes may still be debatable, its pervasiveness in human interaction is not. Infant pointing provides the clearest evidence that quite early in their development, humans engage in ostensive communication as both communicators and addressees. As Liszkowski et al. (2012) have shown, by 10–14 months, infants and their caregivers point with an extended index finger in the same basic situations and with similar frequencies across cultures. Well-known cultural differences in adult pointing are best seen as modulations of this general human behavioral disposition. Infants point at a visible object or event with a variety of goals: for example, to inform the addressee of its presence or location, to ask for it, to request information about it, or to express and share the interest it arouses in them (Carpenter et al., 1998; Kovács et al., 2014; Tomasello et al., 2007), and in doing this, they can take into account the addressee's perspective on the object pointed at (Tauzin et al., 2024).

The interpretation of an act of pointing has to be contextually inferred. There are usually many items to be seen in the direction indicated, each with many properties. Moreover, pointing is often used, even by infants, to communicate not about the visible objects they are pointing at but about other items that are not currently visible. Here are two illustrations, the first from a real-life observation, the second experimental:

Pointing at hidden objects: The mother of 13-month-old Lisa was looking for the missing refrigerator magnets; Lisa pointed to the basket of fruit where only fruit could be seen; but the magnets were there, hidden under the fruit. (Tomasello et al., 2007, citing an unpublished study by Carpenter et al.)

Pointing at absent objects: 12-month-old infants pointed to an empty plate to request not the plate itself but a specific kind of toy object that had been there earlier on. In a parallel experiment, apes pointed to an empty plate to request a specific kind of food that had been on the plate before. (Bohn et al., 2015)

Generally speaking, then, a typical act of pointing underdetermines its interpretation. It may refer to many objects, events, or properties that need not be currently visible. The information it conveys need not be only about the presence and location of the referent. Moreover, a point may express different attitudes to the information conveyed.

It is quite remarkable that despite this underdetermination, addressees commonly succeed in understanding points as intended, and communicators expect them to do this as a matter of course. What cognitive mechanisms enable communicators, including infants, to produce points that in most cases can be readily understood by their intended addressee? What cognitive mechanisms make it so easy for addressees to understand? Of course, when adults point to infants, part of the answer is that they make it as easy as possible for the infants to understand. More generally, the range of possible interpretations is narrowed by context and common ground. But while all this helps to clarify the cognitive challenges faced by both infants and adults in producing and interpreting points, it goes nowhere near explaining how they cope with these challenges. Our suggestion is that, with pointing as with all forms of ostensive communication, addressees are guided by the expectation that the ostensive stimulus will be relevant enough to be worth their attention, and effective communicators are guided by their understanding of how it might be relevant to their addressee.

The very rich comparative and developmental literature on pointing has paid relatively little attention to its pragmatics. It has focused instead on the very existence of pointing and the form it might take in various species, its developmental trajectory in humans, its more or less mentalistic status, and the variety of communicative acts it performs. The fact that pointing is ostensive has often been noted but hardly ever discussed. Our main aim in considering pointing here is to emphasize that humans engage in ostensive communication, as both communicators and addressees, from the early age at which they start pointing communicatively; that is, well

before they speak. As we illustrated in Pointing Vignettes 1–3, pointing can be an instance of basic or mentalistic ostension or a combination of both.

An important aspect of ostension in infancy has been discovered and studied in depth by Csibra and Gergely in the framework of their "natural pedagogy theory," yielding groundbreaking insights (Csibra & Gergely, 2006, 2009, 2011; Gergely & Csibra, 2020). According to this theory, "human communication is specifically adapted to allow the transmission of generic knowledge between individuals" (Csibra & Gergely, 2009, p. 148). In transmitting such knowledge to infants, adults use "ostensive signals" (here meaning signals of ostension rather than signals used ostensively) such as direct eye gaze, infant-directed speech, or calling the infant by name. These signals, which introduce or accompany communicative behavior, fulfill the metacommunicative function of signaling to addressees that this behavior is addressed to them. When addressed with such ostensive signals, infants tend to treat what they are being shown as exemplifying a piece of general knowledge worth paying attention to and learning about. Here are a couple of experimental illustrations:

> *Individual or general preference?* In the first, familiarization phase of an experiment by Egyed et al. (2013), 18-month-old infants saw an adult (the "demonstrator") sitting at a table with two different objects, one on each side. One group of infants saw an uncommunicative demonstrator who didn't even look at them. Another group saw a communicative demonstrator who looked and smiled at them and greeted them by name. In both conditions, the demonstrator then looked at one object with pleasure and interest and the other with displeasure and disgust, and then left. In the test phase, a different adult came to the table and asked, "Give me one of them!" Infants who had seen an uncommunicative demonstrator in the familiarization phase chose at random which of the two objects to give. Infants who had been ostensively addressed picked the object to which the demonstrator had expressed positive emotions.

This suggests that in the absence of ostension, infants saw the demonstrator's behavior as providing evidence of her own preference, while with ostension, they saw it as providing evidence about the objects themselves: that one was preferable to the other.

> *Infants trusting an ostensive communicator more than their own observations:* Marno and Csibra (2015) introduced 18-month-old infants to a toy-like device with two buttons, one blue and one red. In the demonstration phase of the experiment, the infants saw a first experimenter come in, press, say, the red button three times, twice triggering a pleasant light and sound event, and then leave, without communicating with the infant at all. Then came a second experimenter who smiled and greeted the infant. She then pressed the other, blue button three times, triggering the light and sound event only once. She then left and the infants were allowed to operate the device themselves. Which button would the infant press first: the red button that had been demonstrated non-ostensively and had worked twice, or the blue button that had been demonstrated ostensively and had worked only once? A majority opted for the ostensively demonstrated button that had been less effective.

As the authors explain, when the demonstration was carried out ostensively, the infants interpreted it as showing them which button *should* be pressed. It conveyed a normative message about the right way to do things, which took precedence over considerations of efficiency.

Why should the fact that an adult's behavior is preceded by ostensive signals affect the way it is understood by infants? According to natural pedagogy theory, ostensive signals activate a "genericity bias," that is, a default expectation that the object or action displayed exemplifies a piece of general knowledge worth acquiring. When ostensive signals are used, an individual behavior expressing a preference for some object is interpreted as evidence that the preferred object is objectively preferable. An ostensively demonstrated action is interpreted as correct even when it is less efficient. A wide range of other experiments (the most famous being the head-touch experiment—Gergely et al., 2002; Király et al., 2013) have shown that, when some property of a token object or action is ostensively displayed, it is interpreted as a generic property of objects or a normative property of actions of the same type.

Does the form of ostension used by adults addressing infants with pedagogical intent differ from the one used in other communicative interactions? In our view, the experimental evidence that has been taken to show that ostensive signals elicit a genericity bias in infants might be equally well explained by the more general, and independently supported, alternative hypothesis that what ostension invariably elicits is an expectation of relevance. In some situations, this expectation is most easily satisfied by a generic interpretation of the ostensive stimulus, while in others it is best satisfied by what Csibra and Gergely call an "episodic" interpretation, which applies only to the particular case involved and does not generalize.[13]

Csibra and Gergely are, of course, well aware that ostensive signals are often used when informing infants about episodic features of the situation (e.g., the current location of a toy the child is looking for) and that infants themselves use ostension, often in the form of pointing, to communicate about similar episodic concerns. As Csibra writes, "The assumption of genericity that characterizes infants' effort to make sense of communication directed to them represents a processing bias rather than an irrefutable presumption" (Csibra, 2010). Tauzin and Gergely (2018) experimentally demonstrate that 13-month-old infants can interpret an ostensive interaction between two agents as conveying relevant episodic information.

The experiments used to demonstrate the genericity bias typically present infants with the same stimulus in the same context in two conditions: with or without ostensive signals. In the contexts used, the only readily available interpretation of the ostensive stimulus that would make it relevant enough to be worth the infant's attention is a generic one.[14] These experiments demonstrate the predicted effects, but a different experimental design (for instance, one that varies the context and keeps ostension constant across conditions) would be needed to decide whether these effects result from a genericity bias or a more general expectation of relevance.

Even if, as we argue, ostension elicits an expectation of relevance in all cases, Csibra and Gergely were breaking new ground in highlighting the role of ostension in the transmission of knowledge. Here is how. Someone observing a single isolated episodic occurrence rarely draws generic conclusions from it, and indeed would

[13] According to natural pedagogy theory, ostension also activates a "referential expectation" (Csibra, 2010, p. 156). Here too, we suggest that addressees of ostensive communication take it to refer to a certain object or event when (as is quite generally the case) this is the best way to satisfy their expectation of relevance, and not otherwise. If so, there is no need to postulate a distinct referential expectation.

[14] An intriguing exception is Topál et al. (2008) who, using ostension, elicited an apparently generic interpretation about the location of an object when an episodic one would have been more relevant. How best to interpret these findings is unclear (Vorms, 2012).

rarely be warranted in doing so. For instance, observing some stranger expressing a preference for one of two similar items is unlikely to trigger the generally unwarranted inference that this item is objectively preferable. Things are different when it comes to ostensive behavior. An ostensive communicator's behavior warrants the first interpretation of the stimulus that occurs to the addressee and is relevant enough to be worth his attention. When this interpretation is arrived at by generalizing from the stimulus, ostension warrants a generic interpretation. This is how ostension may both warrant and trigger generalizations that would not otherwise be made. Thus, human ostensive communication is, if not *specifically* (as Csibra & Gergely, 2009 claimed), at least *uniquely* "well adapted to allow the transmission of generic knowledge between individuals" (Csibra & Gergely, 2009, p. 148) It is also conceivable that children's motivation to learn and adult caretakers' motivation to teach have evolved to take advantage of the opportunity that ostensive communication provides. If so, in many situations, a generic interpretation would be the first relevant enough one to occur to the infant, and such pedagogical interactions would indeed be "natural."

Research on ostension in apes has focused on basic ostension. Research on ostension in linguistically fluent humans has focused on mentalistic ostension. Refreshingly, research on ostension in infants has proceeded without paying much attention to whether it is mentalistic or nonmentalistic. In a typical natural pedagogy experiment with infants, the general knowledge to be transmitted is exemplified by ostensively presented observational evidence. What ostension does in such cases, apart from getting infants to pay attention to the evidence presented, is encourage them to generalize from it: it is neither obvious nor inconceivable that mentalizing has to be involved.

With toddlers, on the other hand, a great deal of general practical knowledge is transmitted using verbally commented demonstrations: that is, with a mixture of observational and interpretational evidence. This is also true of teaching practical skills to older children and adults—think of how-to videos on YouTube. It is only in the cultural transmission of abstract theoretical knowledge, or knowledge of particulars (such as historical facts) for which no direct observational evidence is available, that interpretational evidence has to play the dominant role. So it seems that teachers make flexible use of basic and mentalistic forms of ostension, singly or in combination, depending on the mentalizing and linguistic fluency of learners and the availability and interpretability of observational evidence of the knowledge to be transmitted.

Cognitive development, increased proficiency in mentalizing, and the acquisition of language (which itself depends on ostensive communication; Bloom, 2002; Papafragou, 2002; Sperber & Wilson, 1986/1995—but see Planer, 2017) make mentalistic ostensive communication more and more effective in both everyday interaction and the transmission of cultural knowledge. It would be a mistake to assume that in the process, basic, nonmentalistic ostension becomes less and less effective. The two forms of ostension not only coexist but often contribute jointly to effective communication, as the study of pedagogy clearly illustrates. This is true not only of pedagogy but also of more situation-dependent exchanges and applies not only to extended communicative interactions but also to isolated communicative acts. We show this in the next section, with a focus on verbal communication.

Verbal Communication Is Ostensive but Not Purely Mentalistic

Seen as tools for communication in the signaling mode, human languages are radically defective. Although they enable the construction of an infinite number of sentences encoding a boundless variety of semantic structures (or "linguistic senses"), sentences are invariably too ambiguous, gappy, and semantically underdeterminate in other ways to encode the kind of information that communicators might want to convey and addressees might want to acquire (Bezuidenhout, 2002; Carston, 2002).

On the other hand, languages are well adapted for exploiting the opportunities offered by ostensive communication (Origgi & Sperber, 2000; Scott-Phillips, 2015; Sperber & Wilson, 1986/1995). Using language, ostensive communicators can produce exquisitely rich and complex evidence of their communicative intentions in the form of utterances; addressees can interpret these utterances as expressions of the communicator's communicative intention and thus obtain interpretational evidence of the information being communicated. Here is a quick, informal illustration of how utterances provide interpretational evidence of the information being communicated (for a step-by-step analysis of this example, see Wilson & Sperber, 2012, pp. 66–70).

> *"I've eaten," Vignette 1:* Alan knocks on his neighbor Lisa's door and invites her to join him and his family for supper. She replies, "No, thanks. I've eaten."

What the sentence "I've eaten" linguistically encodes is the very general sense given in (a), which does not specify what was eaten or when the eating took place:

a. The utterer has eaten something sometime in the past.

However, the sentence is never used to convey this obviously true but irrelevant encoded sense, which has to be narrowed down in context. So how does Lisa's utterance provide evidence of her meaning? It activates in Alan's mind a semantic structure that he can use as a starting point for constructing an interpretation of Lisa's meaning. Following a path of least effort and stopping when his expectation of relevance is satisfied, he interprets her as intending to communicate that (b):

b. Lisa has eaten supper this evening, and that is why she is refusing Alan's invitation.

This gives him interpretational evidence that (b) is indeed the case.

There are clear differences between cases of basic ostension (e.g., the mother pointing to a tablet her son is looking for) and those of purely mentalistic ostension (e.g., Lisa's reply to Alan's invitation). This might be taken to suggest that two quite different types of communicative action are involved. However, as we have already suggested, purely basic and purely mentalistic ostension are at opposite ends of a continuum of possible uses of ostension. It is indeed quite common for ostensive behavior to provide both observational and interpretational evidence of the same information (using both the black, one-arrow and the white, two-arrow paths in Figure 3). In many such cases, the effectiveness of ostensive communication crucially depends on making both types of evidence available.

In the "Ostension: Basic and Mentalistic" section, we illustrated the difference between basic and mentalistic ostension using two cases of pointing, one involving basic and the other mentalistic ostension. With a third case, we showed how basic and mentalistic ostension can be combined. Here is a further case that illustrates how, when human pointing involves such a mixture of observational and interpretational evidence, their relative contributions to the overall interpretation may vary:

> *Pointing, Vignette 4:* A boy and his mother are in the living room; she is reading, he playing. The boy is looking for his tablet and says, "I wonder where my tablet is." His mother points in the direction of the toy box.

Suppose the tablet is normally kept in the toy box. Then drawing the boy's attention to the box should be enough to make him look inside. He need not pay attention to his mother's intention in order to acquire the relevant information conveyed. Suppose instead that the box is generally used only to store his baby sister's toys. Then the mere sight of the box might not be enough to make him look inside. What would make him more likely to do so would be interpreting his mother's ostensive behavior as intended to convey to him the relevant information that his tablet happens to be in that box.

Between these two limiting cases, where the boy's "prior probability" that the tablet is in the box is either high enough for him to consider opening it or else too low, there is a continuum of cases. At each intermediate point along the continuum, basic ostension must be boosted to some extent by mentalistic ostension—more so when the boy's prior probability is low, and conversely—in order to achieve relevance as expected.

In our previous work, we argued (against Grice) that there is a continuum of cases between *showing that P* and *meaning that P*, and claimed that in cases of pure showing, all the evidence for the information being communicated is made directly available to the addressee. However, we maintained that even in these cases, some mentalizing is necessary (if only to make the information communicated "mutually manifest" or "common ground"). That is, we failed to acknowledge the possibility of basic, nonmentalistic ostension. We also discussed many examples of nonverbal communication involving an interplay between observational and interpretational evidence of the same information (Sperber & Wilson, 1986/1995, pp. 46–54; Sperber & Wilson, 2015), but failed to consider the possibility that these might rely on a mixture of basic and mentalistic ostension. Mentalistic ostension has more expressive power—hugely more when language is involved. However, we want to argue that it does not supersede basic ostension, even in verbal communication, as we will now briefly illustrate.

One way to make mentalistic communication more effective is by using observational evidence to strengthen the interpretational evidence it provides. Here is an illustration:

> *"I've eaten," Vignette 2:* Alan knocks on his neighbor Lisa's door and invites her to join him and his family for supper. She replies, "No, thanks. I've eaten," while simultaneously pointing to the dirty plates on the table behind her.

By pointing, Lisa provides conclusive observational evidence for her claim that she has eaten, thus ensuring that her explanation will not be taken as merely a polite excuse.

To see how verbal communication may be enriched by access to observational evidence, compare listening to a tennis match on the radio with watching it on TV:

> *Tennis match:* A radio commentator can provide only interpretational evidence of what is happening on court, often in the form of a lightning stroke-by-stroke description. By contrast, a TV commentator can single out and comment on particular aspects of the play that the audience can see for themselves, so that the interpretational evidence she provides is strengthened by independently available observational evidence ("Nadal seems to be limping"; "Gorgeous single-handed backhand from Federer"; "Nadal serves. Out. Unlucky.").

What the commentator is saying is evidenced by what she is showing, and what she is showing is processed in the light of what she is saying.

Most spoken utterances also provide "paralinguistic" cues (linked to tone of voice, facial expression, gestures, body language, etc.) that can be ostensively displayed, providing observational evidence that may converge with the testimonial evidence being conveyed (Wharton, 2009; Wilson & Wharton, 2006). In "I've eaten," for instance, Lisa may reply to Alan in a regretful tone of voice, with a downcast expression and a gesture of dismay, showing how sorry she is not to be able to eat with him. Similarly, the radio or TV commentator may display her excitement as the match reaches its climax.

Accent and voice quality may also be ostensively used to strengthen the interpretational evidence a linguistic utterance provides. Saying "I have a terrible cold" in a hoarse, congested voice provides observational evidence to support the claim being made; saying "I was brought up in Wales" in a Welsh accent does the same.

Sometimes, neither interpretational nor observational evidence contributes enough on its own to satisfy the addressee's expectation of relevance, but they may combine to make an utterance relevant as expected. Here is an illustration:

> *At the baker's:* Maria is inspecting the cakes on display. The assistant asks her what she would like. Maria points to a chocolate cake and says, "Two slices, please." Neither the observational evidence provided by her pointing nor the interpretational evidence provided by her utterance yields enough information on its own to answer the assistant's question, but together, they do.

Sometimes, observational and interpretational evidence seem to point in different directions when considered separately, but together, they may add up to a coherent whole. Here is an illustration:

> *After the movies:* As we leave a spectacularly boring film, I turn to you and say, "I was on the edge of my seat." Considered in isolation, the interpretational evidence provided by my utterance conflicts with two types of independently available observational evidence derived from (a) our experience of boredom watching the film; and (b) my deadpan tone and wry facial expression. The conflict is resolved by interpreting my utterance as ironical.

Similar clashes between observational and interpretational evidence arise in cases of false modesty: for instance, saying, "Sorry I had to throw this together at the last minute" while serving a meal worthy of Vicky Lau.

It is easy to see why all these examples (and even cases of pure showing) might be treated as mentalistic. Humans are spontaneous mentalizers. Even if, as Malle (2004), Kaufmann and Clément (2014), and Taylor et al. (2023) suggest, they are often content to

categorize and contextualize the routine actions of others without metarepresenting the intentions behind them, these intentions are manifest to them, and are likely to be mentally metarepresented whenever they are relevant enough.

Ostensive communication is an extremely common form of action for humans. When you see two people talking in the street, you can easily categorize their behavior as communicative and identify communicator, addressee, and relevant features of the situation without mentalizing. These categorizations may be quite fine-grained: For instance, you may recognize that one of them is asking the other for directions and that the other is obliging, without metarepresenting their communicative intentions.

When someone you do not know and are unlikely to interact with in the future addresses a routine act of basic ostensive communication to you, you may be able to benefit from their communication without metarepresenting their communicative intention. For instance, a waiter in a restaurant, seeing you arrive with a heavy coat and bags and guessing that you are looking for the cloakroom, points you in the right direction. By following his point, you may well get the relevant information you wanted without paying any attention to his intention. Similarly, when you drop your glove in the street and start looking around you on the ground, a passer-by might point it out to you, half hidden under a pile of leaves. Again, no mentalizing is needed to understand that what is being pointed out is your glove (and not the pile of leaves).

However, when the passer-by who pointed out your glove is someone you know or expect to interact with further—even if only to thank her—you are much more likely to engage in mentalizing, attributing to her the intention to inform you about the whereabouts of your missing glove, and expecting her to expect you to recognize her intention. The fact that she had this intention and the cooperative disposition it reveals are relevant to your future interaction with her and typically become part of your common ground. When it becomes relevant to you that she was being helpful in pointing out your missing glove, you are likely to interpret her ostensive behavior mentalistically as intended to show you not only the location of your glove but also that it was her intention to show it to you.

More generally, interpreting the communicative intention of someone who is addressing you is likely to be relevant not only because it gives you interpretational evidence of the information being communicated but also because it provides evidence of her attitude to you, which is relevant to your social relationship.

This socially relevant information may be part (or even the whole) of what the communicator intended to convey. This typically happens with phatic communication, as, for instance, when you are waiting for the bus and a stranger standing next to you says, "Lovely weather, isn't it?" In doing so, she is giving you interpretational evidence of the fact that the weather is lovely, which, being common ground, is obviously not enough to satisfy your expectation of relevance. On the other hand, her speaking to you in this way gives you observational evidence of her willingness to engage in friendly small talk, and this is what makes her utterance relevant to you.

As these examples show, human ostensive communication, whether mentalistic or not, typically happens in the context of complex multimodal interactions (Holler, 2022), where attending to mental states of all kinds in others is often relevant in many different ways. Much human social interaction involves a high degree of spontaneous mentalizing. With human ostensive communication in particular, mentalizing may occur not only in mentalistic ostension but in basic ostension too. In the case of mentalistic ostension, as noted above, the ability to metarepresent the communicator's communicative intention makes it possible to communicate much more than information for which observational evidence can be produced. The scope of mentalistic ostension is itself vastly increased by the ability to use linguistic utterances as evidence of communicative intentions. However, even in mentalistic ostension, mentalizing may be used for other things than metarepresenting communicative intentions and treating them as sources of interpretational evidence of the information being conveyed. Communicative behavior may also be relevant as observational evidence of mental attitudes of the communicator other than her main communicative intention and can be used ostensively to communicate information about such attitudes.

So the fact that addressees draw mentalistic inferences in interpreting an act of ostensive communication does not necessarily imply that this is a case of purely mentalistic ostension. It could be a case of partly, or even wholly, basic ostension. Having failed to grasp this in the past, we interpreted the form of human ostensive communication we were studying—mostly in verbal communication—as mentalistic through and through. As we have tried to argue here, the rich work of comparative and developmental psychologists on ostension in apes and infants demonstrates that basic ostension is possible. This in turn suggests that verbal communication, which is always mentalistic, need not be purely mentalistic. It may also involve the production of observational evidence in a variety of ways, as we have tried to illustrate here.

Conclusion

In this article, we put forward a revised and expanded account of ostensive communication, drawing on the rich constructive and critical work produced since the publication of *Relevance: Communication and Cognition* (Sperber & Wilson, 1986/1995). Here are the main conclusions that might be tentatively derived:

1. Ostension in general is a mode of communication quite distinct from signaling. It is characterized by three main features:

    a. The communicator draws the addressee's attention to her own communicative behavior and to evidence of the information she intends to convey.

    b. In doing so, the communicator elicits in the addressee the expectation that the information communicated is relevant enough to be worth his attention.

    Unlike signals, which have a largely predetermined interpretation (or, in the case of ambiguity, several such interpretations), the pieces of evidence provided in ostension may warrant a wide open range of conclusions. So how can they be used to convey some specific piece of information? Here is our answer:

    c. In drawing inferences from the evidence provided, the addressee is guided by an expectation of relevance that, for communication to succeed, must be precise enough to be uniquely satisfied by the information the communicator intended to convey.

2. We distinguished two forms of ostension: a basic, nonmentalistic form and a mentalistic form that is fully developed in humans:

    a. In basic ostension, the communicator provides *observational evidence* from which the addressee can directly infer the information being communicated.

    b. In mentalistic ostension, the communicator provides observational evidence of her intention to communicate some particular information; recognizing this intention provides the addressee with *interpretational evidence* of that information.

3. *Basic ostension*, we suggested, is an adaptation that evolved independently of mentalizing and before human languages, plausibly among the common ancestors of all great apes (if not before). Apes are capable of acting intentionally and recognizing intentional behavior in others. However, the potential benefits of communicating intentionally by signaling alone are severely limited by problems of expressive power and reliability. Ostension may have evolved to address these problems, making intentional communication more advantageous. In particular:

    a. The range of information that can be ostensively communicated is broader than the range that can be communicated by signaling.

    b. Ostension makes it possible to communicate effectively using vague or ambiguous signals.

    c. Ostension helps to make intentional communication more reliable.

4. *Mentalistic ostension* emerged among humans (if not before) from a synergy between two capacities that had evolved independently with two different functions:

    a. The capacity to communicate ostensively (with the function of making intentional communication more efficient).

    b. The capacity to mentalize: that is, to attribute mental states to others and metarepresent their content (with the function of better predicting their behavior in agonistic or cooperative interactions).

5. The range of information that can be communicated using interpretational evidence is broader than the range that can be communicated using direct observational evidence. It includes:

    a. Information for which the available observational evidence is too weak on its own, but can be reinforced by interpretational evidence.

    b. Information for which the communicator can provide no observational evidence but can offer interpretational evidence in various ways: for example, more or less conventionalized pantomiming and other iconic devices; repurposed natural or conventional signals; improvised behavior (see Vesper et al., 2021 for experimental evidence of improvised ostension).

    c. More importantly: Information for which language provides a unique source of interpretational evidence.

Recognizing the pervasive role of basic ostension, even among spontaneous mentalizers such as humans, in no way amounts to denying that mentalistic ostension is uniquely powerful and goes a long way toward explaining human uniqueness. Basic ostension makes it possible to communicate about what can be observed here and now, and what can be readily inferred from such observation; this is more than can be communicated simply by signaling but is still rather limited. Mentalistic ostension, by relying on interpretational evidence, makes it possible in principle to communicate any information that a communicator wants to convey, as long as she can produce evidence of a kind that the addressee is able to interpret. In practice, most methods for producing and interpreting such evidence tend to be limited and both cognitively and behaviorally costly for communicators or addressees. Language is unique as a cheap source of boundless evidence of the communicator's communicative intention that can be fluently produced and interpreted. Language brings the boundaries of what an individual can ostensively communicate closer to the boundaries of what she is able to mentally represent. Conversely, language brings the boundaries of what an individual is able to mentally represent closer to the boundaries of what can be socially communicated in her community—but that is another story.

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Received May 8, 2024
Revision received February 4, 2025
Accepted March 29, 2025 ■