

The Ideational Metafunction and Nonhuman Signalling

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You've probably spotted that this is an odd subject for a linguistics conference, and even odder for a conference dedicated to one particular aspect of one particular way of looking at language. However, I believe that Halliday's four metafunctions¹ offer perhaps the best way into understanding how language is comparable to – and different to – other forms of animal signalling.

A quick look at the other main theory of language, formalism, shows that it has not proved too successful in establishing the interface between language and other signalling forms. Chomsky himself has taken the view that language is completely different to all that has gone before: It constitutes a genetic change so fundamental that any similarities between language and nonlanguage signalling are pure coincidence².

The formalists who have tried to link language structure back to nonlanguage structure – Pinker³, Jackendoff⁴, Bickerton⁵, and so on – have all fallen foul of Chomsky's dictum that language is a near-optimal solution⁶. All we need to do is work out the problem it solves, and we will see just how optimal it is. However, in all of the formalist solutions to the origins of language there are part-way stages which must be less than near perfect; and there remains a major unasked question: why should we assume that the current state is the final state? Could this thing that we call language be just one more part-way stage?

¹ The main functional linguistics texts I have used in preparing this paper are — Thomas Bloor & Meriel Bloor, *The Functional Analysis of English: a Hallidayan Approach* — Michael Halliday, *An Introduction to Functional Grammar*, 2nd edition — Michael Halliday & Christian Matthiessen, *An Introduction to Functional Grammar*, 3rd edition — J R Martin, Christian Matthiessen & Claire Painter, *Working with Functional Grammar* — Geoff Thompson, *Introducing Functional Grammar*.

² Noam Chomsky, *Knowledge of Language: its nature, origin and use*, pp3-5 — *Language and the Problems of Knowledge: the Managua lectures*, pp183-185.

³ Steven Pinker, *The Language Instinct — Words and Rules: the ingredients of language*

⁴ Ray Jackendoff, *Consciousness and the Computational Mind — Patterns in the Mind: language and human nature — The Architecture of the Language Faculty — Foundations of Language: brain, meaning, grammar, evolution*

⁵ Derek Bickerton, *Language and Species* — with William Calvin, *Lingua ex Machina*

⁶ Noam Chomsky, *On Nature and Language*, pp105-109 — *The Architecture of Language*, pp16-21.

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Let us, for now, leave formalist theory to one side and concentrate on Halliday's model. First, I should say that I am not going into great detail about clause structure. Instead, I want to take an overview of the four metafunctions, and see how – or whether – animals would use them.

The first metafunction I want to consider is probably the most controversial: the interpersonal metafunction. I intend to demonstrate that this is not needed for nonlanguage signalling, even though it would seem to be a minimal requirement for communication. Contrary to anthropocentric common sense, I want to show that signalling does not need to be communicative.

Let's start with eusocial hymenoptera – bees, ants and wasps. The most famous case here is the honeybee (*Apis mellifera*) waggle dance, which was initially discovered by Karl von Frisch and has been analysed by many others since⁷. The bee dance enables a returning worker to indicate to other bees the direction and distance of food sources. The other bees do not need to have visited the food source themselves, and they do not even need to have been outside the hive before. The dance codes the direction and distance as a series of indexical values, both within the individual signs used in the dance, and in their interrelationship.

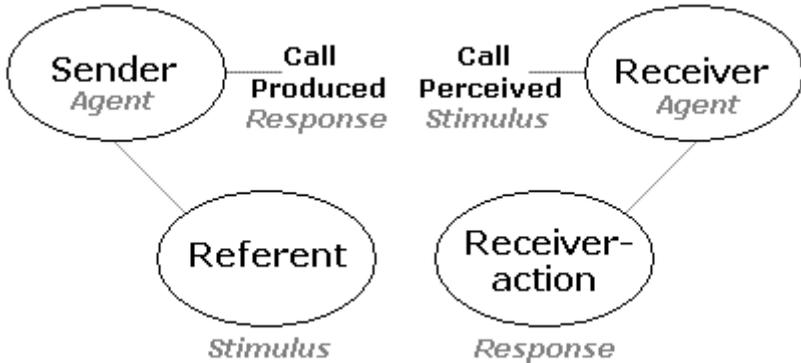
Obviously, the signal is not consciously coded or decoded, this happens at the genetic level. Nonetheless, the bee waggle dance would seem to be a good example of a successful communication device in nature. However, if we look at it from a different viewpoint, it isn't communicative at all.

Stephen Budiansky says that signals are used in Nature not because they mean something but because they work⁸ – and this signal definitely works. But if it has no meaning for the sender or the receiver, why does it work?

⁷ The main text here is Carol Grant Gould & James L Gould, *The Honey Bee* — But also see A Dornhaus & L Chittka, 'Insect behaviour: Evolutionary origins of bee dances' in *Nature* 401, 38 (1999) 02 September 1999 — Adam G. Hart & Francis L.W. Ratnieks, 'Why do honey-bee (*Apis mellifera*) foragers transfer nectar to several receivers? Information improvement through multiple sampling in a biological system' in *Behav Ecol Sociobiol* (2001) 49:244–250.

⁸ Stephen Budiansky, *If a Lion Could Talk*, p137. The full quote is: "This evolutionary perspective [the ritualization of animal signals] underscores the important fact that signals don't evolve because they "mean" something; they evolve because they work. Again, the unwitting feedback between sender and receiver works to create signals that are informative without any conscious intent for them to be so."

The Ideational Metafunction and Nonhuman Signalling

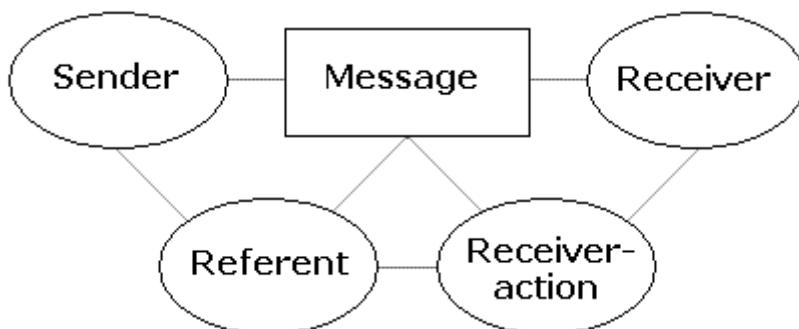


The signalling process seen as two stimulus-response pairings

If we see the dance as a response by the signalling bee to the stimulus of arriving back at the hive with food, then we have a simple stimulus-response pair working on the sender. If the dance also works as a stimulus to other bees to go out and forage then we have another stimulus-response pair, working on the receiver. What makes the signal work is not a comprehension by the receiver of the intention of the sender, it is simply the fact that hives where workers do the dance and respond to it do better than hives where they don't dance. As long as the two stimulus-response pairs continue to be selected for by evolution, they will continue to get more elaborate – even though no model of communication is involved, in the minds of either sender or receiver.

If we look at primates we see that the model is more sophisticated. Vervets (*Cercopithecus aethiops*) making an eagle call switch to the leopard call if the eagle is about to attack vervets on the ground. The implied action of 'out of the trees' is replaced by a more appropriate 'into the trees' call⁹. There would seem to be some awareness that the action-response of the receiver is linked to the call-response of the sender: the sender appears to be telling the receiver what to do rather than what is happening.

⁹ Dorothy L Cheney & Robert M Seyfarth, *How Monkeys See the World: inside the mind of another species*, pp107-108. The event was recorded once. The vervets started by giving the eagle alarm call, which has a response of climbing down trees; but when it became clear that the eagle was, unusually, targeting a vervet on open ground, the signalling vervets switched to the leopard alarm call, which has a response of climbing up trees.



The signalling process seen as a single messaging process

I think it is reasonable to label this as communication; but it is not interpersonal in the same way as language. The sender does not need to be aware that the receiver has intentions, only that there is a link between the call and the receiver-action. Similarly, the receiver does not need to be aware that the sender has intentions in making the call.

In fact, when the receiver does become aware of the sender's intentions they also become aware that the sender can manipulate the call. This is machiavellian intelligence, and it breaks the link between the referent and the receiver-action. Calls are no longer automatically trustworthy, and only costly signalling works¹⁰.

Let's now have a look at the interpersonal metafunction itself: what is the minimum requirement to be able to say it's operating? Fortunately, Halliday and others have given clear definitions against which we can judge the interpersonal metafunction¹¹.

First, it enacts social relationships, which means that the sender and receiver need to be aware that they are both part of a social organisation. But most signals in nature have no need of social relationships to work. From

¹⁰ For a good summary of the arguments on the problem of volitional, cheap signals see Chris Knight, 'Ritual/Speech Coevolution: a solution to the problem of deception' in *Approaches to the Evolution of Language*. The theory (based around Amotz & Avishag Zahavi's Handicap Principle) runs as follows: if cheap signals can be faked, they will be; so cheap signals will only work if they are non-volitional, and volitional signals only work if they are costly. This leads on to the next problem: language is both cheap and volitional, which means that a Darwinian explanation for language cannot be discovered just by reference to language; there has to be another, external cause.

¹¹ Michael Halliday & Christian Matthiessen, *An Introduction to Functional Grammar*, 3rd edition, ch4

The Ideational Metafunction and Nonhuman Signalling

bacterial DNA exchange mechanisms through to the challenge calls of chimps, the normal signal relies on the sender treating the receiver as, at best, a thing to be manipulated rather than an intentional being with its own agenda. The sender and the receiver need no concept of *you* and *me* for the signal to work.

Second, the interpersonal metafunction enacts an exchange of information. However, in nonhuman signalling we see no need for the sender and receiver to attach the same information to a signal. The vervet eagle alarm call is a response by the sender to the stimulus of an eagle, but to the receiver it means “leave the trees”. It works for the receiver not because they become aware of the eagle but because they carry out a procedure which saves their lives. There is no information exchanged, only genetically coded responses invoked.

Third, the favoured structure of the interpersonal metafunction is prosodic. However, there is little room for prosody in nonhuman signals: the signal has value only inasmuch as it is clear and unambiguous. In human language, prosody is used to mitigate or adjust meaning, but in nonhuman signalling there is little scope for variance of signal value. Prosody is used in nonhuman signalling, but it has very specific values. An example is the black-capped chickadee (*Poecile atricapilla*) call, where the final ‘dee’ sound of the warning call is repeated to indicate a greater level of danger¹².

Other interpersonal features are missing from nonhuman signalling. There is no back channel to the signal, there is no negotiating to an agreed meaning, and the signal does not act as an exchangeable currency in social relationships. In fact, the interpersonal metafunction seems to be completely absent from nonhuman signals.

We run into a similar set of problems when we try to identify the textual metafunction in nonhuman signalling. The textual metafunction creates relevance to context: it defines the message between sender and receiver as a negotiation of meaning¹³. However, in nonhuman signalling the context of

¹² Christopher N Templeton, Erick Greene & Kate Davis, ‘Allometry of Alarm Calls: black-capped chickadees encode information about predator size’. In *Science*, vol 308, no 5730, 24 Jun 2005, pp1934-1937. The title is a little misleading. The argument is that the chickadees are coding information about threat size, not predator size.

¹³ Michael Halliday & Christian Matthiessen, *An Introduction to Functional Grammar*, 3rd edition, ch3

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a call is invariant: if the context is present the call has value; if it is not, the call is deceptive – and deceptive calls don't survive¹⁴.

There is also the problem of relevance¹⁵. Nonhuman signalling is not concerned with building relevance in the same way as language. The relevance of a call is intrinsic to the signal: the call is not made to be relevant because it is only produced if it is already relevant. Also, the relevance of the call to the sender is not the same as that for the receiver: the signal has different values to sender and receiver, there is no negotiating to an agreed meaning.

There are also problems for the favoured structure of the textual metafunction. The culminative structure relies on certain parts of the signal being privileged over others, but most nonhuman signals are monolithic, in production as well as receiver value. There can be no emphasis of parts of the signal because there are no parts to the signal.

Once again there are exceptions, like the chickadees, or the Diana monkey (*Cercopithecus diana*) 'probably' boom. With the 'probably' boom a Diana monkey downgrades a call from a stimulus for immediate action to a stimulus for increased vigilance. However, this particular prosodic effect is specific and invariant.

Halliday & Matthiessen describe the language metafunctions as kinds or patterns of meaning¹⁶. As I have already shown, meaning does not need to be a feature of either production or reception of a nonhuman signal: the question is not "what does it mean?" but "does it work?" However, there is

¹⁴ Jack Bradbury & Sandra Vehrencamp, *Principles of Animal Communication*, ch20. A deceptive call can have short-term utility for the sender if it allows the sender to disadvantage a reacting receiver while advantaging himself. However, receivers who do not react to the call will then do better than receivers who react, so the signal will cease to have any value to receivers. It will, however, continue to expose the location of the signaller to predators, so individuals who don't then produce the call will do better than those that do, and the signal disappears.

¹⁵ See Dan Sperber & Deirdre Wilson, *Relevance: communication and cognition*, pp46-54. Nonhuman signals are ostensions of the referent they represent; and, because the signals have to be honest, they are reliable representations. Where a language ostension "makes manifest indefinitely many assumptions", a nonlanguage ostension makes manifest only one assumption. Relevance is not a state to be achieved, it is a pre-existing hallidome of the signal itself.

¹⁶ Michael Halliday & Christian Matthiessen, *An Introduction to Functional Grammar*, 3rd edition, p60

The Ideational Metafunction and Nonhuman Signalling

one level of meaning which is not directly involved in negotiating a commonality of meaning, and that is the ideational metafunction.

As you know, the ideational metafunction consists of two effects, so let's look first at the experiential part. Halliday & Matthiessen describe this as "construing a model of experience". In nonhuman signalling, the signal represents a direct experience of the referent by the sender: if the referent is present as a stimulus then the call is produced as a response – no stimulus, no response. And, because the signal has a one-to-one mapping with the referent, it stands in place of the referent for the receiver of the signal. The signal thus has a direct experiential value to the sender, and an indirect referential value to the receiver.

It may seem odd to be claiming that, on the one hand signals do not have the same value to sender and receiver, and on the other hand they refer to the same referent for both parties. However, the value of the referent to the sender is that it generates a signal which enhances the survival of conspecifics – who are probably related to the signaller. The value therefore lies in kin selection or reciprocal altruism. For handicap principle supporters, demonstrating fitness is also a good source of value for the sender.

For the receiver, the value of the referent is in the one-to-one correspondence with the signal. It is the fact that the call stands in place of the referent, and therefore enhances survival without the receiver needing to be immediately directly aware of the referent. The signal works not because the referent has the same values to sender and receiver but because it has different values.

The logical metafunction is more difficult to justify as present in nonhuman signals. This metafunction is concerned with what happens between signals and not what happens within a signal. Nonhuman signals are essentially stand-alone events which carry their whole value within themselves, so the opportunities for intersignalling significance would seem to be nil.

There is a level at which intersignalling significance occurs, but it is locked within individual minds and is never communicated. If an individual is aware that, for whatever reason, the signals given by another individual have been unreliable, the reliability of past signals will reflect on future signals. Obviously, this is leading us into the realm of machiavellian intelligence, social calculus and theory of mind, all of which are not directly significant

in this paper. Only a few species are capable of machiavellian intelligence: the four or five species of great apes, which includes us; probably the baboons and some monkeys; and possibly the dolphins and whales. While other species do occasionally display behaviours which can be construed as machiavellian, it is among the great apes that the behaviour is endemic.

The ability to link information between signals is only useful if it allows the receiver to build up profiles of the behaviours of its conspecifics. In a machiavellian environment, these profiles cannot be provided by others – there is no way to ensure the given profile is truthful. They have to be experienced directly. However, it is only in a machiavellian environment that profile-building is worthwhile: there is no point worrying about the reliability of signals if signals cannot be unreliable. It therefore seems reasonable to say that the logical metafunction is missing from nonhuman signalling, although it is likely to be used in nonhuman cognition.

This leaves only the experiential metafunction active in nonhuman signalling. Should we be surprised that only one metafunction is involved? If we look once again at the requirements of a nonhuman signal then the answer has to be no. Nonhuman signals rely on the fact that they are unambiguous and directly truthful: ambiguous signals cannot cause automatic responses, and untruthful signals are not worth responding to at all. There is only room for one level of meaning, or value, in nonhuman signals. So we would expect only one metafunction, or kind of meaning, to be active in any nonlanguage signal.

However, the fact that it is the same metafunction in every signal is significant. The interpersonal metafunction cannot apply because there is no need for interpersonal communication in nonhuman signals – there is no need for *me*, as sender or receiver, to have any concept of *you*, as receiver or sender. Only the signal itself is important.

Similarly, the textual metafunction cannot apply: I, as sender or receiver, am not interested in how the context of the signal is relevant to you, only in how it is relevant to me. If it is not relevant to me then there is no meaning, and no value, for me in the signal. It is not a signal, it is environmental white noise.

Formalist linguistics offers a structural view of language: it shows us how language is internally organised, but it tells us nothing about why and how it is used. Functional linguistics, in contrast, offers a process view of

The Ideational Metafunction and Nonhuman Signalling

language: it shows us language in use between real speakers and listeners who do not need to be ideal. If the structure of language is truly unique in Nature, as it seems to be, then looking for the sources of language using a Formalist methodology is unlikely to identify the important similarities between language and other signalling forms. Functionalist methodologies, on the other hand, are very likely to identify the processes of language which have analogues in nonhuman signalling. There is already some evidence that functionalist approaches work best in understanding human nonlanguage communication, and I hope I have shown that the same approaches reveal useful information about nonhuman signalling, too.

The ideas set out in this booklet are currently being developed by the Author. There is more research into the topic than is given here, and other supporting information is also available. If you wish to discuss this further you can contact the author at:

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The Ideational Metafunction and Nonhuman Signalling

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