# Unique – Humans and Language

Language is one of humanity's most distinctive characteristics. No other species has it, and it is central to human life. Dr. Thom Scott-Phillips discusses how his multi-disciplinary approach, which combines mathematics, evolutionary biology, cognitive psychology, and the philosophy of language, can explain where it comes from.

Humans are the only species with language: a set of meaningful units that we can combine together in various ways to express more-or-less any proposition we wish to. A few other species combine signals together in simple ways: honeybees, for example, signal the location of nectar with an elaborate dance, different parts of which communicate different aspects of the location: one part signifies direction, the other distance. However, even this is rare, and no other communication system makes anything like as much use of combining signals together as human language does. Even the most simple of expressions, such as 'the boy wanted the cake', involves the combination of several meaningless sounds into meaningful units (not only the words 'the', 'boy', 'want' and 'cake', but also the '-ed' which indicates the past tense), and the combination of these different units into a sentence. Humans are not the only species to use combinatorial communication, but we are the only species, as far as we know, that makes *widespread* use of it.

For many years, the reason why only humans make such widespread use of combinatorial communication has been something of a mystery. After all, combining signals together is efficient – it maximises the information in a signal, for the minimum amount of effort – and as many popularisers of science have explained, natural selection tends to filter out wasteful behaviour. This suggests that combinatorial communication should be common in the natural world. But it isn't. Why not?

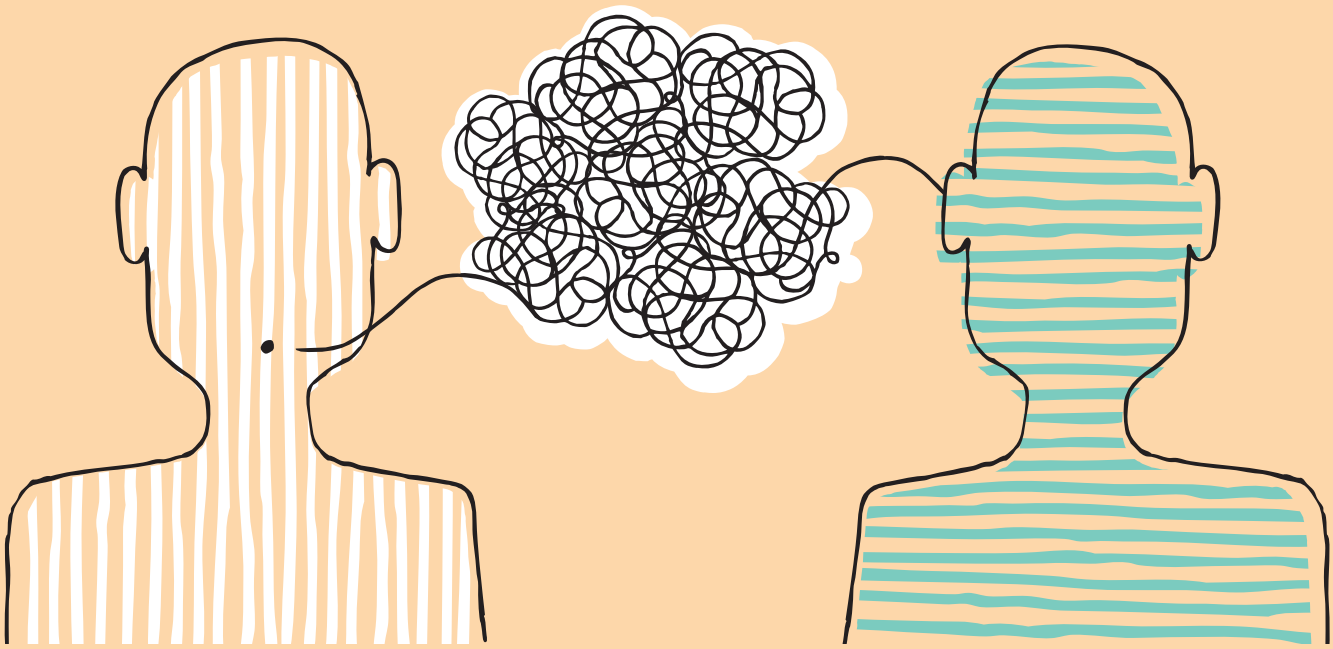
One answer might be that it is cognitively demanding – that only species with a high degree of intelligence can process combinatorial signals. But this doesn't seem right. For one thing, there is no reason to think the combining signals together should be cognitively demanding – computers can do it in just a couple of lines of code, after all. And I have data, which I'm just in the process of publishing, which shows that bacteria use combinatorial communication – so big brains certainly cannot explain why it is rare in nature.

In the last couple of years, I have developed a different explanation. The seeds of this research go back to my PhD, when I spent time thinking about what communication actually *is*. I did my undergraduate degree in Mathematics, and one thing I took away from that was the importance of getting your basic definitions clear, and working up from there. What I realised during my PhD was that, when stripped to its most basic parts, communication is ultimately about the co-dependence of two distinct behaviours, a signal and a response. Each explains why the other exists. One without the other is worthless, and this co-dependence is the heart of what communication is.

I have since developed some mathematical models of the origins of communication that make use of this insight. What these models show is that this co-dependence leads to a chicken-and-egg problem – which comes first: the signal or the response – and this problem places significant constraints on how new signals can emerge. My most recent model shows that this problem is particularly serious for combinatorial signals, to the extent that although such signals can emerge, they are not likely to be common. This explains both why combinatorial systems are rare in nature, and why where we do see them, they tend to be rather limited in scope, like in the bacteria system.

Of course, the elephant in the room is human language, which is so embarrassingly combinatorial that it cannot be treated simply as a freakish outlier to my findings. Why is it so different to other communication systems in this respect? What makes it such an exception to the predictions of my models? The answer lies in the cognitive mechanisms that make different types of communication possible.

Linguistic communication is about far more than the literal meaning of what is said. Sarcasm, irony, metaphor and other figurative uses of language all require that we do not simply decode what others say, but instead that we recognise the speaker's underlying intentions: what does she intend for me to understand?



‘I tilt my coffee cup in an ostensive way. It is ostension that tells the waitress that I am trying to communicate with her, and which hence invites her to search for a common-sense meaning of my tilt.’

Several philosophers of language have pointed out that figurative uses of language are not special in this respect, and that in fact *all* linguistic communication involves the expression and recognition of intentions. The literal meaning of what we say is always only ever one part of what we actually mean (albeit often a major part).

As such, linguistic communication depends not only on learning a language, but also on rich psychological abilities. In particular, it requires that we are able to reason about each other’s beliefs and intentions. And it is not just language where we do this: other forms of communication like pointing, and tilting a coffee cup in a particular, stylised way, so that the waitress refills it, also rely on the same sort of intentions, and the ability to express them and to recognise them in others. Humans are very good at this, but other species far less so. In fact, it is quite likely that no other species has the psychological abilities to engage in this type of communication. The technical term is *ostensive communication:* I tilt my coffee cup in an ostensive way. It is ostension that tells the waitress that I am trying to communicate with her, and which hence invites her to search for a common-sense meaning of my tilt.

One thing that ostensive communication allows us to do is to create new signals at will. Indeed, that is what I did when I tilted my coffee cup, and it is also what I do when I combine two words together in an original way (say, ‘book’ and ‘bike’). In doing so, I effectively announce to my audience that I intend for them to infer some meaning in this combination (perhaps, say, that the bike is made out of books), and in doing so I bypass the historical constraints that my mathematical models show apply to other types of communication system. The old chicken-and-egg problem no longer applies, because signals can be created from nothing, and understood immediately.

This, then, is why only humans make such rich use of combinatorial communication. Most communication systems rely on machine-like encoding and decoding. We communicate like this sometimes too, such as with body language and some other unconscious behaviours. But language and other forms of ostensive communication are based on much richer psychological abilities, which involve the expression and recognition of beliefs, intentions, and other mental states. Only humans seem to have these abilities, and this can explain why only we have language.

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