Mythical myths: comments on Vyvyan Evans' "The Language Myth".

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Language is perhaps the most fascinating of human abilities: our language is an intimate part of our thinking, our identity, our very nature. Language is, at the same time, revealing of the makeup of the human mind, and the construction of our societies. But how to understand language? That has been a source of deep controversy in philosophy, psychology and, indeed, in linguistics. For much of the twentieth century, in Western academic life at least, it was not considered the `done thing' to explore the mental aspects of language. Things of the mind were ethereal, unobservable, and unscientific. But Noam Chomsky, in the second half of that century, overturned that view and inaugurated what came to be known as the Cognitive Revolution. His idea is that our language abilities arise because of a special property of the human mind and this property can be scientifically understood as a kind of mathematical function. Like an engine, this function powers our ability to connect meaning with sound and sign, generating the linguistic structures we use in everyday life. This approach, currently taught in many Universities across the world, and the focus of much research, is known as generative linguistics.

Vyvyan Evans in a recent book (Evans 2014a), and an article in Aeon (Evans 2014b), has argued that generative linguistics is bunkum: it is based on myths and needs to be replaced. Reading the book, or the article, one might think that a compelling case has been made, and that a sea-change is underway in the sciences of language. But that is not true. Evans misunderstands much of what he writes about, misrepresents the ideas of modern linguistics, and makes mistake after mistake. This means that the book and the article are useless for anyone coming from outside the field who wants to understand the issues.

Evans' Aeon article is titled `Why language is not an instinct'. One might be tempted to conclude from this that generative linguistics has proposed that language is an instinct. But that would be wrong: linguists don't use the word 'instinct' as a scientific term. The phrase is a metaphor that Steven Pinker came up with for his popular science book `The Language Instinct' (Pinker 1994). Linguists talk rather of an innate capacity triggered by, and partly shaped by, experience. Instincts, in contrast, are innate, fixed patterns of behavior in animals, triggered by certain stimuli and emerging without training. But generative linguists do not think that language is a pattern of behavior at all, and certainly do not believe that it is fixed in its response to stimuli – indeed that point was part of Chomsky's famous attack on behaviorist approaches to language (Chomsky 1959). So from the very start of his discussion, Evans misunderstands what the basic proposal in generative linguistics is.

Putting the question of instinct aside, Evans writes that, according to generative linguistics, there should be "a set of absolute grammatical universals that are common to all languages" (Evans 2014b). He then says that the amazing variety of human languages shows that this is plain wrong. But generative linguistics has never claimed that languages will display the same observable linguistic patterns, contrary to what Evans says. The claims concerning innate structure of language are not about patterns, but about how the human mind *creates* these patterns.

Think of what happens when we look at a landscape. Our eyes are sensitive to gradations of light and shade, but what we see are shapes, colours, and movements of objects. This is because our mind imposes a structure on the information that comes from our eyes: it creates an interpretation. In a similar way, our mind imposes a structure on the babel of language that we hear, and this is true from when we are tiny babies. What is innate is a capacity to interpret visual and linguistic input in our particularly human way. The ancient philosopher, Epicharmos, rather poetically wrote that "only the mind sees and hears, all else is blind and deaf" (Diels-Kranz 1985, chapter 23, fragment 12). That poetry, though, expresses a deep truth about human nature. Generative linguistics seeks to understand how the mind hears (and

sees) language.

As we grow up, our innate capacities are shaped by the world around us. We are not brains in a vat, and we need to interact with the world for these capacities to develop. In fact, studies of children who have not had sufficient linguistic experience show that there is a critical period during which children have to acquire language (Fromkin et al. 1974). Intriguingly, this is also true of our visual capacity: if a baby has a lazy eye during the first few years of life, then visual information from that eye is ignored by the brain, even if vision is corrected (Mendola et al 2005). Vision, like language, is partly nature, and partly nurture.

Because he misunderstands the difference between a capacity and the behaviour that capacity produces, Evans' article and book both confuse the distinction between typological similarities between languages (that is, how languages look alike on the surface) and proposals about the structure of the human capacity for language (that is, what the mathematical function is). The mistake is a bit like saying that because frogs look different from goats, they're not both built of proteins. Evans' mistake is perhaps because the technical literature uses the term `universal' in two different ways. One is due to the great typological linguist Joseph Greenberg, who started a research program that uncovered similarities in surface patterns across languages. These are called typological universals (or, sometimes, Greenberg Universals). Some of these are universal claims about what patterns are more frequent across human languages (for example, languages more commonly put subjects before objects than vice versa); a few seem to be about what is possible at all in surface patterns (for example, we know of no language which would translate *those three green balls* in the order *green three those balls*, Greenberg 1966). But crucially Greenberg Universals are about surface patterns.

The other use of `universal' is by Chomsky, who adopted the term "Universal Grammar" as a way of talking about the mathematical function we discussed above (Chomsky 1965). Statements of Universal Grammar are about what characterizes this function: a classic example would be that grammatical rules care about how sentences are structured and not about their surface order. Chomsky (2013) gives examples like *Instinctively birds that swim fly*. In this example, the word *Instinctively* tells us something about the flying, not the swimming, even though it is closer to *swim* than to *fly*. There's a structural break that separates the subject *birds that swim* from the rest of the sentence. Structure trumps surface order here, and it seems, almost everywhere else in grammar.

Generative linguists have proposed that this is because the mathematical function at the heart of language creates structures, not just words strung out one after another. That is a hypothesis about universals in Universal Grammar (we could call them Chomsky Universals to distinguish them from Greenberg universals). These are not about surface patterns; they are about a capacity, universal to the human species, to create the structures that lie behind the surface patterns. In the example I just gave, the structure is silent, you can't hear it in the surface order of the words, but it's there, as decades of linguistic, psychological, and neurological studies have shown (see Adger 2014 for review).

Because Evans' article and book both make this mistake, mixing up Greenberg Universals with Chomsky Universals, all of the discussion of the 'lack' of language universals is irrelevant.

Evans makes a similar mistake when he talks about the idea of `recursion'. This term is used by different people in different ways, but two are particularly relevant here, and Evans mixes them up. One notion is what you might call 'category recursion'. We can illustrate this idea

through a real myth.

Legend has it that William James, the famous psychologist and brother of the novelist Henry James, while giving a lecture on the solar system, was accosted by a little old lady. “Young man,” she said, “the earth isn't a ball spinning in space, it's a crust on the back of a giant turtle.” James gently said to her, “Madam, if your theory is right, what is the turtle standing on?” The little old lady replied that, of course, it stood on the back of a yet larger turtle. “But, madam, what does that turtle stand on?” To this the old lady crowed triumphantly, “It's no use, Mr James, it's turtles all the way down!”

What the old lady was getting at is that, if you have a rule that says a turtle can stand on the back of another turtle, then there's nothing to stop you applying that rule to itself, and you get infinite turtle recursion. Category recursion in linguistics is a bit like turtle recursion. The sentence *Lilly caught the mouse* can appear as part of a bigger sentence, like *Anson said that Lilly caught the mouse*. This in turn can appear as part of an even bigger sentence like *Jasper believes that Anson said that Lilly caught the mouse*. Just like turtle recursion, we have sentence recursion. Why do we have this? Again it's because of rules. We don't list all these sentences in our heads, we have rules that allow us to say and understand them. The rules in this case allow verbs like *say* and *believe* to combine with sentences, to give bigger sentences. The grammatical category ‘sentence’ in English, like the old lady's turtles, is recursive, because of a special property of verbs like *say* and *believe*.

The other notion of recursion doesn't care about categories like sentence, or noun, or turtles. It's connected to a branch of mathematics which used to be called *recursive function theory,* and is now usually just called *computability theory*. Computability theory is associated with Alan Turing's famous work on what kinds of mathematical functions are definable by computers---Turing showed that not all mathematical objects, and hence not all functions, can be computed and he defined a special subset that can be. The proposal in generative linguistics is that the best scientific model of the human capacity for language is one of these: a computable function that creates, from a finite list of basic bits of language, a potentially infinite set of structures, each associated with sound and meaning. Nothing to do with category recursion.

Another myth might help here. The famous Argentinian short story writer and poet, Jorge Luis Borges, wrote a beautiful story called the Library of Babel, describing a library so huge that almost every possible book is in it. Borges's books are 410 pages long, each page 40 lines, each line 80 letters, and each letter is one of 25 symbols. But Borges' library is finite: if you do the maths, it contains $25^{1,312,000}$ books, which makes the number of atoms in the universe look distinctly paltry. A computable (or recursive) function is like a guide to these books, telling us just which ones are in English (or Chinese, or Nungubuyu, or the esoteric language of Uqbar from another of Borges’ stories). If a speaker of English were in the Library of Babel, or even a library with twice the number of books, they could tell which books were in English. This is made possible by the fact that our English speaker has, as part of their mental makeup, a computable function, set to English, that provides just that power. This is the second notion of recursion: it just means that the function can be computed.

Evans presents arguments against “recursion” being specifically human and against it being necessary in language. But he doesn't seem to know that there are two ideas at play here, and his discussion is not just confused, it's out of date. He argues that non-human species (European starlings) can recognize recursion (he means category recursion). First off, that's actually just false: that interpretation of the experiments he mentions is now considered by many researchers to be incorrect (see Beckers et al 2012 for discussion). The poor starlings in the study that Evans discusses (Gentner et al 2006) were exposed to between 10,000 to 50,000 trials in an attempt to get them to learn what was going on, and they still couldn't get a pattern that extended beyond six sounds (never mind a Borgesian library). It actually makes more sense to understand what the birds are doing as counting, rather than using a category recursive grammar (e.g. Corbalis 2007). But actually we *can* use computable functions to

model various animal calls, especially birdsong, and when we do so, we see that the functions used are quite different from those used in human language (Berwick et al 2011). Still, it is fascinating to think that we can use the mathematical techniques from generative grammar to begin to understand animal vocalizations.

Evans then raises the interesting case of Pirahã. Dan Everett, who knows the language well, famously argued that Pirahã lacks recursion and so falsifies basic claims of generative linguistics (Everett 2005), crucially a claim made by Hauser et al. (2002), that the (narrow) faculty of language "comprises only the core computational mechanisms of recursion as they appear in narrow syntax and the mappings to the interfaces." Everett's claim is that Pirahã lacks category recursion and the lesson he draws from this is that this falsifies the Hauser et al. hypothesis. This has created a lot of controversy, but makes the same mistake as Evans in conflating the two notions of recursion. We saw above that English has category recursion because of a grammatical property of verbs like *say* and *believe*: they combine with whole sentences. But if Everett is right about Pirahã (and there is some controversy about this, Nevins et al. 2009), then that language just lacks the relevant grammatical properties for category recursion. Absolutely nothing follows about whether language has, at its heart, a computable (recursive) function: the Pirahã could tell which of Borges's books are in their language just as well as you or I can. Everett and Evans simply don't distinguish the distinct concepts of category recursion and recursive, or computable, functions.

It's true that these closely related but distinct concepts both being called `recursive' is confusing and unhelpful, and in a popular book or article simplification is often necessary. But Evans simplifies too far by conflating these two distinct ideas, and so misrepresents what the claims are and what the facts are.

The article and book also take up the highly interesting area of how children learn the grammar of their language. It proposes that, on a generative view, language acquisition should take place by fits and starts as new rules are learned: once a kid hears *the kitty,* if she already knows the word *doggie*, she should immediately also know you can say *the doggie*. Evans says that things just don't work like that: kids pick up chunks like *the kitty* and use those two words together without generalizing to *the doggie*. The idea is that what gets learned is the actual particular forms, not the abstract categories, so it takes a long, long time to work out the categories and the rules. Evans' book and article present this as though it's received wisdom, but it's certainly not. There are well known problems with this view: one, emphasized by Yang (2013), is that, if that's the way children learn languages, there's just not enough data for them to ever generalize to the categories and rules (this is because of a statistical law about how data pattern called Zipf's law). So the view that Evans seems to favour would have to say that kids don't actually ever generalize to grammatical rules as they grow up, and that, from all the evidence, is completely wrong. There are also problems about the idea that, to understand what children know about their language, you look at what they say. What anyone chooses to say only reflects a tiny part of what they know, and experimental evidence, even just restricting ourselves to the issue of phrases like *the kitty*, shows that children who don't use words like *the* or *a*, still understand them (for example, Virginia Valian's Language Acquisition Research Centre in New York looked at both spontaneous speech and at experimental evidence and concluded that the kind of learning by chunks approach favoured by Evans is just wrong for this kind of example, see Valian et al. 2009). As almost every adult knows, kids understand a lot more than they can say.

We've seen so far that linguists have postulated the existence of a human capacity for language. They have modeled this capacity by saying it's best understood as a kind of computable function. Their hypothesis is that this particular function is specialized to human

language: it is a distinct part (or module) of the human mind. Evans' book and article both claim that a consequence of this idea is that language should be anatomically lumped together in a single bit of our brains. But there's no logic to this. After all, the nervous system is a distinct part of human beings' anatomy in just the same sense that language is thought by linguists to be a distinct part of the human mind, but the nervous system is hardly localized. When I stub my toe, I feel it in my toe, not in my brain, but without my brain, I wouldn't do much feeling at all! That's a straightforward misunderstanding of what it means to be a biological system.

One kind of evidence for distinguishing linguistic cognition from other forms of cognition is to look for people who have normal language and defective cognition, or excellent general cognition but poor language. This is called double dissociation. Evans' paper discusses evidence for double dissociation reported in Pinker's book, published the 1990s, and says it doesn't hold up. It's a shame that Evans isn't a bit more up to date with the discussion, because we've learned a huge amount about double dissociation over the past few decades. A recent review article (Curtiss 2012) concludes that, in particular, grammatical ability seems to be quite isolated from many other aspects of the human mind. Curtiss reviews evidence from neurology, genetics, language acquisition in individuals with various kinds of learning difficulties, language breakdown and general cognitive breakdown, and argues that it all points to our grammatical ability being quite distinct from our other mental abilities. Evans should ideally base his discussion on something more recent than work presented in a 20 year old popular science book.

The last big criticism that Evans raises in his article is about how weird a story you'd have to tell to make the generative linguistics approach consistent with evolution. He writes that there would have to be what he calls a macro-mutation, a giant evolutionary jump, and he says that modern evolutionary theory just won't allow that. He also says that it's just obvious that language evolved for communication. But these claims make mistakes both about the generative proposal, and about evolutionary theory. Traits, that is, species-wide properties like language, don't actually evolve *for* particular purposes at all. Traits emerge through genetic combination, random mutation, metabolic change, and various other processes that are little understood, and then they are selected for in populations. Natural selection doesn't create traits, it eliminates them, leaving behind the ones which lead to the best fitness of the animal. No one knows how the human capacity for language evolved but the generative view is consistent with evolutionary theory. It says that there was some genetic event, enough to allow human brains to take advantage of a particular computable function, which then created structures that could be used to soup up our thinking. Once you tie a structure to a meaning, you can more easily reuse that structure, recall it, change it, link it to other structures, and that allows you to plan better, think better, engage more cunningly in Machiavellian social climbing, and maybe even mate more successfully. So this innovation could have (could have, because no one actually knows) been selected via natural selection. Evans says that the generative proposal is inconsistent with evolution, but Evans is again wrong, both in his interpretation of what generative linguistics proposes, and in his understanding of evolutionary theory.

When you propose a new way of thinking about something, one thing you can do is show how the old ways are just wrong, but to do that you have to understand them. But Evans misunderstands the basic concepts, and therefore misrepresents them. You also need to present your case in a way that avoids obvious mistakes, or it just won't be compelling. But Evans' work is riddled with mistakes, as we've seen. But the best way to overthrow a

paradigm of understanding is to present an alternative that does better. Better in the range of phenomena it covers, better in its theoretical elegance.

Evans' new proposal is that humans have a different instinct: an instinct for cooperation. But he doesn't tell us, in either the article or the book, how the 'cooperation instinct' explains anything about language, or why it's any kind of improvement. I'm all for people trying out different approaches to understanding human language, which is a gloriously complex phenomenon, and perhaps we can learn things about language by looking at it from the perspective of the cooperation instinct, but it's hardly an actual proposal.

Chomsky's idea was that the soul of language can be understood as a computable function which creates a limitless set of structures that tie together sound and meaning. This idea has helped us discover what the basic building blocks of language are, how it is acquired by children, how it varies and changes across time and how its properties interact with meaning and use. There are new exciting challenges to be addressed about how language is implemented in the brain, how what we know about language structure can improve statistical translation techniques, how language interacts with other systems in our minds and how it's put to use in situations of social complexity. Language offers us a window into the most intimate aspects of our nature as both biological and social beings. But we need a scientific understanding of the nature of language itself, and currently, at least, the best theories we have of that are all generative.

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