Why and How the Problem of the Evolution of Universal Grammar (UG) is Hard

Stevan Harnad
Chaire de recherche du Canada
Institut des sciences cognitives
Universite du Quebec a Montreal
Montreal, Quebec, Canada H3C 3P8
http://www.crsc.uqam.ca/

Department of Electronics and Computer Science
University of Southampton
Highfield, Southampton
SO17 1BJ UNITED KINGDOM
http://www.ecs.soton.ac.uk/~harnad/

Abstract: Christiansen & Chater suggest that language is an organism, like us, and our brains were not selected for UG capacity; rather, languages were selected for learnability with minimal trial and error experience by our brains. This explanation is circular: Where did our brains' selective capacity to learn all and only UG-compliant languages come from?

Keywords: Language, Evolution, Poverty of the Stimulus, Evolution, Universal Grammar, Chomsky

The problem of the evolutionary origins of Universal Grammar (UG) is not as readily solvable as Christiansen & Chater (C&C) suggest.

UG is a complicated set of grammatical rules, but not the ones we learned in school. We were never taught them, we are not aware them, we cannot put them into words, and we would not recognize them if they were explicitly told to us by a professional grammarian. Yet we all 'know' the rules of UG "implicitly," because they are the rules that make us able to produce all and only the sentences that are grammatically well-formed, according to UG. It's rather as if we all knew implicitly how to play chess -- we could make all and only the legal moves -- yet we had no explicit idea what rules we were following.

The rules of chess, however, are simple, we learned them, and we can verbalize them. UG's rules are abstract, complex and technical. Since Chomsky first discovered their existence, linguists have gradually been figuring them out through decades of hypothesis, trial, and error, guided by the
grammatical intuitions we all share about what can and cannot be said. The result is a set of rules that allow all and only the sentences we all recognize as well-formed and disallow all those we recognize as ill-formed. That set of rules turned out to have some surprising properties: UG turned out to be universal: All languages obey the very same set of rules. But the most surprising thing of all was that children do not learn the rules of UG itself.

Children cannot learn the rules of UG because they are too complicated to learn by observation and trial and error on the basis of the information available to the language-learning child. Nor are they taught by explicit instruction: Before Chomsky no one even knew the rules, let alone taught them, even though our species had been speaking language for a hundred thousand years.

The reason the child cannot learn UG is that the data from which the rules of UG would have to be learned do not contain anywhere near enough of the information to infer the rules from them. This is called the 'poverty of the stimulus'. In order to be learned at all, the rules of UG would have to be learnable through trial and error, with error-correction, just as chess-rules have to be, when we learn them without explicit instruction: I try to move my bishop in a certain way, and you tell me, no, that's not a legal move, this is, and so on. Children cannot learn the rules of UG that way because they basically never make (or hear) any UG errors ('wrong moves'). Hence children never get or hear any UG error-corrections.

It is not that children speak flawlessly from birth. But the little the child experiences during the relatively brief period of transition from being unable to speak to being able to speak does not involve any errors (or error-corrections) in the rules of UG, either from the child or from the speakers that the child hears. There are conventional grammatical errors and corrections aplenty, but no UG violations produced, heard, or corrected. UG rules are never broken, never corrected, hence never "learned": Therefore they must already have been inborn.

But that raises the hard question of the evolutionary origin of those inborn rules. Evolution has more time available than the child, but it has an even more impoverished database: What would serve as error-correction, and what would count as right and wrong, in order to shape UG in the usual Darwinian way, through trial-and-error genetic variation and selective retention, based on advantages in survival and reproduction?

In explaining the origins of other complex biological structures, such as fins, wings or eyes, or biological functions such as the capacity to see, learn, or reason, there is no problem in principle for the usual kind of evolutionary trial-and-error explanation. But with UG there is a deep problem in principle (Harnad 1976). The problem is not just UG's complexity but that UG has no apparent adaptive advantages. For although a professional grammarian's lifetime is long enough to work out most of UG's rules explicitly by trial and error induction, it turns out that (with the possible exception of a few small portions of UG governed by optimality constraints) no logical or practical advantage has yet been discerned that favors what UG allows over what it disallows, or over an altogether different set of grammatical rules (perhaps even a much simpler and learnable set).

C&C rightly express skepticism about alternative 'piggy-back' theories of the evolutionary origin of UG. There is no credible 'precursor' with a prior adaptive advantage of its own that could later have
been 'co-opted' to do the duties of UG as well. But C&C's alternative proposal is no more convincing:
C&C say that language, too, is an 'organism,' like people and animals, that it too varies across
generations, historically, and that the shape that language took was selectively determined by the
shape the brain already had, in that only the languages that were learnable by our brains successfully
'survived and reproduced.'

The trouble with this hypothesis is that it is circular: We were looking for the evolutionary origin of
the complex and abstract rules of UG. C&C say (based on their computer simulations of far simpler
rule systems, not bound by the poverty of the stimulus): Don't ask how the UG rules evolved in the
brain. The rules are in language, which is another 'organism, ' not in the brain. The brain simply
helped shape the language, in that the variant languages that were not learnable by the brain simply
did not 'survive.'

This hypothesis begs the question of why and how the brain acquired an evolved capacity to learn all
and only UG-compliant languages in the first place, despite the poverty of the stimulus – which was
the hard problem we started out with in the first place! It would be like saying that the reason we are
born already knowing the rules of chess without ever having to learn them by trial and error is that, in
our evolutionary past, there was variation in the games (likewise 'organisms') that we organisms tried
to play, and only those games that we could play without having to learn them by trial and error
survived! (That still would not even begin to explain what it is about our brains that makes them able
to play chess without trial and error!)

This circularity is partly a result of a vagueness about what exactly is the target of language evolution
theory. Pinker & Bloom (1990) had already begun the misleading practice of freely conflating
evolutionarily unproblematic questions (such as the origins of phonology, learnable aspects of
grammar, vocabulary, 'parity') with the one hard problem of the origins of UG, which specifically
concerns the evolutionary origins of complex rules that are unlearnable because of the poverty of the
stimulus. Language, after all, is not just grammar, let alone just UG. If, on the one hand, the adaptive
value of language itself (Cangelosi & Harnad 2001; Harnad 2005, 2007) could have been achieved
with a much simpler grammar then UG (perhaps even a learnable one), then the evolutionary origin
and adaptive function of UG becomes all the harder to explain, with C&C's historical variation in the
language 'organism' occurring far too late in the day to be of any help. If, on the other hand, the
adaptive advantages of language were impossible without UG, then we are still left with the hard
problem of explaining how and why not.

Chomsky (2005) himself has suggested that UG may be a necessary property of being able to think at
all. He has been right about so much else that this possibility definitely needs to be taken seriously.
But to solve the hard problem it would also have to explain how UG is logically or functionally
necessary in order to be able to think at all.

NOTE: Unabridged draft of this commentary: http://cogprints.org/6008/

REFERENCES

http://cogprints.org/2036/

http://www.linguistics.stonybrook.edu/events/nyct05/abstracts/Chomsky.pdf


