

Was Syntax Borrowed from Toolmaking?

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1. Language vs. Cognition

The study of language evolution has gone from almost taboo to exuberant in just a few decades, with many new ideas and theories now proposed and debated. How language evolved is tightly linked to how human species evolved, as there is no more distinctive characteristic of our species than our language. Language is also the most tangible aspect of human cognition, the prism through which we get a glimpse into our other cognitive abilities. As put in Planer & Sterelny (2021, henceforth P&S), “since language is manifestly central to human life [...] an account of the origins of human cognition and social life must include an account of the emergence of language” (p. xix). Consider this: When our otherwise immensely intricate, complex language abilities are just a bit off, just a mere 5%, we are judged as impaired, as having a disorder, or as not highly intelligent. We may be sent to therapy, and we are likely not to find the most desirable jobs or mates (both of relevance for natural/sexual selection). On the other hand, if we are not dexterous with using tools, if we are, say, 50% worse in our abilities than the typical person at, for example, assembling anything from Ikea or painting a straight line on the wall, we are still quite fine, certainly not considered as having a disorder. We can also be not musical at all, and not artistic at all, and we will not be considered as having a cognitive disorder. This is not to say—not at all—that we do not get attracted to good singing, or beautiful art and artefacts; this is just to say that these skills are precious (and relatively rare) additions to life, but not the

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necessities of life. Language, on the other hand, is a necessity of life, and it is not rare at all: It is everywhere where there are humans—all day, every day. This must be telling us something about our priorities, whether well-placed or not, which are certainly relevant for the considerations of genetic selection.

Nonetheless, interestingly, there is a tendency in current evolutionary theorizing to try to reduce language abilities to other cognitive abilities, and to argue that the genetic foundation or adaptation for specifically language is not there, or is not of any significance, and that language abilities (e.g., syntax), emerged culturally, simply by relying on whatever genetic predispositions or adaptations evolved for other abilities (e.g., stone toolmaking). As discussed in Progovac (2019a), this view (of no consequential genetic selection for language) seems to be characteristic of two completely opposing camps in the study of language evolution, the saltationist (one-mutation) camp (e.g., Berwick & Chomsky 2011, 2016), and the gradualist cultural evolution camp. As stated in Steels' (2011) overview, adherents to cultural evolution consider that language features *per se* do not originate through genetic evolution—and are therefore not linked to biological fitness. P&S's book falls into this latter category. It is an expertly written and intricately argued monograph, which aims to integrate a host of pieces and details from a variety of fields into a coherent story about human evolution. It is an erudite piece of scholarship, but still presented in a highly accessible style, able to appeal to a wider readership.

P&S put emphasis in this book on the evolution of cooperation and on social factors, and their strategy is to “nest an incremental view of the emergence of language within an equally incremental view of the evolution of human social life” (p. 25). In other words, the aim of this book is to elaborate on the lifeways of ancient hominins in such a detail that would allow them to deduce the cognitive and communicative capacities, including the capacity for language, needed to support these lifeways. P&S consider that the theory of mind, causal reasoning, hierarchical structure, and vocal control all had to be in place before language emerged, so that language could then emerge culturally. The recurring theme of their monograph is the gradual evolution of culture, language, and cognition more generally. The two main strengths of this monograph are (i) its plausible and detailed outline of a gradual evolution of human lifeways and culture, and (ii) its systematic attempts to correlate various lifestyle milestones with the cognitive and linguistic milestones. Regarding (i), P&S make a good case for language and cognitive evolution as a gradual, step by step process, where each stage needs to rely on the previous one, bringing some small but tangible advantages. This is not only the most feasible evolutionary pathway toward complexity, often extravagant in the case of language, but typological variation across languages is better captured within this view (see Section 5), in comparison to the view that syntax sprang into existence suddenly as a result of one single mutation, maintaining uniformity across all cultures (e.g., Berwick & Chomsky 2011, 2016). P&S's stated goal is to show that language evolution does not need to rely on a miracle, that is on an inexplicable jump in complexity (p. 212). I cannot agree more with their view that language (and cognitive) evolution was gradual, continuous with various precursors and pre-adaptations, and that it involved a multitude of factors acting simultaneously and synergistically upon one another. Where I believe modifications

are needed, as I outline below, is in the nature and the role assigned to the early stages of language and syntax in this gene–culture spiral that led to language, specifically the role of language itself in its own evolution, both cultural and genetic.

Regarding (ii), this book is rich in claims and details concerning possible causes or correlates of language evolution, advocating important roles of phenomena as diverse as: Obligate bipedal lifeways (which freed hands for gesturing),¹ hunting, tidal foraging, population size, singing, the control of fire, and especially stone toolmaking. P&S conclude by saying that their aim “has not been to provide an exhaustive survey of the options, still less to endorse one” (p. 211), and that instead they “strongly suspect that the *Sapiens* expansion and transformation of cooperation [...] depended on the simultaneous effects of a number of factors” (pp. 211–12). However, there are two broad points I would like to make in this respect. First, among all these factors, there should certainly be room for one more player, and that is the contribution of early forms of language itself, with all its amazing detail. Secondly, in order to test any of these claims, which the authors themselves often characterize as speculative but plausible, and to move from plausibility to evidence and proof, one does need to converge on (or endorse, if you will) a specific (linguistic) proposal—specific enough that it can be rendered into specific hypotheses to be tested.

It is not my intention (nor ability) to respond to each of the claims P&S make in their monograph, which are many and various. Instead, I have selected a few that seem important and influential in the field of language evolution, and that are closest to my own expertise as a syntactician and linguist. One of them is the role that toolmaking might have played in the evolution of syntax.

2. Was Syntax Borrowed from Stone Toolmaking?

One of P&S’s main arguments in the monograph is that the cognitive capacities for syntax, specifically for creating sentences, were borrowed from stone toolmaking (p. 119), in the sense that the genetic foundation for this ability was set in place by selection for the ability to make stone tools, and that, subsequently, the evolution of syntax itself simply advanced through cultural processes, needing no further genetic adaptations. According to them, the development of these tool technologies depended on the expansion of hierarchical control and were thus selected for computational capacities that “made it possible for hominins to fluently use hierarchically structured sentences” (p. 148). In other words, “the computational machinery underpinning hierarchical structure evolved in the service of technological skill, the production of sophisticated stone tools in particular” (p. xvii). Below I give three reasons why reducing syntax to stone toolmaking cannot be the right approach.²

¹ In this respect, P&S advocate a gesture-first hypothesis for language evolution.

² Interestingly, P&S state that animal communication is about the immediate scene, but that human communication is not. Human communication is certainly not always about the immediate scene, but it can be, and often is, when we say, for example, ‘There’s a racoon right there!’ or ‘What a lovely sunset!’ or ‘Drop that gun!’ or ‘Eat your broccoli!’ or ‘You look worried.’ I am not just saying this to point to an imprecision, but rather as an excuse to point out

There is no doubt, of course, that any new cultural invention that gets spread across a population relies on prior adaptations, and on the general pre-existing abilities. So, it makes perfect sense that tool use of the kind and magnitude manifested in humans has not been invented by say birch trees, for example, tools that would allow them to draw water from a nearby lake in case of droughts, no matter how adaptive this may be for them. So, stone toolmaking had its own many and various precursors and pre-adaptations, including bipedal mode. And if stone toolmaking had to rely on such pre-existing abilities, then, of course, it is expected that the evolution of human syntax, and human language more generally, also needed to be consistent with all sorts of predispositions, including those overlapping with toolmaking. To be completely clear here, and not be misunderstood, I am not saying that human syntax was some kind of evolutionary fluke that was brought about by a single random mutation, which may be the view of the saltationists cited above. In my own work, I have argued consistently against such a view, and, one more time, I have no doubt that pre-adaptations for syntax, and continuity more generally, are crucial. But that certainly does not mean that these predispositions or pre-adaptations are all there is to the evolution of syntax, in the genetic sense, and this also does not mean that stone toolmaking was what caused or enabled the evolution of syntax. Not at all. Here are three reasons, in addition to the reasons given in Section 1, why this line of reasoning does not follow.

First, it is perfectly plausible that both phenomena—that is, both toolmaking and syntax—rely on some more ancient shared predispositions that predate both, as P&S themselves suggest later in the book (p. 141).³ Second, it is also possible that the early emergence and entrenchment of proto-grammar (perhaps of the kind described in Section 5) contributed to the evolution of Broca’s area in a way that also helped develop more sophisticated means of toolmaking; the two could have certainly been engaged in a feedback loop, both contributing to the evolution of Broca’s area. Third, the existence of a pre-adaptation for some ability does not at all preclude the possibility for further genetic selection and adaptation for the newly found function, meaning that it was entirely possible that each of these skills, toolmaking and the use of grammar, have been subject to genetic selection in their own right. I elaborate below.

that language that is less displaced (more immediate) can often be shown to be grammatically less complex, as discussed with some specific small clauses (i.e. mini sentences) in, for example, Progovac (2015; see also Newmeyer 2005 for subordination). This is just one place where linguistic detail is important and useful in reconstructing the linguistic past with some precision, and which shows that syntax/language does not simply reduce to binary oppositions such as displaced vs. not; hierarchical vs. not, as further discussed below, as well as in Section 5.

³ P&S themselves point out that the origins of enhanced action planning and control must be deeper than hominin toolmaking, as their precursors are found in other primates (p. 141). So, for example, premotor cortex F5 in Old World monkeys is considered homologous with Broca’s area in humans, as it, too, is recruited not only for motor behavior, but also for visual and auditory processing (p. 141). If so, then syntax, to the extent that it depends on these motor and multimodal abilities, did not have to wait for stone toolmaking to be perfected, or to rely on this development directly, as there was a previous, common foundation/pre-adaptation for both.

In other words, regardless of the ultimate precursors and pre-adaptations (which every newly emerging phenomenon will have), syntax (and language more generally) would have also, itself, been subject to natural/sexual selection forces, and would have thus contributed to the genetic make-up of humans, which in turn would have contributed to further enhancement of various other cognitive phenomena. As put in Pinker & Bloom (1990), it is impossible to make sense of highly complex phenomena that are especially well designed for a specific function, such as is the structure of the eye, without acknowledging that it (the eye) evolved for the purpose of seeing; evolution is the only physical process that can create an eye because it is the only physical process in which the criterion of being good at seeing can play a causal role. Just like being good at crafting tools would have improved that very ability through generations, including by genetic selection, so would, for sure, being good at using language and syntax, and the discussion below will touch upon just how immensely complex that ability is, and how reliably and effortlessly it is acquired. As P&S themselves state, citing West-Eberhard (2003), “genes are the followers, and not the leaders, in evolution [...] selection will favor the genetic variants that acquire the behavior more rapidly or reliably [...]” (p. 27). I cannot agree more, but then why should this not also apply to syntax, and language more generally? Why would the evolution of syntax follow some genes, set in place for something else? Isn’t syntax acquired rapidly and reliably? Isn’t it in fact acquired much more rapidly and reliably than toolmaking? Why would syntax or language abilities be exempt from these routine processes of evolution?

As a syntactician (although as somebody who knows very little about toolmaking), I do need to point out that there is so much more to syntax than what motor control, toolmaking, and syntax may have in common, and I am sure that there is also more to stone toolmaking than what it shares with syntax.⁴ Contrary to what is often claimed by saltationists such as Berwick and Chomsky (see, e.g., Berwick & Chomsky 2011, 2016), syntax (or language more generally) does not reduce to the hierarchy-creating Merge, which basically allows one to combine and recombine, which may be what prompted this idea that syntax reduces to assembling tools. Human syntax is a composite of various hierarchical and flat constructions, seamlessly interwoven together, some systematic and some rather quirky, with a multitude of abstract grammatical categories whose existence typically arises through (gradual) grammaticalization processes, and which have their own predictable place in the tree of syntax (see Progovac 2015 for a detailed reconstruction and decomposition of various syntactic phenomena; also Progovac 2019b for Merge and Minimalism more generally in the light of evolution). And, above all, syntax is acquired effortlessly and reliably by almost all people (barring certain language disorders), and is processed also reliably, and with lightning speed, none of which is the case with toolmaking. Even though P&S state that their strategy is to “nest an incremental view of the emergence of language within an *equally* incremental view of the evolution of human social life” (p. 25), I see

⁴ Reducing syntax to toolmaking must have some consequences, and I would like to know what its predictions are and how they would be tested. Are people who are especially good at grammar also especially good at tool use or toolmaking? Do cultures that do not make stone tools not have the ability to process complex hierarchical language?

imbalance in their book: While one side of this equation has been presented with good detail, the social lifeways side, the incremental emergence of syntax or language has not been presented equally at all, as I further elaborate below, as well as in Section 5.

P&S's Section 5.6 goes in great detail over the stages through which tool technology passed. It expresses, and rightly so, admiration for the achievements in tool technology, specifically in the third stage, starting at around 800,000 years ago, concluding that "the degree of manual precision and foresight shown by these toolmakers is astounding" (p. 144). I completely agree. But I hasten to add that such tools, or any other tools for that matter, are no match for the sophistication of human syntax and language more generally, and for how fit our brains are specifically for processing them. We can just take a look at one chapter of P&S's book and consider how many words and sentence structures just this one chapter offers, and how many totally different sentences with different meanings. And just consider how much these sentences have been able to convey to the reader about a topic as amazing (and bizarre) from the point of view of nature as are the evolutionary developments in human and hominin lineages, describing the beings we have never seen (early hominins), and the times whose depth is hard to fathom. But it is all made quite accessible to us through language, as are all sorts of other topics. For syntax does not just assemble two dead pieces of stone or wood that are lying around; it assembles words and morphemes, each alive and bursting with meaning and connotations, and it can assemble sentences with a hundred such words, or more, placing each with incredible ease and precision in its designated hierarchical spot, thus constraining their meanings and functions to converge on a precise message. And for this one-hundred-word sentence that our syntax can so easily assemble, in a matter of seconds, it is not just that the words and morphemes are lying around like bricks waiting to be picked up and built into a house. Not at all. These words and morphemes themselves are creations of our linguistic mind, stored in our mental dictionaries, and we command on average tens of thousands of such words, and often even more. So, when we create this one-hundred-word sentence, each word must be carefully selected among many alternative possibilities, and these choices depend not only on the meaning, but also on the multitude of various syntactic particularities that words carry with them. But our syntax juggles all these words, thousands upon thousands of them, hardly ever dropping a ball. This cannot possibly be a trait that did not need any genetic adaptation beyond the abilities of motor control and tool assembly. I think that we often forget just how much work syntax does for us, and how much we take it for granted.⁵

3. What Kind of Feedback Loop?

Language is specifically discussed in P&S's Chapter 7 "From Protolanguage to Language." Here, the authors state that "if only late Pleistocene anatomically

⁵ P&S refer to "the easy problem of syntax" (p. 126), which "poses no deep mysteries" (p. 129). There is truly nothing easy or straightforward about reconstructing the evolutionary trajectory of syntax, once its details and variability across languages are taken into account.

modern humans (AMHs) had full language, we need at least a tentative explanation of that fact. We propose it was because only those humans cooperated so extensively” (p. 184), suggesting that cooperative lifestyles caused language to emerge. However, as will be elaborated below, cooperation cannot cause language to emerge, but it can facilitate its solidification, once language starts emerging, which means that some kind of feedback loop had to be in place to facilitate the evolution of both language and cooperation in humans. But what kind of feedback loop?

P&S invoke the self-domestication hypothesis of human origins, as a mechanism for decreasing reactive aggression in our species specifically (p. 205), by selecting against aggressive individuals. This is a promising line of inquiry because the propensity for reactive aggression, related to (lack of) cooperation, leaves a fossil signature, and has a genetic foundation. However, if we conclude that the reduction of reactive aggression somehow caused language, rather than that the concurrent emergence of early forms of language actually engaged in a feedback loop with self-domestication (see below for this type of proposal), then we are at square one again: because neither bonobos (a self-domesticated species), nor other super domesticated animals, such as cows or chicken, have developed language, certainly not of the kind that humans have. For such an immensely intricate, rich, and complex phenomenon as human language to emerge on an evolutionary scene, there had to be multiple factors acting simultaneously, and synergistically, one upon another, including selection for the emerging ability to use language. Language itself should certainly not be excluded from this synergy—why would it be?

In fact, it is fully expected that the cultural emergence of early forms of language was a crucial contributor to both language evolution and cooperation/self-domestication. A specific proposal advocating such a feedback loop, involving reduction in reactive aggression (via self-domestication), has been developed in Progovac & Benítez-Burraco (2019) and Benítez-Burraco & Progovac (2021). In this view, the ebbing and flowing of reactive (and proactive) aggression are seen as closely tied to the different stages of language evolution, with the emergence of verbal aggression/insult (associated with simplest syntax) constituting an important milestone in the gradual transition from physical fighting to verbal/cognitive contest.⁶ P&S themselves conclude that self-domestication itself (with its reduction in reactive aggression) can only be a part of the story, as another factor is needed (p. 208). I completely agree. But the other factor, the elephant in the room, can certainly be the emergence of early forms of language, respectively, syntax.

⁶ P&S state that early proto-language was used to facilitate cooperation and coordination, but that today we use language also for teasing each other, to tell a joke or a story (p. 47). However, there is no reason to exclude the relevance of joking and teasing (which can be continuous with insult/verbal aggression) from earliest proto-language, as they would have been especially adaptive at these early times, and are also more continuous with our ancestors’ mindsets, providing more graceful evolutionary continuity (see e.g. Progovac 2015, 2016). Other primates seem quite capable of teasing and joking. To take just one example, as reported in Patterson & Gordon (1993), the gorilla Koko was not only capable of producing novel compounds (i.e. two-slot compositions), but also of using them for insult, playfulness, and humor.

Even though P&S's main argument is that language abilities are parasitic on other cognitive abilities, and on the genetic foundation put in place to support those other abilities, they seem to doubt themselves occasionally, and I find this promising. For example, they allow for the possibility that "natural selection has equipped us with many language-specific cognitive adaptations" (p. 112). That would mean that, after all, there was genetic selection for language features specifically. Then, later, P&S state that "this is not to say, however, that language has not exerted an evolutionary influence on the structure of this computational system. [...] Indeed, we would be most surprised if the evolution of language made no difference to these control and recognition mechanisms" (p. 150). Indeed, and for that reason, one does need to enter the specifics of language into this feedback loop, for it is not enough to just mention the adaptiveness of language here and there, in generic terms. One does need to bite the bullet and hypothesize (and then test) just exactly what kind of language, and what kind of syntax, was subject to genetic selection, and how it interacted with, and contributed to, all the other evolutionary developments.

4. Who Needs Language and Who Doesn't?

Another line of reasoning that I do not find convincing are the arguments to the effect that hominins developed language because they 'needed' it. For example, P&S state that the hominins that lived after about the first third of the Pleistocene were "both capable of using a protolanguage and very likely needed a protolanguage, one with flexibility and displaced reference" (p. xvii).⁷ But, in truth, who would not need language?⁸ If somehow bonobos (who have been argued to be self-domesticated, too) were to manage to develop some (proto)language, would that not be highly adaptive, and would not that seem in retrospect as something that they needed? In fact, they seem to need it really badly for survival, as so many other species do. Nature does not just give a species or individuals what they need. Evolving something as useful and complex as language had to be partly a matter of chance or some "lucky break" as put in P&S (e.g., cultural emergence of simple forms of grammar), partly a matter of many other factors emerging and converging at the same time, in a positive feedback loop (e.g., reduction in reactive aggression; various environmental factors), and partly a matter of ruthless genetic selection for the phenotypes whose brains were just a bit better equipped to use and learn these newly emerging forms of language. For that reason, a strong, specific version of a gene-culture feedback loop involving the specifics of language is needed.

While P&S occasionally state that there was a coevolution of social and linguistic complexity (211), and that "advances in hominin communication systems [...] fed back to further transform cooperation, creating a positive coevolutionary

⁷ P&S also state that "mid-Pleistocene hominins needed to be able to add arbitrary signs to their lexicon, if their social capacities made that possible" (p. 216).

⁸ It could be that the use of the word 'need' in this respect was a shortcut for something else, but I mention it here because it may be reflective of P&S's unidirectional, deterministic view of language evolution, portraying it almost as an inevitable consequence of other evolutionary developments (that needed it).

feedback loop” (p. 181), they at the same time systematically advocate a unidirectional view especially when it comes to genetic evolution, where it is not clear what, if any, the return effect of early forms of language would have been. For example, on the same page, they say: “We have considered several factors that might explain the fact that sapiens found themselves on a trajectory toward hyper-prosociality, and hence full language,” suggesting again that language was a result of human pro-sociality, and not a contributor to it. Similarly, on the final page of the monograph, P&S state that perhaps only sapiens developed “the complex forms of cooperation that required the resources of full language” (p. 222). P&S do acknowledge that their connections between language and social lifeways are imprecise and speculative, and that the specifics of language are not dealt with in the book (e.g., p. 214). The next section aims to show that the devil is in the detail...

5. Some Details of Proto-Syntax

P&S do consider some details of syntax, which is welcome, as without the detail one cannot start a meaningful discussion on this topic. For example, they consider that fixed word order (SVO or subject–verb–object) was the initial state of proto-language, and that some languages later developed other means of marking these distinctions, such as case and agreement (p. 118), leading to the subsequent loss of fixed word order in many languages. In this respect, their proposal is related to Jackendoff’s (2002) Agent First proposal. P&S link this proposed stage of linear SVO syntax to archeological traces of enhanced forms of cooperation (p. 128). However, if proto-languages already converged on such a straightforward way of expressing who does what to whom with a simple SVO ordering, it is not clear at all why they would have lost this excellent solution. Why do many languages, as they point out, have free word order, and even more languages (certainly more than half) show other word order types, distinct from SVO? And why have so many languages developed all these complicated and often baroque agreement and case systems, whose main purpose is again to distinguish subjects from objects? At the very least, it seems safe to conclude that starting with a proto-language with the fixed SVO word order hardly provides that baseline for incremental evolution which P&S are seeking, the baseline which would lead to a next stage, and then a next stage, and where each stage brings some tangible advantages. This just highlights the difficulty of identifying such baseline for syntax without considering the details of syntax, as well as the details of syntactic variation across languages.

In my own reconstruction of proto-syntax, I have relied on some stable theoretical, as well as typological, postulates for syntax. This led me, surprisingly, to the earliest stage of syntax which does not in fact show any subject/object distinctions, and only operates with a two-slot syntactic mold initially, a small clause, with only a verb and one single argument, not differentiated for semantic/thematic role (see Progovac 2015, 2016, for many examples of such constructs across present-day languages, which can serve as proxies of this stage). It would have been only later, and based on this foundation/baseline, that transitivity in languages emerged, by adding one additional argument, but in diverging ways in

different cultures, yielding, for example, two main case-marking types: nominative-accusative and ergative-absolutive types. In addition, some cultures developed serial verb constructions, exhibiting sequences of two (or more) small clauses, the first one typically introducing the agent with a verb, and the second one introducing the patient with a verb. Starting with a two-slot small clause baseline (or common denominator), which operates with only one argument, goes a long way toward explaining this profound cross-linguistic variation in expressing transitivity, where each solution nonetheless involves only a small tweak of the baseline. This kind of approach not only lends itself to incremental evolution of syntactic complexity, but it is also specific enough to be testable.

Even by looking at this one specific syntactic example of transitivity across languages, one can see that humans across cultures struggled to just develop and grammaticalize subject/object distinctions, again something we take for granted, and one can also see that the reason why transitive grammars evolved can be directly linked to incremental communicative advantages, rather than being a mere consequence of a generic ability to assemble and reassemble things hierarchically, i.e. to merge and remerge. In other words, in this view, it was the struggle to develop and grammaticalize various linguistic distinctions, including subjecthood/objecthood, that led to the layered syntax (by tweaking the baseline), rather than hierarchy emerging for its own sake (or for the sake of stone toolmaking), and then these linguistic distinctions just populating these hierarchical layers, as some kind of ready-made products. There is a lot of discussion of this phenomenon in Progovac (2015, 2016; see also Progovac & Benítez-Burraco 2019), accompanied by an attempt to connect this specific proposal to the hominin timeline.⁹ As do P&S, I also believe that specific interdisciplinary cross-fertilizations between linguistic and archeological and anthropological reconstructions are necessary, and I am sure that there is plenty of room for improvement in this respect on my end, just as I have suggested there is on the P&S's end. But that just means that more dialogue is necessary across different disciplines, as well as more testing, and that the details and reconstructions on both ends, both linguistic and archeological and anthropological, are absolutely necessary to get to the bottom of human evolution. In this endeavor, there is just no escape from the details of language, or from linguistics, for that matter.

Declaration of Interest Statement

The author declares no competing interests. A copy of the reviewed book was provided by MIT Press free of charge.

⁹ In a nutshell, in Progovac (2015, 2016), I have proposed, based on these profound differences in the expression of subjecthood, and transitivity more generally, that the hierarchical stage, and transitivity more specifically, did not emerge in all its complexity and in a uniform fashion only once (in Africa), but instead multiple times, and independently, either within Africa, or after the dispersion from Africa. This has specific implications for the timing of the emergence of hierarchical syntax, as well as for the hominin timeline.

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