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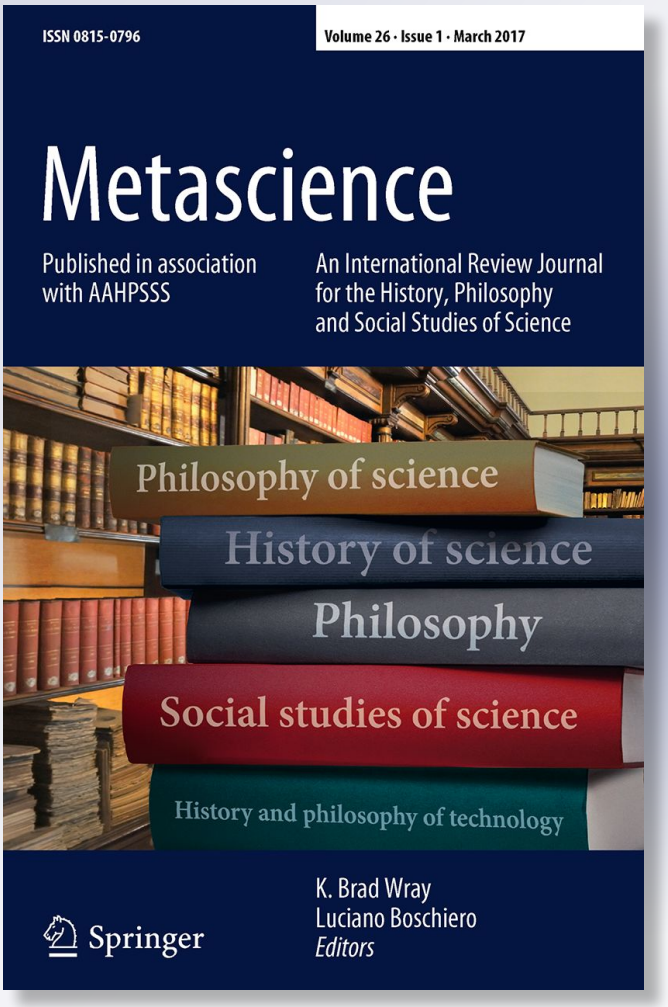

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ESSAY REVIEW

Placing universal grammar on the agenda of evolutionary linguistics?

Robert C. Berwick and Noam Chomsky: Why only us: language and evolution. Cambridge: The MIT Press, 2016, vii+215pp, $22.95 HB

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Philosophers are most successful when they open up new research avenues by questioning the validity of existing paradigms. By countering behaviorist schools of thought and introducing his theories on generative/universal grammar, Noam Chomsky has been a key figure in (re)conceptualizing structural linguistics, biolinguistics and the cognitive turn in psychology. Can he also induce paradigmatic turnovers in the emerging, and in many instances, opposing field of evolutionary linguistics? In *Why Only Us: Language and Evolution*, Chomsky teams up with computational scientist Robert Berwick and gives a summary account of the *what*, *who*, *where*, *when*, *how* and *why* of generative grammar which they assume underlies the capacity for human language.

In the first chapter, "Why now," the authors address the *what* of the language capacity. The human language capacity is characterized by three components: a sensorimotor system that enables language "output," i.e., the production of speech or gestures; a conceptual–intentional system that provides the "input" of language, thought that underlies the lexicon; and a cognitive "processor" they call Merge that underlies generative grammar by building syntax. The first component enables "externalization," and the latter two are "internal" to the organism; and of all three components, they characterize Merge as the "Basic Property" of language. Merge is a cognitive, combinatorial operator or "internal computational system," understandable through set theory, "that builds hierarchically structured expressions with systematic interpretations" at the interface with the other two systems (11). Merge enables generative grammar which is conjectured to be uniform across all languages. The authors assume that the cognitive capacity is genetically underpinned (the point where "generative" grammar becomes "universal").

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In chapter two, "Biolinguistics Evolving," they further explain that Merge enables linguistic properties such as displacement, i.e., dissociation or the possibility to think and talk about not-now-existing and never-existing entities, and recursion that enables the hierarchical combination of sets to potentially go on *ad infinitum*. Animal communication systems, on the other hand, are syntactically linear rather than hierarchical, and associative instead of dissociative, because they are confined to real-life social or physical events that remain connected to emotional responses and "actor-action-goals schemata." Only humans evolved the capacity to Merge, though they share, with other animals, aspects of the sensorimotor system responsible for externalization, and the conceptual–intentional system responsible for thought.

Generative grammar is thus argued to differ from animal communication systems, which brings the authors to the *who, when, and where* questions. Building on paleo-anthropological observations that point out a discrepancy between the first emergence of anatomically modern humans in the fossil record in Africa 200,000 years ago, and the first display of symbolic, modern behavior by humans in the archeological record 80,000 years ago, they conjecture that only behaviorally modern humans evolved Merge. And because Merge is uniform across all languages and thus shared by all humans, they hypothesize that the trait must have evolved before the final diaspora out-of-Africa that occurred some 60,000 years ago. This leaves a relatively small window for Merge to evolve, and they conclude that Merge must therefore have evolved rapidly. They explain this point further during their discussion of the *how* of language, but first we focus on their *why*.

Humans share with other animals a "secondary" system that enables communication about social and physical events. But Merge is understood as a facilitator for internal thought, because it enables recursive, hierarchical structuring and a dissociation of language with emotional triggers induced by real-life events. That language evolved "for" communication in a social context is today the mainstream view among evolutionary linguists, especially those in the Evolang community. Chapter three, "Language Architecture and its Importance for Evolution," therefore reads as a critique and a reply to comments, as well as a defense of the old philosophical idea that language is "for" inner thought.

The *how* of language is somewhat scattered throughout the book, and together with the other questions, summarized in the final chapter, "Triangles in the Brain." The authors assume that the capacity to Merge must be genetically underpinned, and it must have evolved rapidly in humans, causing a discontinuity with animal communication systems. By taking the evidence on recent changes in regulatory genes, including the *FOXP2* gene, as an exemplar, they examine how epigenetic and evo-devo schools today conceptualize genetic change and how genes can underlie the emergence of anatomical and neurocognitive form. They conjecture that the cognitive operation to Merge results from a small change in an enhancer sequence that prolonged the transcription of the associated gene in the brain, leading to a new neural circuitry that underlies the evolution of the capacity. They find evidence for this suggestion in comparative brain analyses of human infants, adults and macaques. Broca's area that contains Brodmann areas 44 and 45, and Wernicke's area are connected to one another by fiber tracts. Diffusion Tensor Imaging of these

fibers shows that in adult humans there is a tract connecting the superior temporal cortex to the premotor cortex which the authors consider to be involved in auditory–motor mapping. Another tract connects the superior temporal cortex to Brodmann area 44, which for the authors might be connected to processing sentence syntax. Ventrally, two fiber tracts link Brodmann area 45, the seat of the lexicon, and the ventral inferior frontal cortex to the temporal cortex. These tracts form a complete ring in adult humans. In human infants, however, the dorsal pathways connecting to Broca's area are not yet myelinated, and in homologous areas of the Macaque brain, some of the fiber tracts are missing. Berwick & Chomsky suggest that "the dorsal and ventral fiber tracts together form a complete 'ring' that moves information from the lexicon to the areas on the dorsal side where it is used by Merge. The key idea is that the fiber-tract 'ring' must be in place in order that syntactic processing work" (161). This indicates that newborns are not yet wired up for syntax, although their auditory processing is fully in place. The fiber tracts for syntax mature during development, and the authors point toward a possible small change in gene regulation affecting the growth factor of these fiber tracts for completing the ring.

In preparing this review, I checked the existing reviews of Berwick and Chomsky's book, and most, apart from Tattersall's (2016), were rather negative. This is no surprise. Many scholars active in evolutionary linguistics endorse the idea that language is an adaptation that evolved for social communication by means of gradual natural selection, and they have often developed these ideas by opposing Chomskyan linguistics. What caught my eye were the fundamental misunderstandings of Chomsky's theory. The field of language origin and evolution studies today is mostly made up of (computational) linguists turned Neo-Darwinian, and to a lesser extent it includes evolutionary psychologists, anthropologists, archaeologists and primatologists. Given their training, these scholars lack the theoretical background to understand the roots and ideas behind generative grammar. One reviewer even conjectured that Chomsky's generative grammar, characterized by Merge, is "mysterious." But such is hardly the case. The roots for his theory on grammar lie in philosophy, and one of its subdisciplines, mathematical logic, fields that are almost never considered in Evolang conference calls. The theory on generative grammar looks at full-blown language and tries to find the logical, mathematical-like structure common to all grammars. This common structure can be explained by combinatorial set theory, where discrete elements such as X and Y become combined into sets {X, Y}, {Y, X}, {X, X, Y}, {X, Y, X}, {X, Y, X, Y}, etc. Each set is obtained by following algorithmic rules for calculation or recombination of the parts, and each set creates new meaning. We can derive such a logical structure from syntax, but also from mathematics or theory of mind (I know, you know, that I know …). Falsifying this characterization of syntax would imply either of the following: one should prove that set theory is wrong; or one should prove that our mind does not actually process data according to set theory, which would imply that set theory is the product of sociocultural learning; or one should prove that animal communication or nonverbal communication also follows combinatorial structuring similar to hierarchical set theory. At present, none of these has been proven. Therefore, I cannot but agree with the authors: A research reorientation toward aspects of what they call "externalization" or the "intentional–

conceptual system" in and of itself does not falsify the theory of the logic of generative grammar.

Second, the authors do not oppose general evolutionary theory when they argue that the capacity for Merge might not be an adaptation; and that, if it did evolve, there is no reason to assume that it evolved gradually and by means of natural selection. When Chomsky first formulated his theory of syntax, he did so by making use of a jargon that is associated with general systems theory and hierarchy theory, where concepts such as division of labor, self-organization, phase transitions and critical thresholds emerged. While not part of the Modern Synthesis, this jargon has since been incorporated into an Extended Synthesis via epigenetics and eco-evo-devo schools that provide plausible evolutionary theories for how the rapid evolution of traits can come about. These theories, furthermore, help explain why aspects of the sensorimotor system appear to be shared with other animals. As the authors note, we share with song birds many of the neural circuits that enable speech production, and gene regulatory mechanisms might underlie developmental constraints on how such a system evolves. Chapter One also gives a very nice overview of neutral theory, otherwise known as genetic drift, a mechanism that today is well-recognized to be more important than selection, especially with regards to the preservation, spread and most of all loss of adaptive traits. And because they implement Tattersall's work on the dissociation between the first appearance of humans and the first evidence of modern, symbolic behavior, they also apply jargon associated with punctuated equilibria theory. In comparison with the rising evolutionary linguistic canon that unjustifiably lags behind in implementation of the Extended Synthesis, the work of Berwick and Chomsky reads as very up-to-date and refreshing.

Nonetheless, some claims are merely posited, and not well argued for. The idea of precursors to language, or a protolinguistic phase, for example, is wiped off the table in one sentence (72). This, of course, depends upon how we define protolanguage, but on their view, at one point in time our ancestors would have possessed a fully developed sensorimotor brain ready to put to use for communication on social and physical events. And they would have had an evolving conceptual–intentional system that underlies mental concepts. But lacking the capacity for Merge, they would have been unable to cognitively order or externalize any of their evolving "concepts" or "ideas." This point seems too radical, especially given that scholars have now aptly demonstrated that aspects of nonverbal communication such as pointing, or vocal calls associated with emotions in humans and other primates convey meaning to both actors and recipients. The authors, however, and probably following philosophers such as Quine, deny that language, here understood as the lexicon, bears any reference to the external world, be it social or physical. Instead, they understand concepts, ideas and words to originate in the mind, what they call "mind-dependent entities" (84–5), where they function as requirements for inner thought. Though it is true that we are born with what philosophers used to call inborn categories of the mind, and though we might even assume that ideas, concepts and words are creative inventions by individuals, it is equally true, as anthropologists have long demonstrated, that in order for such ideas or words to become part of a society's lexicon, sociocultural transmission is

required. We learn many words and concepts from the community we live in, and such learning is first and foremost a social endeavor. Following their scenario, what is lacking is an explanation of why communication about social and physical events, which can be understood as a form of "associative" protolanguage that works well in other animals, became secondary; when syntactic language took over; and when inner thought became dissociated from the world. Instead, the reader is left with an extreme rationalist and even solipsistic view on cognitive content.

Nonetheless, this book primarily deals with grammar, which indeed needs to be placed on any evolutionary linguistic agenda. But one can rightfully wonder whether the origin of grammar can be so easily decoupled from the conceptual–intentional system, the "externalization" of language as the authors call it, and the sociocultural dimensions that accompany any modern language.

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