Chomsky on the Evolution of the Language Faculty: Presentation and Perspectives for Further Research

Anne C. Reboul

A Companion to Chomsky

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Chomsky on the Evolution of the Language Faculty: Presentation and Perspectives for Further Research

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30.1 Introduction

What might be the most remarkable thing about Chomsky's view of the evolution of language is that it has changed very little throughout the years (see Chomsky 2016). Since the 1960s, he has claimed the following:

- Language is species-specific (no species other than mankind has anything even remotely comparable to language).
- Language is a biological endowment.
- Language is not the product of evolution in the sense that it is not an adaptation (see below for a more detailed discussion).
- Language is not first and foremost a tool for communication.
- Language emerged as a whole, rather than gradually (a so-called saltationist position).

Surprisingly, these positions have occasionally been interpreted as an attack against a biological approach to language on the rather flimsy grounds that all biological approaches should see language as an adaptation. Given the emphasis that Chomsky has always put on a biological conception of language (against most nongenerative linguists until recently), this seems a gratuitous view.

What is most remarkable about this continuity in Chomsky's thought about language is that it takes place against a theoretical landscape in constant flux, the landscape of generative grammar (GG). While this is not the place to give a history of GG, there is one major change that has affected the very notion of a Faculty of Language and hence the stance in the GG community regarding the question of the evolution of the Language Faculty. This will be our point of departure.

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30.2 The Faculty of Language: Then and Now

A central question in any evolutionary query is the very object of the query: what has evolved? While a lot of approaches to the evolution of language (for a recent example, see Christiansen and Chater 2016) center on E-languages (the various and fuzzily delimitated languages that are used for communication in human groups, e.g. French, English, Tagalog, etc.), this is not the case in the Chomskyan paradigm. Chomsky (1986) introduced a central distinction between E-languages and I-language[1], the internalized knowledge of language that each speaker has and which is the result of the interaction between his or her language faculty and the (limited) experience that he or she had of his or her mother tongue during language acquisition. The object of linguistics is, in that perspective, not E-languages, but I-language. And the object of any question about language evolution is the Faculty of Language, the ability, unique to the human species, that allows all humans to develop an I-language, regardless of the linguistic environment in which they are born or raised. In other words, if anything evolved in the biological sense, it was not E-languages (as any human infant can acquire any E-language whatsoever given the relevant linguistic environment), but rather, the ability to develop an I-language, i.e. the Faculty of Language. Thus, in terms of the question of language evolution, a lot will depend on what exactly is meant by the Faculty of Language, notably whether there is any chance of answering the question of its evolution, and whether to see language as an adaptation in the strong sense that it evolved to fulfill a specific, adaptive, function. And it is here that the GG paradigm has undergone a major change.

A good outline of this shift and of its consequence for the question of evolution is given in Chomsky (2010). While the notion of *biolinguistics* was introduced by Massimo Piattelli-Palmarini at an international conference in 1974, following Lenneberg (1967), the view of the language faculty at the time saw it as “rich, highly structured, and substantially unique to this cognitive system” (Chomsky 2010, p. 46). As pointed out by Pinker and Bloom (1990), under such a view, it makes sense to consider that the Faculty of Language is an adaptation, progressively evolved through natural selection to fulfill some specific function. This is however in tension with Chomsky’s views, according to which the Faculty of Language evolved as a whole (in one step, i.e. in a saltationist way). However, the introduction of the Principles and Parameters approach (see Chomsky 1986) has changed the situation in major ways. Principles are invariant and operate beyond language as they have to do with computational efficiency. Parameters can be set to different values. While principles explain the universality of grammar, parameters account for the variability of E-languages. The question relative to language evolution then becomes that of whether there is anything specific to the Language Faculty and if so, what. This corresponds to the distinction between the *Faculty of Language broadly understood* and the *Faculty of Language narrowly understood* introduced in Hauser, Chomsky, and Fitch (2002/2010).[2]

The Faculty of Language narrowly understood (FLN) corresponds to “the abstract linguistic computational system alone, independent of the other systems with which it interacts” (Hauser, Chomsky, and Fitch 2010, p. 17). As such, it is subject to the principles that characterize Universal Grammar (UG) and is a subset of the Faculty of Language broadly understood (FLB). The FLB gathers the FLN and the systems with which it interacts, i.e. the conceptual-intentional system and the sensory-motor system. Very roughly, the first provides the “meaning,” while the second has to do with externalization and notably with externalization for communication. What is most relevant here is the FLN and its characterization. The FLN has the property of producing discrete infinity (an infinity of discrete sentences) from a finite set of elements and the computational operation that makes this possible is *recursion* (more technically, *Merge*). Hauser, Chomsky, and Fitch (2010) have insisted on the idea that it is this computational operation that is relevant to the question of language evolution. They argued that "although many aspects of FLB are shared with other vertebrates, the core recursive aspect of FLN currently appears to lack any analog in animal communication and possibly other domains as well" (Hauser, Chomsky, and Fitch 2010, 19). As the paper is oriented toward comparative psychology, this obviously makes sense. In such a perspective, looking for what is not shared with other species is crucial regarding the evolution of a faculty that, as language, is species-specific. Additionally, the authors advocate investigating recursion not only from the viewpoint of language, but also in other cognitive domains, more widely shared among animal species, such as number, social relationships and navigation, where it might also apply.

So, to sum up, the question of the evolution of language concerns the FLN rather than the FLB, and the FLN is reduced to a single computational operation, recursion. This *Minimalist* position (see Chomsky 1995/2015) has the advantage of reopening the question of language evolution by radically simplifying the FLN. While the initial, complex view of the FLN seemed to make a strongly adaptationist (and progressive rather than saltationist) approach mandatory, this difficulty disappears under Minimalism. Additionally, the question of E-languages is now entirely a question of externalization, that is of the interaction between the FLN and the sensory-motor system, a question of historical, not biological import. Let us now turn to how Chomsky's main positions about the evolution of language articulate themselves with this new view of the FLN.

To recapitulate, Chomsky sees language as species-specific, and as a biological endowment. He claims that language did not evolve as an adaptation for any specific function and that language is not primarily a tool for communication. Finally, he insists on a saltationist account, in which the FLN emerged in a single step, rather than in a progressive and piecemeal way.

In Hauser, Chomsky, and Fitch (2010), the authors advocate investigating recursion (the computational operation that makes the FLN species-specific to humans) not only in the domain of language, but also in other domains, such as counting, social relationships and navigation. This is clearly linked to the idea that recursion itself is not "new," rather what is new in the FLN is its range of application. This leads rather naturally to the notion that the FLN is a species-specific exaptation (a reutilization for other purposes of a feature that initially evolved as an adaptation for another function: see Gould, and Vrba 1982) and not an adaptation. Thus, it is not recursion as such that is species-specific, but rather its use in the specific domain of language. The fact that recursion is the only species-specific part of the FLN also makes a saltationist account mandatory. While recursion, as a computational operation, may be limited in a cognitively modular sense (for instance, to keep track of hierarchical social relationships or to navigate the environment) or be constrained by other cognitive restrictions (linked to performance) such as working memory, it cannot be had "in part." One either has recursion (notwithstanding modular or performative limitations) or not. In other words, its emergence as the FLN cannot be the result of a progressive process but must have occurred in a single step. Thus, the emergence of the Minimalist Program and the new view of the FLN it entails has made all of Chomsky's tenets about language evolution very reasonable.

One question that I want to discuss here, because it opens new avenues for research is the domain of the FLN. Should it really be seen as limited to Merge? The view that it should was qualified in Fitch, Hauser and Chomsky (2005), where the authors recognized that the FLN might contain more than Merge, a point also insisted on by Pinker and Jackendoff (2005). One interesting question, thus, is what else the FLN could encompass. The most obvious extensions to the FLN would seem to be found in the FLB, i.e. in the sensory-motor and conceptual-intentional interface systems. Here I want to follow the trail of Chomsky's strongly reiterated claim throughout the years that language is not primarily a tool for communication, but rather, a tool for thought.

30.3 Language Is Not Primarily a Tool for Communication

As we have just seen, Chomsky has an exaptationist view of language evolution. While this basically means that the FLN (seen as the use of recursion in language) did not evolve as an adaptation for a specific function, it nevertheless does not mean that an exaptation is not in need of an account of some kind. So, is there a reason why one should discount, as Chomsky does, the possibility that the FLN was an exaptation for communication? In other words, why not think that the use of recursion in language, i.e. *Merge*, emerged to facilitate communication?

30.3.1 Language Uniqueness

The major problem with the view that Merge emerged to facilitate communication is language uniqueness. As Bickerton (2009) has pointed out, while communication (in the broad sense of transfer of information) is ubiquitous in the living world, language is unique, inasmuch as it has Merge and allows for discrete infinity. This might seem like a minor objection.

If, as hinted in Hauser, Chomsky, and Fitch (2010), animal species have recursion in noncommunicative modular systems, why not think that if Merge is the only difference between language and animal communication systems, Merge could have been exapted in the FLN to allow more widespread communication in the human species? In other words, contrary to Chomsky's claims, language would be primarily a tool for communication. Language would be basically in continuity with animal communication systems. There are, however, quite a few problems with this proposal.

First of all, while animal communication systems seem limited to around 30 different signals with different contents (see Reboul 2017), language is in principle unlimited in the range of different contents it can communicate. This raises the question of why animal communication systems are so drastically limited relative to language, as well as the related question of why only humans needed a more extensive communication system. One of the most popular answers to this question (see, e.g. Tomasello 2010) is that humans have a uniquely cooperative and altruistic sociality relative to all other animal species, including primates. Apart from any doubt that one might have about such an optimistic view of human sociality (for a detailed discussion, see Reboul 2017), this raises the question of where all this unlimited content that humans can communicate comes from. While one may legitimately think that animal conceptual systems are less limited than the range of their communicative signals suggest, there still are strong indications that human conceptual apparatuses are cognitively a lot more powerful than anything found in nonhuman species. While social explanations have also been proposed for the emergence of higher cognitive abilities among primates and particularly among humans, it is not clear that these hypotheses fare very well under scrutiny. The Machiavellian view (see Byrne, and Whiten 1988, Whiten, and Byrne 1997) argues that higher intelligence evolved in an evolutionary arms race to deceive and manipulate other group members in social animals. However, the paucity of deception in the animal world (see Searcy and Nowicki 2005), even among apes, sheds doubt on the Machiavellian hypothesis. Tomasello's (2014) view, according to which human thinking emerged due to social pressures from human altruism, does not fare much better. Apart from any doubt one may harbor about human altruism, the main problem is that it is not clear why altruism as such should lead to higher cognitive capacities.

There is another major discontinuity between language and other animal communication systems. Language is displaced or decoupled[3] in a strong sense. Human language is unique not only in its discrete infinity but also because the contents communicated can be independent of the situation of communication: they don't have to relate to what is present in the environment of the communicators. One can in principle talk of entities that are not present in the communication space, but also of abstract entities and even of nonexistent objects, and independently of any actual, future or potential action.[4] In contrast, animal communication seems limited to concrete (perceptible) objects that are present in the environment, when it is "referential" rather than merely devoted to regulating the social interaction. One major question is where decoupling in the strong, human, sense, came from. As we will see below, decoupling in this strong sense is absent not only from all animal communication systems, and even from the communicative acts of the animals engaged in animal language programs. One might want to argue that decoupling evolved through the interface between the FLN (merge) and the sensory-motor system. There is, however, a problem with this thesis.

The interaction between the FLN and the sensory-motor system is directly linked to externalization, and externalization has a communicative function (indeed, one could say that the communicative part of human language is this interface). If this is the case, it would be very unlikely that decoupling could be due to the interface between the FLN and the sensory-motor system. This is because decoupling makes deception easier because the audience, in the absence of what the communication is about, cannot verify its veracity. There is a general consensus that communication should be profitable for both the sender and the receiver, and deception is obviously not in general profitable to the receiver (see Krebs, and Dawkins 1984). Thus, it is very unlikely that decoupling would emerge in a communication system. Hence, the origin of decoupling is unlikely to be found in the interface between the FLN and the sensory-motor system.

This other main difference between language and animal communication systems, in addition to Merge, has been relatively ignored in the literature on the evolution of language. So, let us turn to decoupling and to the Chomskyan idea that language is not primarily a tool for communication, but rather, a tool for thought.

30.3.2 Language as a Tool for Thought

It seems that there is a common factor in the limitations of animal communication systems and of animal conceptual apparatuses. As pointed out above, the question of why Merge emerged in the FLN and not in other animal communication systems may be the question of where the infinity of different contents that Merge allows to communicate come from in the human species. In other words, and contrary to Hauser, Chomsky, and Fitch (2010), there would be major discontinuities between human and nonhuman thought.

While there is evidence that some primate species can master, after numerous trials, abstract relations such as *similar* and *different*, it seems clear that they are limited in their conceptual range in a way that humans are not. A first indication of this lies in the very different vocabulary sizes of human children and animals engaged in animal language programs (where animals of different species are taught sign or symbolic languages). While insistence is often (and rightly) put on the absence of anything like syntax in these animals, it is also notable that they are limited in the size of their vocabularies, learning around 250/300 "words," about the size of the vocabulary of a three-year-old child, at the most. By contrast a six-year-old has a vocabulary of around 10,000 words (see Anderson 2004 on animal language programs, Bloom 2000 for children's vocabularies, and Reboul 2017 for a more extensive discussion). One might argue that nonhuman animals are more limited than humans in the number of associations they can master (words in animal language programs are typically considered to be associations between forms and meanings), but recent works have demonstrated that this is not the case (see, e.g. Fagot, and Cook 2006; Kaminsky, Call, and Fisher 2004; Pilley, and Reid 2011). Rather the limitation seems to lie in the nature of concepts that animals can build. While human concepts, just as words used in linguistic communication, can be *decoupled* (used regardless of the presence of the referent in the environment or of any intention to action), it is not clear that this is the case for animal concepts.

Here, one possible domain of interest is so-called *mental time travel* (see Suddendorf, and Corballis 2007), a notion that covers both episodic memory (memory for specific past events and the associated emotions and feelings) and projection into the future. Clearly, given that it concerns past or future events or situations, mental time travel has to deploy concepts for entities that are not present in the environment of the thinker. The question of whether nonhuman animals have mental time travel or not (for a positive argument, see Corballis 2013, for a negative one, see Suddendorf 2013) is thus relevant to a potential difference of nature between human and nonhuman concepts. Clearly, human capacities for mental time travel are wide ranging far beyond animal capacities (distance in time is not strongly limited in humans, while it seems to be in animals, where a few days is the limit). But beyond the distance in time limitations, there seems to be other differences. Up to now, the only evidence regarding episodic memory in animals is relative to food hiding. Regarding projection into the future it has to do with planning (e.g. chimpanzees taking with them hammer and anvil when they go to eat nuts). A good example of so-called "spontaneous planning" is given in Osvath (2009) who describes how the alpha male of a chimpanzee group in a zoo would make caches of stones that he would throw at zoo visitors the next day. But in all of these examples, while concepts may be deployed in absentia, they are strongly linked to an intention for action. In other words, they are not deployed in the disinterested way of which Millikan (2013) rightly argues that it is a central characteristic of human thought. Additionally, when an animal engaged in an animal language program refers to an absent object, it is always in a request for that object (see, e.g. Segerdhal, Fields, and Savage-Rumbaugh 2005). Indeed, it has been noted (see, e.g. Cheney and Seyfarth 1990) that animal communicative acts do not take into account the informational state of the audience. Apparently, they are not informative, but directive acts. Thus, there seems to be an entire lack of transmission of information for anything other than practical purposes both in naturally occurring animal communication and in communication in animal language programs. This suggests that either the nature of concepts or the way in which they are deployed (or, presumably, both) are different in human and nonhuman animals. While there is a limited form of decoupling in at least some animal species, it is a weak decoupling in which concepts can be deployed in absentia, but only in representations linked to actions. By contrast, human concepts are strongly decoupled in the sense that they can be deployed not only in absentia but independently of actual, potential, or future action.

While this is not the place to give a detailed account of human concepts (see Reboul 2017), there is one interesting example, which is color concepts. On the face of it, colors being so-called secondary qualities (see Locke 1975), they seem to be the epitome of a visual concept, a concept that would depend for its very existence on visual experience.[5] Yet, as was pointed out by Milligan (see Magee and Milligan 1995), even people blind from birth can use and deploy color concepts, in the sense that they can amass (and transmit) information about colors. This is possible because humans (and presumably only humans) have *deferential concepts*, concepts that are not based on direct knowledge of their referents, but on knowledge "borrowed" from "experts" (see Fodor 1975). And this, in turn, is possible because human linguistic communication allows humans to communicate about entities that can be absent or inaccessible to perception. There is however an hen-egg problem here: Do we have deferential concepts because we have decoupling in language or do we have decoupling in language because we have decoupling in concepts? The first possibility would imply that decoupling (both in language and in concepts) depends on the interface between the FLN and the motor-articulatory system. The second would imply that decoupling in language depends on the interface between the FLN and the intentional conceptual system. While one can argue for the first hypothesis by appealing for instance to Dennett's (2017) notion of language as a *cognitive crane*, it is not clear why externalization as such would allow humans and only humans to decouple language and concepts. After all, the few animal signals that are referential are not decoupled (see Cheney and Seyfarth 1990), so externalization is clearly not enough for decoupling. Additionally, when provided with such an externalization, animals engaged in animal language programs do not thereby become able of decoupling, as shown by their communicative acts. And finally, this hypothesis fails to explain the limitations in their vocabularies.

Let us come back to this point. As noted above, explanations in terms of memory limitations are unsatisfactory because it has been shown that animals (primates, dogs, and pigeons) can learn more than a thousand arbitrary associations, much in excess of the vocabularies attained in animal language programs. But what is it exactly that these animals learnt? In a study by Fagot and Cook (2006), the subjects (baboons and pigeons) learnt arbitrary associations between pictures and one or the other of two colors. Pigeons learnt between 800 and 1200 such associations and baboons between 3500 and 5000. In Kaminsky, Call, and Fischer's (2004) study, a border collie learnt around 200 associations between linguistic expressions (e.g. "the blue ball") and individual objects. Finally, in Pilley and Reid's (2011) study, Chaser, a female border collie mastered 1022 "names" for different objects, all toys, over the course of three years, before the study was discontinued, leaving open the possibility that she might have done even better with a longer time. This achievement is intriguing, in light of the limitations of chimpanzees's vocabularies in animal language programs.

What is it exactly that Chaser learnt? She learned something like proper names for individual objects, that is, associations between auditory forms and individual objects. By contrast, animals engaged in animal language programs learned (very laboriously) associations between forms (abstract visual symbols or gestures) and categories of objects, something clearly more demanding from a cognitive point of view. While Pilley and Reid (2011) claimed that Chaser also learnt three common names (*balls, frisbees,* and *toys*), it is not clear that she actually learnt *toys* as a superordinate category for both balls and frisbees (for a discussion, see Reboul 2017). So, all in all, Chaser learned a great number of proper names, but only two common names. All of this suggests that what is important in acquiring a lexicon is not so much the ability to learn new associations, but rather, the ability to categorize objects on the fly (to conceptualize), the resulting categories (or concepts) being then associated with forms, whether these are acoustic, gestural, or visual.

Do we have any indications that human and nonhuman animals have different conceptualizing abilities? The first relevant factor is obviously lexical acquisition, which is fast, seems painless, and is unlimited in human children, while it is slow, laborious, and limited in other animal species. Beyond that, it seems that the human perceptual (and notably visual) system is geared toward abstraction in a way that animal perception is not (see Reboul 2017). For instance, the human preference for the treatment of visual information at a global rather than a local level may be linked to the ease with which humans master basic categories (see Rosch et al. 1976 and for a general discussion, Reboul 2017). Finally, and crucially, the very nature of the concepts acquired may be different.

I have already suggested above that this may be the case: animal concepts seem linked to actual, potential, or future action in a way that human concepts are not.

30.3.3 Affordances

To pinpoint the difference, the notion of *affordance* introduced by Gibson (1986) in his ecological theory of visual perception is interesting. Gibson's view was that a visual scene is perceived by a given organism in terms of the potentialities for action that it makes available to this organism and that (some of) the objects in the scene are categorized accordingly (as potentialities for action, i.e. as affordances). On such a view, the same visual scene will offer different affordances to different species, but also to a single organism at different times depending on its current biological status. Now, clearly, the notion of affordance has a strong adaptive flavor: natural selection determines, at least in part, what affordances are for a given organism, because affordances are important for survival. This does not mean that some affordances cannot be learnt, for instance through association, but one would expect a number of affordances to be genetically inherited (see New, Cosmides, and Tooby 2007 for a nice experimental demonstration of this). Beyond the adaptative aspect, what is central to the notion of affordances is the idea of a direct link between (visual) categorization and action. This direct link between categorization and action is precisely what seems to characterize animal concepts relative to human concepts.

Clearly, the claim is not that humans do not have affordance categorization. Given the adaptive impact of affordances, it seems safe to postulate that if affordance categorization exists, it will be widespread among species. Rather, it is that in humans, and as far as we know, only in humans, concepts are not limited to affordances. Side by side with affordance categories, humans are able to develop a much richer conceptual apparatus, in part independent of visual perception as the possibility of decoupling manifest in deferential concepts as well as the existence of abstract concepts show. And this is presumably the explanation for the very different lexicon sizes that are manifested by humans and by animals engaged in animal language programs. Thus, a natural conclusion would be that the strong decoupling that characterizes human linguistic communication is due to the interface between the FLN (merge, in other words) and the conceptual-intentional system, rather than to its interaction with the sensory-motor system.

30.4 Conclusion: Extending the FLN

Thus, it seems that the core of human language is the interface between the FLN (merge) and the conceptual-intentional system. Additionally, there are good reasons to believe that the human conceptual-intentional system is specific to humans in the sense that human concepts can be deployed independently of actual or potential action (they are strongly decoupled), while this is not the case for animal concepts. This suggests that it might make sense to extend the FLN in such a way that it is composed of both Merge and the conceptual-intentional system. This, it should be noted, echoes Chomsky's view that language is primarily a tool for thought.

Such a move would also open new possibilities for research on language evolution. First, it means that it is not only recursion but also decoupling that should be investigated in comparative psychology. As said above, chimpanzees seem to be able of planning, manifesting a weak kind of decoupling, and investigating the scope and the limits of decoupling in other primate and non-primate species might be interesting.

Second, investigations of the interface between Merge and the conceptual-intentional system would be rewarding. This could be done from a more syntactic point of view, as in the exo-skeletal model proposed by Borer (2005a, 2005b, 2013). It could also be done from a pragmatic point of view. Chomsky (2006) argued that meaning is largely a matter of pragmatics rather than of "externalist" semantics. Contemporary pragmatics, notably of the relevance-theoretic variety, centers on conceptual matters (the so-called lexical pragmatics approach, see Carston 2002, as well as Wilson and Carston 2007, and Allott and Wilson, Chapter 27, this volume) and has advocated an immediate pragmatic interpretation, rather than a pragmatic interpretation mediated by a primary semantic interpretation. This would seem to be an area of profitable investigation regarding the evolution of the Faculty of Language if the FLN is extended to include both Merge and the conceptual-intentional system.

Endnotes

1 Previously, generative grammar had distinguished between *performance* and *competence*. While the two distinctions are not equivalent, they are related: what is paramount is inner representation versus external productiom.

2 Quotations and references to pages will be given relative to the 2010 reprint in Larson, Déprez and Hiroko (2010).

3 Hockett (1959) used “displacement” or “displaced reference,” but the term “decoupling” has been extensively used in the psychology of early symbolic activity in young children and has the advantage of targeting cognitive ability beyond communication (see, e.g. Nichols and Stich 2000).

4 This excludes the honeybee dance, whereby a bee inside the beehive indicates the location of nectar outside of the hive to the other bees. It is clearly not decoupled in the strong sense.

5 This was confirmed by the World Color Survey (see Kay et al. 2011), which demonstrated that despite lexical diversity, color centroids are remarkably stable among human populations and dependent on the human visual apparatus.

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