Language as skill

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1. Introduction.

Language has long been regarded as among the more distinctive and theoretically interesting characteristics of human beings as a species. It provides a central means by which we structure our thoughts and also come to exchange those thoughts with others through communication and cultural transmission. As has frequently been noted, part of what makes language such a powerful device of thought and of social communication is its particular *unbounded character*. Language allows us to generate an indefinite number of meaningful thoughts or propositional contents about a vast array of possible subject matter and, further, to express those thoughts "so that even a thought grasped by a human being for the very first time can be put into a form of words which will be understood by someone to whom the thought is entirely new" (Frege 1984:390). We shall call the capacity to both generate an indefinite number of propositional contents about a wide range of subject-matters and to express and interpret those propositional contents through the use of structured bodily movements (be they spoken or signed) the **Basic Property** of human language.

Its **Basic Property** makes human language a unique system of communication, with no significant analogues in the animal world. But while language is arguably something that humans can uniquely do, it is also arguably not the *only* thing that humans can uniquely do. From artistic

[1] The order is alphabetical.

performances in the visual arts and in music, to motor control in gymnastics and athletics, to cumulative tool use culture, to high order cognitive skills such as chess, humans excel in their skills. As is sometimes remarked, a hallmark of human skills is their *unboundedness*: the skilled agent can adjust flexibly to understanding and responding to a potentially infinite number of demands in their task domain (e.g., Ryle 1949; Dreyfus 2002). So just a cursory look at the more general domain of human skills raises the questions: How does the Basic Property of Language compare with the general unboundedness of human skills? How does language compare with other things that humans can uniquely do?

One answer to these questions to which we have been accustomed in philosophy and linguistics is that language has *little*, if anything, to do with other things that humans can uniquely do. Language is fundamentally different from other skills that humans uniquely exhibit—language is *special*, from both a biological and cognitive point of view. This view, which we might call **EXCEPTIONALISM** about language, is the default view in the 'generative' or 'biolinguistic' approach to human language initiated—or, depending on one's reading of the relevant history, reinitiated—by Noam Chomsky (1957, 1965), Eric Lennenberg (1967), and others. According to EXCEPTIONALISM, human language is not a skill that we acquire—rather, it is an instinct that has an innate basis in the human brain and that humans develop into an I-Language through the first years of language development.

Against EXCEPTIONALISM, we will argue that humans' ability to exhibit the Basic Property of language does share many features with other skills that are worth the name, and that motivates thinking of it as *acquired skill*—different in character but not in kind from other skills that humans reliably acquire such as the skill to dance or to play games. Thinking of language as

a skill puts us in a better position to understand not only its commonalities with other skills but also its evolution and acquisition. Or so we will argue.

Although opposition to EXCEPTIONALISM has found very few allies in philosophical discussions of language, it has received growing support within discussions of language in psychology, where many have emphasized that language and other skills are a lot alike along their acquisition and cultural dimensions. However, on these most prominent recent instantiations, ANTI-EXCEPTIONALISM has been identified with the extreme empiricist view that denies any reason to posit an innate machinery in the human brain to explain the compositional architecture of thought and language (e.g. Heyes 2018; Christiansen and Chater 2016, 2022).

While we identify with this anti-exceptionalist impulse, there are reasons to shy away from these most extreme empiricist positions. Just as exceptionalism fails to capture important commonalities and interaction between language and other human skills, such as their manner of acquisition and their amenability to cultural enrichment, we argue that these forms of ANTI-EXCEPTIONALISM that populate psychological discussion of language are not well-positioned to capture other respects in which language and human skills are alike—in particular, their common unboundedness and recursive character. As we argue, ANTI-EXCEPTIONALISM is best developed in a way that enables us to capture what is right about the generative program while at the same time avoiding its most serious pitfalls.

We begin in §2 by introducing three core desiderata on accounts of language competence. We then provide a more careful statement of EXCEPTIONALISM, and develop an evolutionary challenge to that position. In §3, we turn to the nature of skills and the way in which skills differ from instincts and other abilities. This discussion about the nature of skills sets the stage for our

discussion in §4 in which we critically assess standard considerations that have been used to motivate the claim that competence with a language is purely an instinct. In §5, we make a case for the claim that recursive structure and unboundedness is common to all human skills, by looking at three central case studies. In §6, we weave a positive account of language as a special kind of skill, which shares a common innate component with other skills; §7 pulls the strings of our argument in favor of our form of moderate ANTI-EXCEPTIONALISM with a discussion of the advantages of our account over rival accounts.

2. Exceptionalism and its Discontents

It will be useful to begin our discussion with some core *desiderata* that any adequate account of the Basic Property of human language competences should satisfy. We focus here on three core *desiderata*. Roughly speaking, these desiderata pertain to which states and processes are at work in human language capacities ("descriptive adequacy"), how these states and processes develop within human individuals over time ("developmental adequacy"), and why humans have states and processes of this kind at all ("evolutionary adequacy").

First, any adequate account of the Basic Property of human language competences should be *descriptively adequate*. To be descriptively adequate, an account should correctly characterize the observed patterns that humans display when they generate, express, and interpret uses of language. We will take it as given that the patterns of language use that humans engage in is regularly *creative* in that it involves the production and interpretation of propositional content that is novel to the individuals producing or interpreting language but which is, nonetheless, appropriate to the contexts in which the acts of production and interpretation occur. Somewhat more controversially, we will take it as a robust cross-linguistic generalization that humans

regularly deploy *structure-dependent operations* in the way they generate, express, and interpret propositional content in their use of language. Such structure-dependent operations center on the use of abstract structural descriptions of the form-meaning pairs generated and interpreted rather than on the features that are straightforwardly derived from the linear order in which those form-meanings are presented. Although no doubt requiring a good deal more, descriptively adequate accounts should minimally explain the observed facts concerning the creative and structurally-dependent aspects of humans' use of language.

Second, any adequate account of the Basic Property of human language competences should be *developmentally adequate*—i.e., it should explain the fact that all human children—absent extreme genetic pathologies or environmental deprivation—come to display the Basic Property. Furthermore, adequate accounts should explain how it is that human children manage to reliably come to display the Basic Property despite the manifest variety of learning environments and practices of adult-child interaction in which human children find themselves. To use the now familiar (if contentious) term, we can put *desideratum* by saying that any adequate account of the Basic Property of human language competences should resolve *Plato's Problem:* it should explain how it is that human children reliably come to possess rich capacities for linguistic thought, expression, and interpretation given the specific and sometimes impoverished patterns of language use to which they are exposed.

Third, any adequate account of the Basic Property of human language competences should be *evolutionarily adequate*—i.e., it should cohere with what is known about human evolutionary history and, in particular, should not forestall an explanation of why it is that the capacity to display the Basic Property initially emerged among and was subsequently perpetuated within, and only within, the human lineage. In short, adequate accounts should not

be inconsistent with empirically plausible attempts to explain why human beings (or their ancestors) came to evolve the linguistic capacities that underwrite the Basic Property and why it is only human beings (as opposed to other living animals also) that came to display these capacities.

So much for the *desiderata*. Chomsky and many others working within the generative program have taken these adequacy conditions to strongly suggest a particular conception of linguistic competence. The animating idea of this conception centers on the claim that human individuals possess a *language faculty* or a *universal grammar*. This language faculty is taken to be a species-typical, biologically inherited, language acquisition device. It enables human children to reliably acquire what Chomsky (1986) calls *I-languages*: psychologically real computational systems for recursively generating structured linguistic meanings from a discrete set of computational atoms (e.g. a set of word-like elements or lexical items) stored in individuals' memory and for pairing those structured meanings with structured systems of linguistic expressions (spoken or signed). These psychologically real computational systems are called I-languages because they are both *individually indexed* to the states and processes of individual languages users' minds/brains—each language user has their own I-language—and also because the computational systems acquired are characterized *in procedural terms as functions-in-intension* rather than in purely extensional terms as a particular set of linguistic objects or meaningful linguistic utterances (Chomsky 1956, 1959a, Chomsky and Miller 1963, Chomsky 1986, ch. 2).

As we will see, we think the claim that human individuals have a Universal Grammar—and by extension, I-languages—in the foregoing sense is both true and important. However, we want to draw attention to a further claim that has also long been associated with the

generative approach in general and with Chomsky's work in particular. This is the thesis that human linguistic competences are *internal* or grounded in *narrow* properties of individual language users' minds/brains.

We reject this internalist approach to language capacities, and the broader claim that internalism somehow follows the claim that each human inherits a set of cognitive procedures which allows them to use language. Before going on to develop our reasons for rejecting internalism, we want to distinguish between two separated but interconnected versions of internalism.

In the first instance, internalism is a synchronic thesis about the individuation conditions of the linguistic capacities of an individual at a time. It holds that the cognitive procedures that individuals deploy in language use do not constitutively depend on features of individual language users' ecological or social environments. Quite clearly, individuals' language faculties are causally influenced by their ecological or social environments. The internalist doesn't deny this. But the internalist insists that the core features of humans' language faculties can be individuated in a way that is invariant across changes in these causal influences.

This synchronic version of internalism has been much discussed (and reviled) in recent discussions of generative approaches to language.[2] Less well discussed is the fact that Chomsky and many others have also endorsed *diachronic* versions of internalism which center on the processes whereby language facilities develop within individual humans and manner in which the biological basis for those facilities evolved in our lineage. At the developmental level, internalism is the thesis that human language capacities are innate in the sense that they do not constitutively depend on learning. At the evolutionary level, internalism is the thesis that the

[2] See especially Chomsky (2000), ch. 5-7 for classic statements of these issues, and Pietroski (2018) for more recent discussion.

biological basis of human language capacities did not evolve in our lineage in a way that constitutively depends on pressures imposed by an ecological or social environment or through gradual processes of adaptation.

Chomsky himself has often treated these various versions of internalism about human language capacities in general, and UG in particular, as part of a single theoretical package. We will call the conjunction of synchronic and diachronic versions of internalism together with the claim that humans possess a UG **EXCEPTIONALISM ABOUT LANGUAGE**, or simply **EXCEPTIONALISM**. Since it will be important in what is to follow, we should note that EXCEPTIONALISM provides the principled basis for the rejection of the claim that linguistic capacities are skills. EXCEPTIONALISM entails (via developmental and evolutionary internalism) that human linguistic competences are instincts rather than acquired skills and, hence, are fundamentally different from the biological and cognitive capacities that enable the production of skilled actions.

EXCEPTIONALISM has been motivated by a wide variety of considerations: from facts about the developmental robustness of language acquisition as opposed to the acquisition of skilled actions to considerations of cases in which humans can competently utilize language without thereby being able to competently perform skilled actions (and *vice versa*). Evaluating the strength of these arguments and of EXCEPTIONALISM more generally requires a more careful discussion of the nature of skilled actions and their relation to instincts than we have thus far provided. We'll turn to that task in §3. But before doing so, we want to provide some initial reason to think that the brand of EXCEPTIONALISM exposed by Chomsky and collaborators

fails to capture at least one of the core *desiderata* with which we began—namely, that it fails to satisfy the condition of evolutionary adequacy.[3]

In a series of recent publications, Chomsky and his collaborators have strenuously elaborated on the evolutionary component of EXCEPTIONALISM, providing a quite general rationale for holding that the biological basis of human language capacities did not evolve for its role in facilitating the production of skilled actions: namely, the biological basis of human language capacities did not originally evolve via a process of natural selection "for" anything at all. According to their proposal, the biological basis of human language emerged "not in the context of a slow gradual modification of pre-existing systems under natural selection but in a single, rapid, emergent event…" in which a random genetic mutation produced a slight rewiring of some individual's brain in such a way that this individual could utilize the generative operations at work in language (Bolhius *et al* 2014, p. 4; c.f. Chomsky 2011, p. 275 and Berwick and Chomsky 2016).

This proposal concerns the *origins* of the biological basis of the language faculty. It is not a claim about why the biological basis of the language faculty stabilized and spread across individuals to become a species-typical property of humans (or their ancestors), and it is not inconsistent with the claim that language capacities are regularly co-opted (or *exapted*) for some selective benefit, including those related to the production of skilled action. The claim, rather, is that appeals to functional benefits in general, and natural selection in particular, is irrelevant for answering questions about why the biological basis initially arose within our lineage. As Berwick and Chomsky (2016) have put the point, "[Biological] innovations therefore arise

[3] Separate but related evolutionary criticisms apply to versions of EXCEPTIONALISM that don't share these features of Chomsky's view. For instance, while Pinker endorses a gradualist account of language evolution (Pinker and Bloom 1990, Pinker 1994), his account assumes a genetically-based and neurologically modular account of language that we think is undermotivated and independently implausible.

independently of the functions that they will eventually be selected for. Acting like a sieve, natural selection can only differentially sift through what is presented to it. Any innovation must necessarily have been created in some other way, as gold nuggets that pan out" (p. 39). It is, according to this picture, random processes of genetic mutation that explain how and why individuals initially became equipped with heritable biological differences in their ability to display the Basic Property of Language. With respect to questions of origins, natural selection is taken to be beside the point.

There are several problems with this evolutionary account of the origins of language faculty. To start, this evolutionary story is essentially *incomplete*. First, it does not explain how the capacity to produce or process language through complex bodily movements evolved in our lineage. Second, it does not itself explain how the capacity to lexicalize evolved in our lineage. Call these the problems of *Missing Phonology* and the *Missing Lexicon*.

Even focusing on what the account does purport to explain—namely, the evolution of the capacity to realize the core compositional operations of syntax and semantics—we think the account is not just incomplete but also inconsistent with well motivated construals of the role of natural selection in evolutionary theory.

Suppose we were to grant the suggestion that the biological basis of the language faculty arose on the basis of a single or small number of independent mutations of the genetic system. Would it follow that natural selection is irrelevant to answering questions about the evolutionary origins of the language faculty? It would not. The reason has been pointed out in a more general context by Neander (1995). While it is true that random mutations in the genetic (or epigenetic) system give rise to biological innovations, the genetic features of a population at one time are not *independent* of prior episodes of natural selection at earlier times. That is, not all random genetic

mutations are probabilistically equal. Natural selection can make certain genetic mutations more or less likely at one time by changing the background distribution of features among the individuals within which mutations arise at some later time. More specifically, natural selection at one time can serve to make a trait—for example, light receptors in the form of eyes, opposable thumbs, or the generative operation of MERGE—accessible or within reach via a mutation in the genetic system at later times.[4]

When Berwick and Chomsky claim that natural selection can only differentially sift through what is presented to it and that mutations are the primary source of evolutionary innovation, they are treating mutation and selection as occurring *over the course of a single step*: mutations produce innovations and then selection acts over time to filter those innovations. But mutation and selection are each *cumulative* in character, taking place over the course of many sequential steps (Godfrey-Smith 2009, Ch. 3). It is through the interaction of these two distinct cumulative processes that novel traits come about: neither mutation nor natural selection has explanatory priority over the other, and neither is extraneous to questions about evolutionary origins. Accordingly, if it is true to say that the biological basis of the language faculty arose by a random genetic mutation, then it is equally true to say that the biological basis of the language faculty arose by natural selection.

In short, Chomsky et al.'s evolutionary claims turn on confusions about the irrelevance of natural selection in explaining the potential effects of genetic mutations in a population. These confusions highlight a more substantial problem with EXCEPTIONALISM. Why is it that the

[4]It is important to distinguish claims about the need for sequential steps from claims about the speed or tempo with which the members of a population traverse those sequential steps. Many of Chomsky and collaborators' most direct criticisms of appeals to "gradual" Darwinian processes target the claim that biological evolution takes place at a constant speed or uniform tempo. However, issues concerning sequential steps and issues concerning tempo are both conceptually and empirically distinct. Accordingly, it may be that nature does not take leaps over sequential steps even if nature evolves at a punctuated, non-constant tempo.

capacity to display the Basic Property emerged among a group of hominids in Africa and not among sea turtles in Australia or among brown bears in Alaska? The answer—which Berwick and Chomsky do not dispute—is that there were specific features found in our lineage that made our ancestors "language ready" in a way that the ancestors of modern sea turtles and brown bears were not. But there is little hope of explaining what it was that made our particular lineage (but not other lineages of other non-human animals) language ready if we abstract away from the role of the language faculty in facilitating skilled actions.

Here is why. In order to effectively survive and reproduce in the hostile world of the Pleistocene, our ancestors needed a wide range of skills for responding to and for generating changes in their environments. These skills included, but were not limited to, the ability to effectively provision for one's own and others' offspring (Hrdy 2009), the ability to make complex tools for hunting and foraging (Sterelny 2012), the ability to control fire for both cooking and defense at night (Wrangham 1999), the ability to coordinate the behavior of social groups over space and forward in time (Sterelny 2021), and, more generally, the ability to effectively communicate complex culturally acquired skills from experts to novices (Boyd and Richerson 1988).

The range of skills at work here place strong cognitive and communicative demands on individuals: it requires them to be able to generate complex thoughts about a wide range of subject matters and, further, to express and interpret those thoughts in episodes of social communication. Over the course of many generations, the demands on individuals with the need to effectively acquire, produce and transmit complex skills provides a natural context in which one would expect find the kind of *behaviorally-driven biological changes* that have occupied center stage in recent discussions of biological innovations (West-Eberhard 2003; Jablonka and

Lamb 2014). In particular, long-term cognitive and communicative demands of this sort over many generations have provided a behavioral context in which those individuals with inherent genetic (and epigenetic) material that favors the acquisition of the computational resources required to display the Basic Property of language would be better able to survive and reproduce than individuals that fail to inherent such material. Conversely, the fact that other lineages of animals have not been subjected to the same cognitive and communicative demands provides a natural explanation of why individuals in those lineages do not possess the computational resources required to display the Basic Property of language. Although the particular behavioral and biological details are a matter of some controversy, the basic explanatory framework has been widely adopted in discussions of the evolution of language by generativists and non-generativists alike (e.g., Pinker and Bloom 1990; Deacon 1997; Kirby and Hurford 2002; Christiansen and Chater 2016; Planer and Sterelny 2021).

EXCEPTIONALISM thus forestalls empirically well-motivated explanations of why it is within the human lineage and *only* in the human lineage that the capacity to display the Basic Property evolved. Of course, the evolutionary shortcomings of EXCEPTIONALISM are neutral on questions of how linguistic capacities develop within modern human individuals over time and are deployed by those individuals at a given/certain time. Nevertheless, these evolutionary claims warrant a more careful look at the prospects for a more thoroughgoing ANTI-EXCEPTIONALISM about the nature of the Basic Property of Language.

3. What is a skill?

According to ANTI-EXCEPTIONALISM, language—both in its acquisition and in its evolutionary development—is like any other skill that is worthy of the name; so not different

from motor skills (e.g., swimming and dancing), from tool use skills (e.g., hammering, carpentry, and knitting), musical skills (e.g., dancing, or playing an instrument) or even intellectual skills, such as chess. But what is a skill? We take skills to be practical abilities that are distinctive for (i) their agentive character; (ii) their acquisition; (iii) their amenability to cultural enrichment.

3.1 The agentive character of skills.

Abilities such as the ability to digest or to sweat as well as a variety of *subagential* abilities such as the ability to process relevant complex acoustic and/or visual inputs, the ability to deal simultaneously with multiple layers of linguistic structure (e.g. phonetics, phonemes, morphemes, syntax, semantics and pragmatics), or the ability to store information in working memory, are not skills in the sense relevant for our discussion. Skills differ from these sorts of abilities in that they characteristically manifest in *actions* (cf., eg., Ryle 1949). Motor skills characteristically manifest in *bodily actions*; intellectual skills in *mental actions* (Schmidt and Wrisberg 2008). By contrast, the characteristic manifestations of the ability to digest (i.e digestion) and of the ability to sweat (i.e., sweating), as well as of subagential abilities, do not need to be actions, nor do they need be at all under the control of the agent.

3.2 The learnability of skills

We understand skills also in opposition to *instincts*. Skills are crucially supposed to be learnable (Adams, 1987; Willingham 1998; Rosenbaum, Carlson, & Gilmore, 2001; Singleton 1978; Yarrow, Brown, & Krakauer, 2009). By contrast, instincts are unlearned abilities for even fairly complex and stereotyped activities which are common to members of a species (Lorenz 1957, Hailman 1969, Blumberg 2017). There is, however, considerable controversy over what the

alleged *learnability* that is characteristic of skills amounts to. How does skill's learnability differ from the development of paradigmatic instincts, such as birds' pecking, spiders' instinct to spin a web or babies' instinct to cry when hungry?

What distinguishes an instinct's development from a skill's learnability is that the former develops *across a variety of different environments*. By contrast, a skill exhibits a modal dependence on the environmental conditions: *had the environmental conditions been different, the skill would have been different too* (cf. Stich 1975, Fodor 1981, Sober 1998, Aries 2007), the general idea being that while an instinct tends to develop in pretty much every healthy member of the species that grows in normal environments, skills are only acquired by individuals that find themselves in appropriate social and learning environments. For one thing, instincts are generally thought to be capable of developing in socially deprived environments—i.e., in socially isolated animals (Tinbergen 1942; 1951; Lorenz 1957; 1937). For example, a chick's ability to peck might develop in a variety of more or less congenial circumstances and quite independently even of the presence of other chicks, or even of parents instructions. As another example, a songbird can be raised from egg to adult without ever hearing a member of its own species sing, and yet develop the typical song of its own species the spring after (Lorenz and Tinbergen 1957-1938). Moreover, instincts are independent of environmental conditions: the presence of the relevant environmental conditions is not necessary for the manifestation of an instinct, as evidenced by *vacuum activities*—i.e., fixed patterns of behavior that can be observed even in absence of the environmental conditions that usually elicit them. So, for example, starling birds snap at the air when flying as if they are catching insects even if no real insect is there (Lorenz 1981); weaver birds engage in complicated nest-building behavior when there is no nest-building material (Barrows 2000); or some birds, when kept in cages with little or no

access to litter, perform all the elements of normal dust bathing, but in the complete absence of any substrate (Lindberg and Nicol 1997); cats attack a ball of wool as if it were a mouse (Leyhausen 1979).

By contrast, the learnability of genuine skills is tied to the specificity of the relevant environments. The acquisition of skills depends on the resources made available by the environment—sailing skills developed in populations in proximity to water, whereas mountaineering skills in populations living in mountainous regions. The differing availability of materials makes for widely different tool-use skills—e.g., Incas' tool skills were shaped by the availability of stone, copper, and bronze, but not of iron (Romney 2021). Given this dependence on environmental conditions, vacuum activities are not observable along with genuine skills. Relatedly, skills are not fully learnable in socially isolated animals, the idea being that their acquisition requires exposure to the activity in others, as well as to interactions with other practitioners of the skill. This is particularly evident in the case of craft skills, which require techniques developed across generations, so that it is virtually impossible for socially isolated individuals to develop on their own craft skills. Moreover, the modes by which we acquire craft skills exhibit both a vertical dimension (parent/children), as well as a master/apprentice dimension, and a horizontal (among peers) dimension (Hosfield 2009). The social dimension of skill learnability is also evidenced by the role verbal feedback plays in the acquisition and transmissibility of skills. In evolutionary psychology, for example, Morgan *et al*. (2015) argue that the teaching of general concepts, such as that of a platform edge, contributes to the development and transmissibility of Oldowan stone knapping techniques. The impact of verbal feedback has been shown to significantly affect the acquisition of wide-ranging kinds of skills, from basic motor skills (e.g., Sullivan *et al.* 2008; Al‐Saud *et al.* 2017), to more complex sport

skills, such as swimming and tennis (cf. Zatoń & Szczepan 2014, Hebert & Landin 1994), yoga (Chang *et al.* 2020), surgical skills (cf. Porte *et al.* 2007; Flinn *et al.* 2016), and musical skills (Duke & Henninger 1998), *inter alia*.

3.3 Skills and Cultural Enrichment

A second difference between skills and instincts is *the availability of the former to cultural enrichment*. Cultural enrichment comes in two stages: individuals improve at a task by learning a new type of behavior over a single lifetime; then, that behavior spreads across a population, is transmitted, via *social learning*—imitation and verbal feedback—to the next generation (Boyd and Richerson 1988; Henrich and McElreath 2003; Richerson and Boyd 2008; Birch and Heyes 2021).

Every skill is susceptible to this sort of cultural enrichment—from tool use, to sport skills, to musical skills. Humans learn how to make artifacts from others after they have improved them by experience; they transmit these improvements to the next generation, until quite sophisticated artifacts evolve through effects of cumulation. This generational improvement gradually diversifies the range tools and artifacts available (Petroski 1992; Basalla 1988; Scavenius 1975; Johnson 2010); in music, it enriches songs and tunes through centuries (Savage 2019); sometimes improvements are even less gradual, such as the potters' wheel (Foster 1959), Fosbury's flop in the high jump; Tsukahara's vault in gymnastics (Bar-Eli *et al* 2008), Cristofori's piano incorporation of hammers and action (Giordano 2016), or the electrification of musical instruments (Goldsmith 1977).

By contrast, instinctual behavior is not susceptible to this sort of cultural enrichment. As an example of the fixity of instinctual behavior, consider some recent research on zebra finches

(Fehér *et al* 2009; Chater and Christiansen 2022:175). These studies have attempted to recreate the generational enrichment in the birdsongs of this species, so as to see if starting from a generation of socially isolated birds, the song exhibited by subsequent generations of zebra finches differ substantially from the wild type of song that zebra finches exhibit in their natural habitat. But instead of the subsequent generations culturally enriching on the song of the previous generation, quite the reverse happens: across generations, the learners gradually regressed to the wild type of song, demonstrating that cultural enrichment does not stick long-term.[5]

Having laid out these differences between skills and instincts, we do not mean to say that the boundaries between skills and instincts are always clearly defined. For example, consider *walking* in humans: like an instinct, every healthy human eventually walks, in a variety of different environments; on the other hand, even walking postures appear to be culturally sensitive (Matsumoto & Kudoh 1987). Moreover, instincts *can* give rise to corresponding skills, in the sense that some innate and unlearned characteristics can provide the scaffolding for acquiring a corresponding skill (Lehrman 1953). What matters for our purposes that *stereotypical* cases of skills—tool use skills, musical skills, complex motor skills—score high both with respect to learnability and to the degree of cultural enrichment, whereas the stereotypical cases of instincts—such as babies' crying for being fed, birds' pecking behavior, or spiders' spinning a web—score very low in both respects. The question of whether language is a skill is the question of whether language is more like the former than the latter.

[5] Another study replicated the exact same results even though the first generation of zebra finches had learned the song of a completely different species of bird (Diez and MacDougal-Shackleton 2020).

4. Could language be a skill?

4.1 The positive argument

Let us now zoom in on *the general linguistic ability to both produce and understand linguistic utterances* and ask whether this ability could be a skill in the sense of 'skill' outlined in §3. For monolingual beings, this ability is confined to producing and understanding utterances of sentences in one particular *public language*. Let us call this ability a '*c-language*', for '*coordinating language*'. A c-language is the ability to map thoughts onto utterances of a particular public language and to map utterances of that language back onto thoughts.

C-languages share some important features with skills. For one thing, the characteristic manifestations of the ability to produce utterances in a public language are actions of the speakers—the acts of *uttering* sentences. Thus, assuming that (non-mental) actions are bodily movements (Davidson 1971), the characteristic manifestations of the ability to produce utterances are like those of motor skills (§2). The ability to interpret utterances is also skill-like, since it characteristically issues the tokening of thoughts—*interpreting*, which is a mental action.

So, the characteristic manifestations of c-languages, just like those of skills, are actions of sort. In §3, we have identified two further distinctive features of skills—their learnability and culturally enrichability. Now, it is widely known that languages cannot be acquired by individuals that are socially isolated, as the well-known case of feral children has shown (Clark 2016: 413; Cole 1968: 115; Curtiss 1981:18-25; David 1947:432-437). Since they are not acquirable in socially deprived environments, c-languages are much more akin to skills than to instincts.

One might object that an important difference between c-languages and skills remains. Tool use can be acquired *to some extent* in isolation—e.g., one might learn by themselves how to

build a shelter. By contrast, the case of feral children suggests that lacking social interactions with other humans completely inhibits the acquisition of a c-language.

Far from undermining the analogy between language and skills, we take this to be evidence that language is a distinctively *social* skill. Its skill-like nature is evident from the fact that the acquisition of a c-language is heavily dependent on the nature, size, and quality of the inputs that children receive.[6] This point is not easy to appreciate, since *typically* a child's linguistic environment is equally rich: most children are raised in a linguistic community with a rich and fully formed language, with linguistically active parents, and so on. Indeed, exceptionalists have taken this observation to mean that languages are instinct-like in that they are universal: every, or almost every, human acquires one. This has been taken to suggest that like an instinct, linguistic competence develops in a variety of different environments (Pinker 1995:51).

However, the importance of the linguistic environment for language acquisition becomes clearer when one looks at cases where said linguistic environment is not very rich. A well-known case of this phenomenon is *creolization*, where language learners develop complex I-languages via exposure to relatively impoverished and superficial data sets, or *pidgins* (see DeGraff 2009). Another instructive case study is that of deaf children in Nicaragua. In a widely documented case study, deaf children with hearing parents did not find themselves in a linguistically rich environment but came to converge only on a rudimentary sign language by interacting through gestures among them (Senghas 1995; Senghas & Coppola 2001). The language was rudimentary in that it allowed for *very few spatial modulations*—which are alterations of the direction of a sign movement which, in sign language, can perform several grammatical functions, such as

[6] We return to discussing the distinctive sociality of c-languages in §6.2.

indicating person or number, providing deictic, locative, or temporal information, or indicating grammatical relationships, such as a verb's subject and object. The sign system was perfected over the years, showing sensitivity both to the population of speakers and to the length of time it was utilized by them. Remarkable differences in the complexity of the sign language was found in the second generation of deaf children, who entered the deaf community and were exposed to the sign system used by the older children. From this impoverished language, they were able to develop the language into a much more complex sign system, where many more spatial modulations for a variety of grammatical markings were utilized (Senghas 1995; Senghas & Coppola 2001), which included an inflected verb morphology system as well as a noun classifier system. Indeed, the dependence of this sign language's grammatical mechanisms of co-reference on characteristics of the linguistic community and on the quantity of linguistic interaction, has been ascertained for other sign languages as well, such as Israeli Sign Language (large, heterogeneous, geographically dispersed population), Al-Sayyid Bedouin SL, and Kufr Qassem SL (Dachkovsky *et al* 2018; Stamp & Sandler 2021). The fact that production patterns are so impacted by factors such as population variables, the number of years that the relevant linguistic system has been used, and the richness of the original linguistic input—as the studies of sign-languages suggest—counts against the claim that the relevant productive patterns of language are purely instinctual, since it suggests that, on the contrary, the acquisition of the language is heavily dependent on one's social environment, the richness of the linguistic inputs, and the presence of specific linguistic triggers.

Indeed, this evidence from the dependence of sign language on the richness of one's linguistic environment is suggestive of a further way in which c-languages are similar to skills. As we have seen, skills are, to some extent, culturally invented, in the sense that they allow for

cumulative enrichment, of which *cultural innovation* is a central ingredient. Linguistic innovation is ubiquitous both lexically and syntactically. Languages allow for the introduction of new lexical items (Armstrong 2016), which alter the current semantic conventions—such as the introductions of new names, nouns, and even with processes of zero derivation, processes that preserve the phonological shape, but not the lexical category, of the original linguistic expression (such as using 'houdini' as a verb in "Bea managed to houdini her way out of her cell). Moreover, cultural innovation in language does not only pertain to lexical innovation but also to *structural innovation*. This is the sort of innovation we observe in Nicaraguan sign language: the second generation of deaf children could benefit from a much richer linguistic input and enrich it into a much more expressive system of communication, by adding spatial modulations and grammatical categories to their languages. Creolization—the process whereby a pidgin turns into a creole spoken as a native language in a population—is perhaps the most widely studied case of cultural innovation pertaining both the syntax and the lexicon of a given language—where individual innovations are transmitted and quickly changed across generations of speakers. As Degraff (2009: 896) argues, the sort of linguistic innovation we find in creolization is unlikely to be exceptional. Socio-linguists and historians converge in thinking that language-change patterns in the history of all languages, including of Creole languages, ultimately depend on innovations in *individual* instances of first- and/or second-language acquisition and on cross-generational transmission (see, e.g., Roberts 2007).

If c-languages are skills, then their susceptibility to innovation and cross-generational enrichment, as well as their learnability, can be explained on the model of skill innovation, cross-generational enrichment, and learnability: it is no longer a mystery why in these respects languages are actually a lot alike skills.

4.2. Arguments against

One type of argument that exceptionalists have given for thinking that language cannot be a skill is highly general, and is intended to show that language is not learned at all and, *a fortiori*, is not a learned skill. The so-called poverty-of-the-stimulus argument is probably the most familiar version of this type of argument. A second type of argument focuses on more specific ways in which language is allegedly unlike other complex skills. Instances of this style of argument include disanalogies that Chomsky has often noted between language competence and practical abilities and Pinker's arguments from double disassociation.

We will here work to undercut the more specific arguments, and return to the poverty of the stimulus argument in §6 after we have developed our positive account of language capacities as skills.

4.3.1 Chomsky on linguistic competence

Chomsky (1985, 2000) insists that linguistic competence is not a skill, an ability nor know-how. Now, the claim that skills are abilities of a sort can be understood in a *substantial sense*—i.e., skills are *merely* abilities, not further grounded in cognitive states of subjects. There is also a *minimal sense* in which skills are abilities—skills are abilities grounded by cognitive states of the subjects.

It is clear from Chomsky's discussion that he has in mind a *substantial* sense of 'ability'. For example, Chomsky (2000, p. 50) argues that linguistic competence cannot be an ability because "the ability to use one's language (to put one's knowledge to use) is sharply

distinguished from having some knowledge". Indeed, this substantial sense of ability was widely assumed at the time of Chomsky's writing. For example, Dummett had suggested that to know a language is a matter of having know-how—i.e., the ability to use it (cf. Kenny 1984:138). And he followed Ryle (1949) in thinking that know-how is an intelligent capacity, which is not itself grounded in standing representational states of the subject. At the same time, Dreyfus (e.g., 2002) was advocating a view of skills as *motor intentionality*, according to which skilled subjects are not skilled, in virtue of representing the world in a certain way, or in virtue of knowledge that they possess but rather in virtue of being well-situated and embedded in the world. Since these non-cognitivist views were the prevalent models of skill to which Chomsky was responding, it was natural for Chomsky to have distanced himself from an understanding of linguistic competence as a skill.

In the last decade, cognitivism about skills has developed into a plausible alternative to non-cognitivism. An emerging consensus in the philosophy of skills characterizes skills as having a *dual cognitive component*—a declarative (or semantic) component on one hand, and a procedural or non-declarative component on the other (e.g., Pavese 2019; Krakauer 2019; Christensen et al. 2019). The declarative component is stored as propositional and articulable knowledge about the task; the procedural component is instead modeled as a procedure or program that maps the relevant declarative knowledge as well as the agent's intention onto dedicated motor representations that guide the execution of the task. Both components are needed for an explanatory theory of skills. The 'declarative' component proves essential to guide the production of actions that conform with the agent's intention. Indeed, the importance of the knowledge component is revealed in one's ability to initiate and plan a task and to reason strategically about these plans (Shadmehr et al 1998). On the other hand, the procedural

component can explain a variety of features of skills, such as their gradability and the role of practice in their acquisition. According to cognitivism of this sort, skills *are* abilities only in the minimal sense in which an ability might nonetheless be grounded in representations and cognition.

Thus, cognitivism about skills provides the natural framework within which to develop a theory of linguistic competence as a skill. So, while we might agree with Chomsky that linguistic competence is not an ability in the substantive sense, it might still be an ability in the minimal sense.

The second argument Chomsky (2000:51) gives against construing linguistic competence as a sort of ability is that linguistic competence simply cannot coincide with the ability to use a language, since the latter varies with injuries and memory loss, whereas the former remains stable (e.g., Chomsky 1985:9). Chomsky asks us to imagine a speaker of English who improves their ability to speak the language by taking a public speaking course or loses this ability because of an injury. In both cases, *something* remains constant, while the ability to speak and understand varies: this ability may decline or even be lost, or might even be recovered once the injury's effects recede (see also Chomsky 1980; 1986). So, for Chomsky, linguistic competence cannot be the same as the skill to produce and to understand linguistic utterances. The latter belongs to the realm of linguistic *performance*, not to that of linguistic competence.

Yet, even this argument for thinking that linguistic competence is not a skill conflates the distinction—standard in action theory—between *general abilities* and *circumstantial abilities*. Circumstantial abilities are *not* very stable: they come and go as the circumstances in which subjects find themselves change. So, one might have the skill—e.g., a general ability to play the piano—but might lack some circumstantial abilities—e.g., if one lacks the piano, if one has just

lost both hands. General abilities are abilities to perform under normal circumstances; circumstantial abilities are abilities to perform in particular circumstances, which are not necessarily normal. A general ability is stable across normal circumstances, while a circumstantial ability might vary with changing circumstances. So, for example, a pianist might still have their general musical ability, even immediately after having a car accident where they lost both their hands. What makes it true that the pianist still possesses their musical ability is that they would be able to play the piano in *normal circumstances*—where what counts as normal might depend on the nature of the task. Lining up skills with general abilities also makes conceptual room for a *competence-performance* distinction. *Qua* competences of sort, skills are compatible with problems in the performance: the most skilled pianist may have performance problems and the most skilled athlete may endure periods of disappointing results. Similarly, skills are not necessarily lost with injuries.

With this distinction in play, Chomsky's argument only establishes that linguistic competence is not a *circumstantial* ability; it does not establish that it is not a *general ability* or skill. For while it is true that having incurred injuries, one cannot perform linguistically, we should not thereby conclude that they have lost their ability, if it is true that they could still perform in normal circumstances. Thus, both of Chomsky's arguments ultimately fail to undermine the view that linguistic competence is a skill of sorts.

4.3.2 Pinker on dissociations

One of Pinker's (1995, p. 45) central arguments for thinking that language must be an instinct—i.e., analogous to spiders' instinct to spin webs—hinges on observed dissociations between language competence and general intelligence on the one hand and skills on the other.

As he explains, if language were an instinct, with an identifiable seat in the brain, then it should be doubly dissociable from general intelligence. That means that, on one hand, one could have a *linguistically idiotic savant*—somebody with low general intelligence but good at using language; on the other hand, one might have defective linguistic competence, and be perfectly smart and intelligent, and even proficient at different tasks.

Pinker thinks both of these predictions are borne out. As an example of dissociation where language, but not general intelligence, is impaired, Pinker (1995, p. 47) mentions the phenomenon of *Broca's aphasia*, where an individual is damaged in their capacity to produce meaningful utterances, but preserves their general intelligence, their capacity for thought, as well as their capacity to acquire other motor skills (cf. Dronkers & Baldo 2010). Mr. Ford is described as having a hard time in getting his speech out, but not due to a general motor incapacity. Ford can blow candles out, for example. His speech impediments are described as concerning grammar, as he would omit endings such as -ed, and -s, as well as grammatical function-words, such as or "be" and "like".

Aphasia is not at all a mystery in the picture outlined so far. If the ability to produce and understand utterances is a skill, then there is no expectation that general intelligence would suffice for possessing that ability. Skills can be highly compartmentalized, as they belong to specifiable domains. Mr. Ford might be impaired in his inability to produce utterances that adequately translate his thoughts, while remaining a perfectly intelligent and even competent thinker.

What about the other direction of dissociation—the possibility of a linguistically idiotic savant? Pinker (1995, p. 50) describes the case of fourteen years old Denyse, a loquacious and sophisticated conversationalist, who is however affected by *chatterbox syndrome*, which involves

some serious form of retardation. So, while she is an excellent conversationalist, she never learned how to read or write, nor can she perform ordinary tasks such as handling money, having a job, etc. Her general intelligence is severely impaired, and so is her acquisition of other ordinary skills, but not her language competence.

Now, if languages are skills of some sort, then we *would* expect some dissociation between it and other sorts of skills. After all, the acquisition of one skill (say, carpentry) may be observed in subjects that are incapable of acquiring other sorts of skills (such as musical skills): skills ordinarily dissociate from each other. What is interesting about Pinker's case of linguistically idiotic savant is that it is an example of a dissociation of linguistic competence from *general intelligence*. However, individuals of exceptional skills in some domains with severe impairment in their general intelligence have been widely documented for other skills as well. For example, there are well-known cases of idiotic savants in music (e.g., Judd 1988) as well as in the visual arts (Selfe 1977, Mottron and Belleville 1993). If dissociations of general intelligence from particular skills are attested in a wide variety of skills, the phenomenon of linguistic idiotic savants alone cannot be used as evidence that linguistic competence cannot be a skill of some sort.

5. Common unboundedness and common recursive structure.

As we noticed at the outset, the Basic Property of language is its unboundedness. As often remarked, what explains this unboundness is its recursive character. But recursivity is not unique to language: recursive structure can be found in musical skills (Lerdahl. & Jackendoff 1983; Lerdahl 2001; Patel 2003, Patel et al 2008); dancing skills (Charnavel 2019, 2023), in motor skills such as lifting (Esipova 2023), in tool use and food processing (Sterenly 2012). Here we

briefly overview the recursive structure of three representative human skills: music, dancing, and lifting.

5.1 Recursion in music.

The role of hierarchical structure mental representations in the computation of pitch is a common ground of a lot of research on musical skills. Via exposure to tonal music, musicians acquire highly structured representation of musical pitch (Krumhansl 1990). For example, a musical key such as C-major is represented much more than simply a scale (or set of pitch classes): C,D,E,F,G,A,B. Within this scale there is a hierarchy of importance, such that some pitch classes are perceived as more central or stable than others, with the first (C) being the most stable, followed by the fifth (G) and third (E) pitch class. Based on empirical research on the psychology and neuroscience of musical skills, Lerdahl (2001) provides an algebraic model for quantifying the tonal distance between any two musical chords in a sequence, yielding a single-integer value that incorporates the tripartite distances of pitch classes, chords and keys. This model also provides a method for deriving tree structures (Figure 1), which serves as a hypothesis for the perceived relations between chords. In Figure 1, a phrase from a composition by Bach is shown to be structured along a hierarchical pattern of tension and relaxation. Right-branching indicates an increase in tension, and left-branching a decrease (i.e., relaxation). The tree shows how local tensing and relaxing motions are embedded in larger scale ones. Such patterns arise from the perception of chords with reference to a governing harmonic reference point or ‘tonic’. Using the tree structure, one computes the distance of each chord from the chord to which it attaches in the tree, with the added stipulation that a chord ‘inherits’ distances from the chords under which it is embedded (Lerdahl & Jackendoff 1983). A huge amount of work on musical skills suggests that like linguistic sequences, musical sequences are not resulting from

the haphazard juxtaposition of basic elements. Instead, combinatorial principles operate at multiple levels, such as in the formation of chords, chord progressions and keys in music (Patel *et al* 1998).

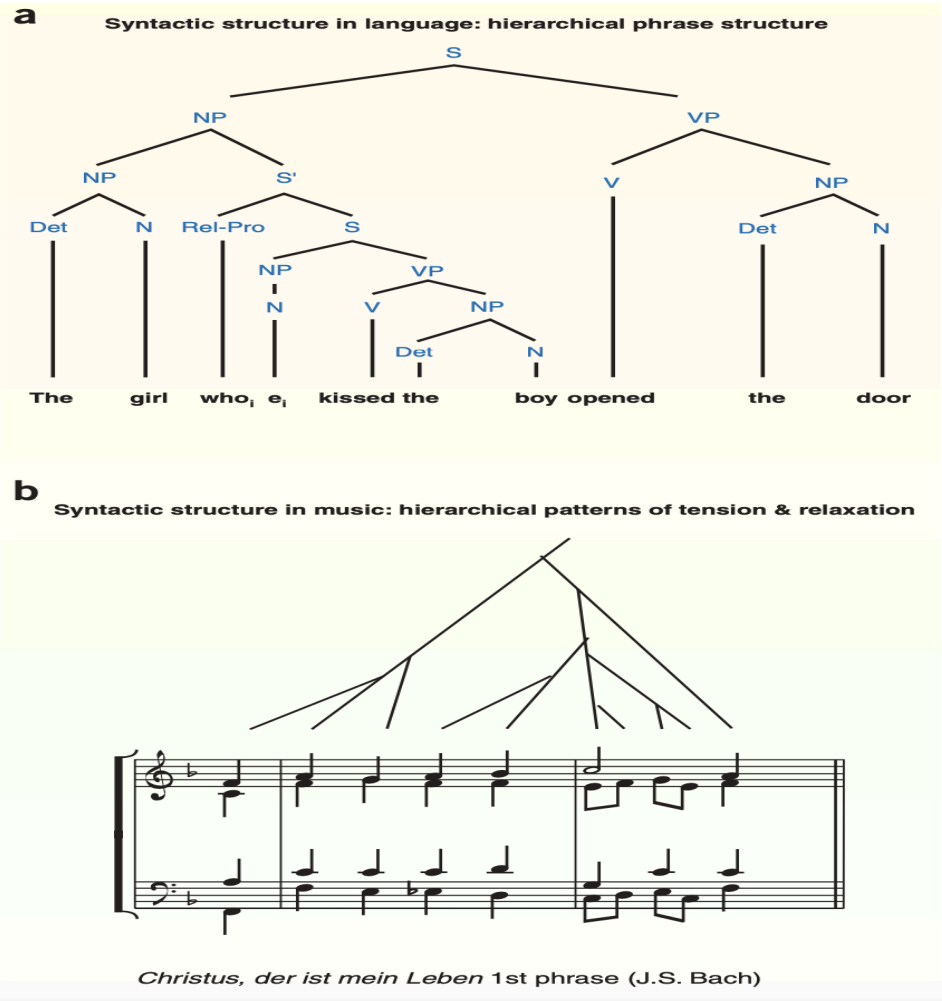

Figure 1: Recursion in Music. (Jackendoff and Lerdahl 2006: 56)

5.2 Recursive structure in dancing.

Recent work on dancing has similarly unveiled its recursive structure (Charnavel 2016, 2019, 2023). Like musical sequences, dancing sequences come with a *grouping structure*, which in the

case of dancing has as its most basic components *continuous positions*. Movement is, accordingly, a sequence of continuous positions (Figure 2). Groups are themselves segmentations of movements into a set of continuous positions in the scenic space. Such grouping is subject to *well-formedness rules*—e.g., only contiguous positions can constitute a group and a dance as a whole constitutes a group. In addition to well-formedness constraints, grouping is subject to *preference rules*. While the former only define formal conditions on grouping configurations, the latter state substantive conditions about what parameters within dance affect perceived grouping. Among the preference rules, there are *local* ones—which determines the boundaries of groups—and *global* ones—which determine larger-level grouping. For example, similarity is a local rule—according to which positions that resemble each other tend to be perceived as grouped together; and so is proximity—according to which positions are proximal to each other tend to be perceived as a group. By contrast, repetition and parallelism are global rules determining higher level grouping, according to which when a series of changes (of direction, speed, etc) is repeated with respect to some (parallelism) or all (repetition) parameters, it constitutes a group. Local and global rules determine a hierarchical structure—local rules indicate the lowest levels of grouping, while the global rules determine the higher levels of grouping; principles of parallelism, symmetry and repetition apply recursively, and yield several hierarchical levels of grouping.

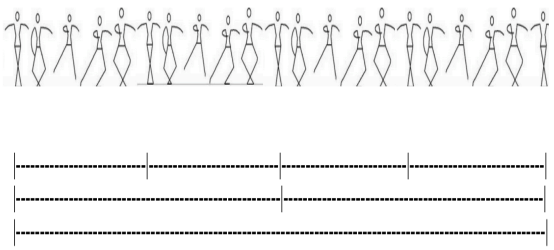

Figure 32. Recursivity (in the case of repetition)

Figure 2: Recursion in Dancing (Charnavel 2016: 30).

5.3 The grammar of lifting.

The non-linearized hierarchical structure of motor skills such as lifting has been studied by Esipova (2023). For example, consider the repetition of a deadlift. The figure on the left represents its concentric phase—where the eccentric phase is the reversing of the movement. Though the deadlift requires several repetitions, the repetitions themselves are hierarchical, and their nodes are movements such as knee extension and hip extension. Variations of deadlift vary these nodes—for example, the stiff-leg deadlift and the Romanian deadlift, that eliminate the knee extension/flexion component. Just like in language, new exercises can be created from scratch or as innovative variations of existing exercises. Most importantly for our purposes, there exist modification patterns that, once learnt, can be productively applied to new cases. For example, one productive modification is the "1.5-rep" modification, whereby the lifter goes through a certain portion of the full routine twice within a single rep to increase time under tension for the target muscle(s) in that portion of the full routine (Figure 3). Another example of productive modification is the "paused rep" modification, where we simply introduce a "pause" into the compositional structure—i.e., an isometric contraction of the target muscle(s), which will also target a specific point of the routine. Repetitions themselves are embedded into large structures, such as warm-up sets, exercise sessions, training sessions, training microcycle (weekly), training mesocycle (e.g., several weeks), training macrocycle (over years).

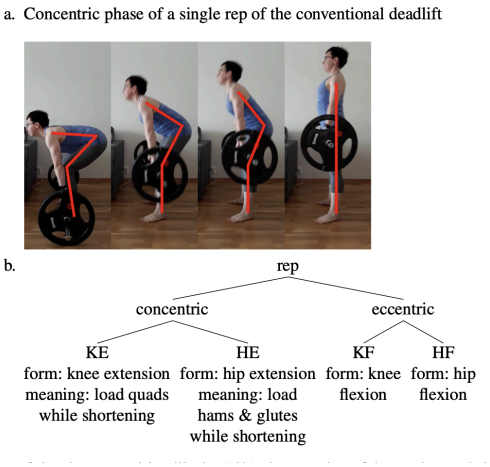

Figure 3: Recursion in lifting (Esipova 2023: 888).

6. A theory of language as a skill

Thus, skills have a common recursive structure, that in all cases gives rise to hierarchical structures, and which in turn capture at least one dimension of their unboundedness. This section outlines a model which provides a proof of concept of how a c-language could be a skill while at the same time requiring an innate scaffolding that, as we will explain, resembles UG.

6.1 The Innate Scaffolding of Skills

This idea that the universality of languages is evidence of their instinctual nature can be traced back to Darwin. In his discussion of the difference between humans and other animals, Darwin draws attention to humans' instinctive capacity to acquire language, which he understands as "the *ability to connect a wide array of definite ideas with defined sounds in ways that require the use of complex mental faculties*" (1871, p. 54). Darwin recognizes the obvious fact that the particular connections between ideas and sounds at work in any given language will need to be learned. But he maintained that humans come biologically prepared with instincts that allow

them to learn the art of language in a way that they do not come biologically prepared to learn other cultural arts such as brewing, baking, or writing. For Darwin, this is what makes human language special among other human practical abilities. So, for example, Darwin observes that while "... language is a art, like brewing or baking," it differs from ordinary arts in that "man has an instinctive tendency to speak, as we see in the babble of our young children; while no child has an instinctive tendency to brew, bake, and write." Darwin therefore concludes that language is "an instinct to acquire an art" (1871, p. 54).

This passage is often quoted by exceptionalists in support of the exceptionality of language (cf. Pinker 1995, p. 20). However, by itself, the claim that some instinct is required to learn a language is compatible with the ability to produce and to understand utterances in a language being a skill. A comparison: a variety of studies suggest that infants (between three and twenty four months) have a predisposition for rhythmic movement in response to music and other metrically regular sounds (Demany et al. 1977; Trehub & Thorpe 1989; Hannon & Johnson 2005; Zentner and Eerola 2010). Moreover, infants as young as five months exhibit some tempo flexibility (e.g., Baruch & Drake 1997). These studies suggest that babies have a distinctive *musical instinct*—i.e., an instinct to respond to music and metrically regular sound with bodily movements and that this instinct for music might be necessary for acquiring certain skills, such as dancing or playing a musical instrument. However, the fact that these skills have an instinctual prerequisite does not thereby disqualify them from being skills. So, by itself, the fact that humans have a linguistic instinct does not necessarily make linguistic competence anything less than a skill.

Indeed, it seems clear that a variety of different cognitive abilities are required specifically for acquiring a language over other skills. Let us just list a few: the ability to process

relevant complex acoustic and/or visual inputs and to create the articulatory gestures involved in producing speech of one's own; the ability to control the vocal tract; the ability to store information in working memory; the productive ability of generating and contemplating thoughts; a variety of motor-chunking abilities required for both producing utterances and for interpreting the utterances of others, etc. For each of these prerequisite abilities, it makes sense to ask whether it is an instinct or a skill. If several of these abilities are instincts, then several different instincts constitute the essential background conditions for acquiring a language.

If so, one might concede that there is an innate scaffolding to linguistic competence and even that such an innate scaffolding is quite rich. Their being necessary for the acquisition of a language does not necessarily make a language an instinct rather than a skill. Just as it would be incorrect to conclude that tango skills are not genuine skills from the fact that dancing skills require basic abilities of this sort as prerequisite, *mutatis mutandis* so for linguistic competence.

In the following, we will take for granted that just like there is an innate scaffolding to musical, dancing, or motor skills, there is an innate scaffolding to linguistic skills, of the sort hinted above. The goal of this section is to outline a theory of linguistic skills that highlights the common innate scaffolding to linguistic skills and other skills.

6.1.2. Basic innate structural operations within minimalism

Generativists take MOVE to be a fundamental structural operation, which is itself composed of two operations—COPY and LINGUISTIC MERGE (e.g., Hornstein 2009 and Hornstein and Pietroski 2009). LINGUISTIC MERGE is itself composed of two further structural operations. First, it involves CONCATENATE, which consists in an instruction to combine atoms into sequences—i.e., A and B, into A^B. CONCATENATE is not specifically linguistic:

non-linguistic representations can be concatenated as well.[7] Second, LABEL assigns a category to the result of concatenating two conceptual atoms. So, for example, the result of applying LABEL to A^B might be [A A^B], with label A. Labeling it with 'A' in this fashion indicates that the concatenation A^B is as concatenable as A is and that its internal structure (A or B) is not available for further concatenation. In LINGUISTIC MERGE, LABEL gives words a *grammatical category*—noun/verb; subject/predicate/object. Effectively, LINGUISTIC MERGE combines grammatically labeled heads and complements into a new grammatically labeled constituent structured along binary branching which is available for further merging. As such, LINGUISTIC MERGE effectively amounts to *linguistic recursion* (Coolidge *et al* 2011). The sequential application of the operation of MOVE—composed out of COPY and MERGE—gives rise to hierarchical structures that obey c-commands and other structural constraints, or LF-representations.[8][9]

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[7] Also not specifically human (Steedman 2017).

[8] For example, moving A in [x A [A A^B] requires copying A and merging it, which will result in adding to the top of the chain, i.e., [x A [x A [A A^B]. So, in the resulting chain, the head (A) must c-command its foot ([x A [A A^B]).

[9] LF-representations arise from applying basic structural operations to atoms—which are sometimes thought of as lexical entries (cf. Pietroski 2015, Glanzberg 2018) which are understood as *pointers* to conceptual representations. So understood, LF-representations are tied to a particular lexicon, distinctively linguistic. A pitfall of going this route is that the resulting picture fails to cast light on purely conceptual and prelinguistic thoughts. However, plausibly, the capacity to reason *is* the capacity to manipulate conceptual representations which meet structural conditions not found in perception. Such conceptual representations will be already present before language has evolved or because it is acquired by an individual (Burge 2010). Another option is to posit different layers of LF-representations. The most basic layer corresponds to *proto-LF representations* which apply to conceptual, perceptual, as well as motor representations. The capacity for LINGUISTIC MERGE gives rise to basic LF-representations. Though specifically human, so understood LINGUISTIC MERGE applies basic structural operations to non-linguistic concepts as atoms. Recognizing this layer of pre-linguistic LF-representations does not preclude positing another layer of hierarchical representation, which involves lexical entries as atoms. This derived layer of LF-representations presupposes both the ability for conceptual thoughts and rich lexical knowledge. Derived LF-representations of this sort are obtained by imposing lexical constraints on basic structured propositions and in giving them linguistic structure. The nodes of these derived LF-representations are not simply conceptual representations and might instead be language-specific instructions for finding corresponding concepts (cf. Pietroski 2015). As such, they are language-specific. Linguistic thought corresponds to this level, which not only involves a linguistic reformatting of pre-linguistic thought but also enriches our representational resources in powerful ways by being informed by a publicly shared lexicon.

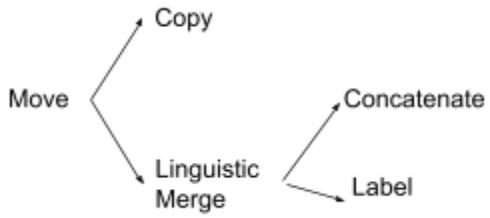

Figure 4: Basic Structural Operations

6.1.3 From Linguistic Merge to General Merge

Now, minimalism takes LINGUISTIC MERGE to be the core of the innate scaffolding to language. Thus, for minimalism, the innate scaffolding to language is language-specific and yet quite sparse.

Notice, though, that binary branching does not need to combine *grammatically* labeled nodes. There is a more general operation that combines nodes that are labeled in some way or another—not necessarily grammatically. Call such a general operation 'GENERAL MERGE'. We can think of GENERAL MERGE as a more abstract structural hierarchical operation—as an operation that can be used to model any cognitive system that exhibits a finite number of discrete, hierarchically organized objects (cf. Hinzen 2012). It effectively amounts to *general recursion*. As such, it is a *more general* cognitive tool—not just a tool for linguistic purposes.

Having distinguished between LINGUISTIC MERGE and GENERAL MERGE, we might correspondingly distinguish between a narrow and a broad conception of UG. Broadly conceived, UG is simply the productive capacity to generate hierarchical structures, out of a basic repertoire. UG is really a capacity for recursion—GENERAL MERGE. In our picture, this broad notion of UG is the innate scaffolding for acquiring a skill. This capacity is not language-specific, both in the sense that it is more general than the capacity to generate

linguistically structured propositions and in that it is deployed in a variety of skills, not just in language.

In minimalist discussions, UG is more often understood *narrowly* as involving only the capacity for specifically linguistically structured propositions (basic or derived LF structures). Constructed in this way, UG is the capacity for structured propositions that satisfy certain lexical constraints and that have the syntax of LF-structure. This level of cognition is not only human-specific but also *language-specific*, in the sense that it is characteristically deployed in linguistic performances. Though language-specific in this sense, it does presuppose a non-linguistic-specific level of cognition—the capacity to generate hierarchical structures.

In the emerging picture, only broad UG is innate; it is also not language specific, since it constitutes the common innate scaffolding to *every* skill—not just to linguistic skills. On the other hand, this picture is compatible with narrowly construed UG being not innate but acquired; for on this model, it can be allowed that, while the capacity for hierarchical structures might well be innate, we learn to form linguistically structured representations—such as LF-trees—only as we acquire a particular c-language.

6.2 The dual component model.

Having clarified the innate scaffolding common to linguistic skill and other skills, we go on to outline how to model specifically linguistic skills. In order to do so, we will assume the dual cognitive component of skills outlined in §4. According to it, acquiring a skill is a matter of gradually (through practice and learning) acquiring knowledge relevant to how to perform a given task and translating it into a procedure that maps one's intention and knowledge onto motor representations that govern the execution of said task.

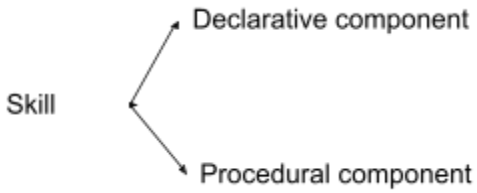

Figure 5: Dual Component View of Skills

Like any skill, c-languages involve a *declarative* component, which plausibly involves acquired knowledge of the relevant semantic conventions.[10] Knowledge of these conventions consists in knowledge of the meaning of the primitive words of the language, as well as of idioms.

How are we to think of the procedural component for c-languages? For the sake of clarity, we will distinguish between two highly interdependent, albeit different, procedures.[11] The first procedure is dedicated to mapping a speaker's intention to express certain thoughts, together with the speaker's knowledge of the relevant semantic conventions, onto utterances of that language by producing intermediate motor representations, understood as a set of motor instructions executed by the motor system. The second procedure maps utterances of others onto their interpretations and corresponds to the ability to interpret and understand a language.

In order to give an outline of the first procedure, it is helpful to break it down into its inputs and intermediate representations. We take the inputs to be thoughts—more precisely *structured thoughts*. We have outlined a model on which the innate scaffolding for skills is a capacity for hierarchical structures quite generally. In the case of linguistic skills, this general

[10]The declarative component of skills plausibly also involves morphological and phonetic knowledge of which sounds map onto which words—of the phonetic realizations of words.
[11] There is actually some evidence that competent speakers use the *same* procedure for both abilities, see Chater et al. 2016.

capacity is developed by applying it to basic linguistic categories, which are then mapped into basic LF-representations. These basic structured propositions are then mapped, in accordance with the speaker's intention to express them, to derived LF-representations.

The question we tackle next is how these derived LF-representations can be mapped onto linguistic utterances. First, we take utterances to be nothing but bodily movements—ones that come with distinctive phonetic effects, as in the case of spoken languages, or without phonetic effects, as in the case of sign-languages. This theoretical choice is well-motivated: utterances are things speakers *do*—they are *actions*; and a long tradition in action theory models actions as bodily movements. This choice is particularly well-suited to modeling the utterances of sign-languages—i.e., *gestures*. What about spoken languages? In this case too, utterances *are* bodily movements—in this case, ones that have certain phonetic effects. These bodily movements involve controlling the larynx position as well as making precise tongue, jaw, and lip gestures in order to create configurations of the vocal tract—also known as *acoustic cavities* in phonology (Boë et al. 2019)—and to control airflow so as to produce an array of different sounds.[12]

According to the current psychological theories of motor control (Schmidt 2003; Jeannerod 2006; Wolpert 1997), intentions to perform certain tasks are translated by the motor system into motoric representations of bodily movements. Motor representations of bodily movements can be thought of as an unfolding of sequences of motor instructions executable by the nervous system. More efficient motor representations are produced *via* practice, through

[12] Indeed, the state of the art in phonological studies suggests that what distinguishes humans from our ancestors are not so much anatomical differences concerning a descendant larynx, as formerly thought, but rather our ability to control the larynx position, as well as to create particular configurations of the vocal tract that enable us to produce those sounds (Boë et al. 2019).

which different motor instructions are chunked into simpler motor instructions, so to enable further expediency in the performance of the relevant motor task.

Translating intentions to express LF-representations into bodily movements (utterances) is just one particular example of more general translations of intentions into bodily movements studied by contemporary sensori-motor psychology. As discussed, the nodes of a derived LF-representation are lexical pointers, which point at corresponding motor concepts at an interface, which in turn retrieve a corresponding motor representation—a sequence of motor and phonetic instructions that correspond to that particular lexical entry. As one learns how to pronounce the words of a language, one produces chunked perceptual-motor representations corresponding to that word, which are stored in long-term memory. So, while a certain word might at first correspond to a complex motor instruction, with practice the complex motor instruction is chunked into a primitive motor instruction. When it comes to spoken languages, these motor instructions also concern bodily movements such as using precise tongue, jaw and lip gestures as well as controlling the larynx position, in order to control the vocal tract and the airflow. For these reasons, they are *phonetic-motor representations*. Translating a speaker's intention to express derived LF-epresentations, these phonetic motor representations flatten the characteristic hierarchical structure of LF-representation into a non-hierarchical sequential structure.

While the procedure that underlines the ability to produce utterances maps each LF-representation onto one and only one sequence of bodily movements, the inverse procedure (corresponding to the ability to interpret utterances of that language, by mapping them onto LF-representations) might map the same sequence of bodily movements onto different LF-representations, as in cases of unresolved structural ambiguity. This procedure too involves

the chunking of phonetic configurations into bits or chunks, both at the lexical and the sublexical level, which are then preserved and retrieved from long-term memory (McCauley & Christiansen 2015, Christiansen & Charter in press).

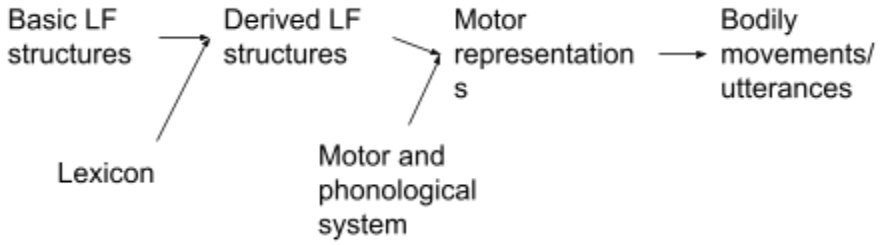

Figure 6: The Mapping

This concludes the outline of our simplified model of linguistic skills. We take this model to offer a proof of concept that the idea that language is a skill can preserve some generativist claims. It gives a vivid illustration of how the ability to express thoughts in a language and to interpret utterances in that language can be a skill *even though* it presupposes crucial innate abilities—such as the innate ability to produce hierarchical structures. One rationale for distinguishing the skill of language from these innate components is that the latter are operative in other skills as well. The capacity for productive hierarchical structures is a more general cognitive tool, we think, which is essential to other complex skilled activities, such as skill tool use, skill planning, strategic thoughts, and so on. So, far from being specific to the skill of language, this innate scaffolding constitutes a repertoire that human cognition deploys in a variety of different and not necessarily linguistic tasks. Second, and relatedly, once we have distinguished this innate component from language itself, thinking of language as a skill as

opposed to an instinct becomes less objectionable, as it does not come with rejecting a core assumption of the generative program—i.e., that the Basic Property of language has an innate and unlearnable component.

6.3 The Poverty of the Stimulus Argument

It is now time to discuss the Poverty of the Stimulus Argument, concerning how it is that human children reliably acquire computationally rich systems of linguistic thought and expression from the impoverished and highly variable linguistic data to which they are exposed. The Poverty of the Stimulus argument has regularly been invoked to show that language acquisition is fundamentally different from the acquisition of other skills.

We are skeptical of this way of construing the conclusions to be drawn from the Poverty of Stimulus. The developmental disanalogy between language and other skills is only striking when one focuses on idiosyncratic and culturally variable skills—for instance, on the skills involved in the ability to ride a bike, interpret traffic signs, dribble a basketball, or operate a helicopter. Such skills are acquired by a subset of human children after much explicit training, in contrast to the robustness of language acquisition. If instead one focused on culturally universal skills, for instance, like motor skills, skills involved in the extraction of resources from an environment, food processing techniques, the acquisition of social norms that specify rules for social interaction, policies of friendship and social bond formation, and which seem, despite some degree of variation, to be present in all human cultures that have ever been observed, the contrast between language and practical skills is far less robust. Not only are these skills universally acquired across human populations, they are acquired on the basis of improved data; children must, for instance, supplement the explicit instruction they are given to figure out the

social norms of turn-taking in conversation or how far away to stand someone in face-to-face conversation. Thus, insofar as the general Poverty of the Stimulus considerations apply to many other domains outside of language, it provides no good reason to endorse exceptionalism—for it provides no respect in which language is utterly unique cognitively and developmentally.[13]

We nonetheless think that the poverty of the stimulus argument does show something important—i.e., that there is some specific feature of human biology that explains why humans acquire structurally rich capacities for thought and communication in a way that other living animals, including our closest primate relatives, do not. In this sense, the poverty of the stimulus argument shows the shortcomings of a *radical* empiricist position, according to which the mature cognitive capacities that human children acquire are always and everywhere grounded in specific features of the input data to which they've been exposed. In the specific case of language, this radical empiricist position has it that language is robust acquired by human children in virtue of the fact that languages themselves have evolved across cultural generations to because easier to learn and produce (Christiansen and Chater 2008 and 2018; Hayes 2018)

We agree with Chomsky and others that this radical empiricist position is mistaken (more on this in §7). However, we resist the further claim that this provides any reason to adopt exceptionalism. On the view we have laid out in this section, humans have a species-typical biological endowment that innately prepares them to engage in syntactically rich computational operations involving the formation and manipulation of discrete cognitive elements that come to be combined together recursively to form hierarchical arrays of those discrete elements. This innate capacity for General MERGE helps human children learn one or more natural languages but it also helps learn a wide range of other computationally demanding skills. Some parts of the

[13] As Cowie (1999) has also forcefully emphasized.

language systems—such as the innate capacity for General MERGE—are developed in any normal learning environment in which children find themselves and independently of any specific data. Other parts of the language systems acquired will be more developmentally fragile—varying with specific properties of the linguistic data to which they are exposed.

This intermediate position concerning the force of the poverty of the stimulus argument is well motivated from the facts about language acquisition in human children.[14] Data involving so-called homesign languages, or systems of thought and communication constructed by congenitally deaf children not exposed to a conventional sign language, show something of the robustness of language acquisition in even the most informationally impoverished learning environments (Feldman et al 1978; 2003)---i.e., that capacities for MERGE do reliably develop in human individuals despite a radical impoverishment of the data to which they have been exposed. Yet as we have already noted, there are many crucial features of human languages that are not robust in this sense since they are more dependent on the learning environment to which children have been exposed and on processes of iterative learning that take place through cultural inheritance. Certain features of tense morphology, verb affixation, and other characteristic features of modern human languages are not present in these homesign systems (Goldin-Meadow 2008). In the case of Nicaraguan Sign Language, as generations of homesigners in were initially brought together and allowed to interact, the structural properties of their linguistic systems began to change: the expressive power of the languages acquired in the fourth and fifth generation of uses was richer than the expressive power of the first generation of home-signers.

[14]It has been increasingly common within mainstream generative linguistics—c.f. Chomsky (2005) and Yang (2010) to favor "third factor" explanations of the developmental robustness of language acquisition (i.e. explanations that center on *unlearned but non-instinctual* and *non-genetic* features of language developmental—for instance, structural principles of efficient computation in light of constraints imposed by the biochemistry of developing brains that reliably occur across environments).

Pulling the various strands of the discussion together, the poverty of the stimulus argument does show that there are some innate capacities for syntax that are included in our species-specific human biology. In these respects, our positive proposal is structurally similar to the treatment of the poverty-of-the stimulus argument given within the Minimalist Program. Rather than a hodgepodge of arbitrary linguistic rules, human grammars are held to be grounded in a capacity for MERGE. However, in contrast to the standard exceptionalist assumptions, we take this innate infrastructure not to be unique to language, but instead a general platform that is used in language and in a wide variety of other domains as well. And we think that important parts of the language acquisition process are indeed acquired in virtue of the data to which human children are exposed. In this sense, language acquisition is both a process of maturation or development in light of certain basic innate capacities, that these basic capacities must be supplemented both through trial-and-error learning of individual minds, but are often enriched through cultural processes of linguistic inheritance.[15]

7. Theoretical Gains

Language is a skill that comes with an innate scaffolding—GENERAL MERGE— that is common to a variety of different skills. This biological endowment provides a developmental platform around which skills can be reliably acquired and fluidly deployed. In the case of language, it provides the developmental platform around which creative acts of linguistic production and interpretation can take place.

[15] A number of theorists have called into question the extent to which the data to which human children are exposed in the process of language development is indeed informationally impoverished, holding, instead, that humans typically develop in informationally rich linguistic environments (e.g., Putnam 1971, Bohannon and Stanowicz 1988, Sampson 1989, Moerk 1991, Pullum 1996, Reali and Christiansen 2004, 2005).

Our proposal thus combines the thesis that human linguistic capacities are skills with a recognition of the reality of a broad sense of UG. This specific combination of commitments makes our particular brand of anti-exceptionalism particularly well-suited to capture the core *desiderata* with which we began. In this section, we will draw out this point by highlighting the advantages of our account over alternative accounts of human linguistic competences—over extreme anti-exceptionalism which deny the existence of both broad and narrow UG (§7.1) as well as against over standard forms of exceptionalism which deny that linguistic capacities are skills at all (§7.2).

7.1 Extreme Anti-Exceptionalism

Christiansen and Chater (2016, 2018) have recently proposed a radically use-driven account of language. According to their account, language is a skill that is wholly derived from the demands of interpersonal communication. Human agents need to efficiently process a wide range of communicative signals and, in turn, need to produce a wide range of communicative signals that can be efficiently processed by others. Linguistic competence is for them an interaction-effect that arises from purely domain-general mechanisms of the human brain that allow human agents to segment, remember, and produce structured devices of interpersonal communication. It is, according to this picture, *languages themselves* that evolve rather than any biologically-inherited capacity for structured thought or Universal Grammar. In particular, languages (i.e., sets of form-meaning pairs) are said to evolve through extended processes of iterated cultural evolution in which these languages come to conform to the domain-general constraints on the human brain and, thereby, become easier to use, learn, and repurpose (Christiansen and Chater 2016). Usage-based accounts of language provide *data-driven* models of language acquisition in which

the patterns language users learn conform to the patterns extracted from the linguistic data to which they are exposed. For Christiansen and Chater, this data-driven process of acquisition is *scaffolded* not by an innate component but by extended processes of cultural evolution which serve to make the patterns which language learners are exposed to easier and more efficient to acquire.

So, this approach to language might seem to be particularly well suited to capture several commonalities between language and skills—their learnability and their availability to cultural enrichment. And yet, Christiansen and Chater go as far as denying any innate scaffolding specific to language as well as an innate scaffolding common both to language and skills—including *any* recursive conditions (Christiansen and Chater 2016, ch 7). In fact, they forgo an explanation of the Basic Property of Language, which was our starting point.

The problem with extreme forms of anti-exceptionalism such as Christiansen and Chater, as we see it, is that the common recursive structure to skills and language is extremely surprising on this data driven view. Let us concede, for the sake of argument, that full recursion is not a basic property of language or of skills. Nonetheless, functionalist accounts will want to capture some limited degree of recursion to language. On this account, this limited recursion is learned and extracted from linguistic data. Likewise, we might imagine, *mutatis mutandis*, for any other skill. So on this view, presumably, the common recursive structure would be learned and extracted from the data specific to the relevant skills—whether linguistic skills, musical skills, dancing skills, or lifting skills. Even if the recursive structure were to be acquired in both the case of language and that of other skills, it still remains to explain why things so disparate exhibit the same structure. Why is it that such gerrymandered data all display the same non-linearized

hierarchical structure? It is hard to believe that such a structure is not something imposed top-down from the way the mind cognitions the world.

So, an extreme form of anti-exceptionalism that does not recognize the reality of an innate scaffolding such as broad UG is at loss explaining the common unboundedness of skilled action and language, for it cannot afford an explanation of their common recursive structure. As noted in §6, it also forestalls an explanation of the easiness of language acquisition, in light of the sparsity of the stimulus. These two considerations together—poverty of stimulus considerations, together with the need to account for commonality across skills—motivate moving away from radical anti-exceptionalism towards a more moderate form of anti-exceptionalism.

7.2 Language as a Culturally Mediated Skill

In §4, we have argued that human language capacities display the characteristic properties of skills. If language were an instinct, it would be a quite *sui generis* instinct, one that is unusually dependent on the social environment, size of the population, numbers of generations of practitioners, etc. This discussion already provides some abductive reasons to think that anti-exceptionalism about language is on the right track.

Additionally, as we have seen in §2, exceptionalism faces the evolutionary challenge of explaining both why UG evolves in any given lineage and why, in particular, it is only in the human lineage that UG evolved. The appeal to processes of biological assimilation provide a natural way to address these problems. UG evolved in the human lineage to satisfy a recurrent cognitive and communicative need—namely, the need to have cognitive resources that are suitable for representing a wide range of subject-matter in an integrated computational format

and to freely communicate about this subject-matter in acts of complex signal production and comprehension. This need was first generated in our lineage by the demands of forms of life that required our ancestors to be in possession of a wide range of cognitively demanding and culturally mediated skills for responding to and generating changes in their environments. These diverse skills provided a pre-existing condition for the evolution of language. Conversely, the fact that other living animals do not require the possession of a wide range of cognitively demanding and culturally mediated skills—from alloparental care, to the use of multi-part tools and the control of fire—provides a natural way to explain why it is only in the hominid lineage that UG evolved.

The account of the evolution of language we favor gives cultural factors a central explanatory role. This is because only individuals embedded in contexts replete with rich practices of cultural inheritance have the means and opportunity to acquire complex skills. Left to their own devices in isolation from other cultural models, lone individuals do not and often cannot not acquire the skills of knowing how to efficiently build complex stone tools or how to process otherwise inedible food sources (Boyd et al 2011; Sterelny 2012). This emphasis on the role of culture in the evolution of language highlights a more general set of considerations which favor the thesis that language is a skill.

This framework also provides a more adequate approach to the development of language. Human language acquisition is socially mediated. Human children do not become competent with a language in isolation from social interaction with others. As a number of studies have demonstrated, the ability to establish joint attention with others and to manipulate objects in a shared physical environment is essential for the process of early language development—not only for the acquisition of words and other basic lexical items, but also for the acquisition of a

variety of components of phrasal syntax (e.g., Tomasello 1987; Papafragou et al 2007). Moreover, languages themselves regularly undergo processes of cultural enrichment which serve to generate changes over time. Our account of language makes good sense of this fact: while language acquisition is guided by an innate infrastructure, it is nonetheless a complex social skill and, like many other social skills, it is mediated by interactions with others, so that even individuals not exposed to a conventional language model (e.g., those acquiring a home sign language) need to communicate with others if they are to acquire this competence.

Thus, both developmentally and evolutionarily, there are a plethora of reasons to think that c-languages are a lot like skills. Beyond these reasons, the thesis that language capacities are skills is supported by parallel considerations to the ones we have just provided against radically use-driven accounts of language. Just like functionalist accounts, generativism as understood within the minimalist tradition is not well-positioned to account for the commonalities between language and skills that we have emphasized through this article. According to Chomsky, human language is not a skill that we acquire—rather it is an instinct that we develop. The biological and innate basis of human language is LINGUISTIC MERGE: a recursive operation that targets specifically linguistic items and linguistic categories. This is the innate basis that, according to Chomsky, develops into a I-language through the first years of language development. Although generativists have themselves emphasized the common recursive structure to language and other skills, it is actually not clear that their apparatus is well positioned to capture this common recursive structure. Arguably, the fact that LINGUISTIC MERGE is innate part of the linguistic scaffolding does not explain why humans also display MUSICAL MERGE—the result of applying GENERAL MERGE to musical categories—or to DANCING MERGE—the result of applying GENERAL MERGE to dancing categories—or to LIFTING MERGE—where

GENERAL MERGE is applied to lifting categories. The innateness of LINGUISTIC MERGE does not explain why we find a variety of non-linguistic merge in e.g., prolongation structure in music, group structure in dance, body structure in lifting, as well as recursive structure in tool use and food processing etc.

This point is important. It is part of the generativist package to insist that LINGUISTIC MERGE is a *sui generis* recursive operation, one that cannot be simply conflated with other sorts of MERGE. For example, generativists insist that MOTORIC MERGE—MERGE applied only to motor representations—does not entail LINGUISTIC MERGE, for the former we share with non-human animals, not so the latter. But by parity of reasoning, the generativist is committed to the claim that LINGUISTIC MERGE is quite unlike other sorts of MERGE that we find in other skills. But recall that, according to minimalism, only LINGUISTIC MERGE, not a more general MERGE, is the innate scaffolding specific to language. It goes without saying that the innateness of LINGUISTIC MERGE does not entail the innateness of any other specialized MERGE—for LINGUISTIC MERGE only targets linguistic items and linguistic categories. Thus, just like extreme anti-exceptionalism, exceptionalism about language is cornered into a position from which it is hard to capture the common recursive structure to language and to other skills that are distinctive to humans.

8. Conclusions

The generative approach to language has long been criticized for assuming a characterizations of the nature, ontogenetic development, and phylogenetic evolution of human linguistic competences which ignores or otherwise abstracts away from the social and ecological contexts of language use. For this reason, generative approaches to the study of language have long

seemed at odds with functional and social approaches to the study of language, which instead have emphasized some of the commonalities between language and skills. This perceived antagonism has led those working on functional and social approaches to language to ignore the insights of generative linguistics and, in turn, has led those working in generative linguistics to downplay or flat out deny the essentially social and environmentally-dependent nature of linguistic competence.

We think it is long past time for a rapprochement between these approaches to the study of human language. Our thesis that human linguistic competence is a skill guided by a (non-language specific) biological endowment provides a useful corrective to the internalist presuppositions that have dominated work in generative linguistics. The thesis that linguistic competence is a skill provides a theoretically unified and empirically well-motivated way of capturing what is right about the generative program while at the same time avoiding its most serious pitfalls.

COMPLIANCE WITH ETHICAL STANDARDS

The authors have no potential or actual conflicts of interest to declare. This research did not involve human participants nor animals.

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