What is Special About
the Human Language Faculty
and How Did it Get That Way?

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In making the case for evolutionary shaping of the human language faculty, little of what I have to say will be new to most readers of this book. My purpose in building that case, however, is to set the stage for discussing what seems to me to be a false dichotomy in much theorizing about language. That is the notion that we have to choose between attributing a property to the human cognitive faculty of language on the one hand, and providing an account of it that is external to this aspect of the structure of the mind on the other: that these options are mutually exclusive, such that something is either a consequence of the structure of Universal Grammar or else it has a basis in function, or processing, or the workings of historical change, or whatever. I want to suggest that these two foundations for linguistic structure are not incompatible, and that in fact evolutionary considerations ought to lead us to expect a kind of duplication of foundation for much that is important in language. If this is correct, it actually leaves linguists in rather worse shape, with more basic questions than before and less of an idea of how to go about answering them. But that may nonetheless be the situation we face.

Linguistics is, fairly uncontroversially, the scientific study of “language.” But when we try to be more precise, the sense of what we are studying is less obvious, and has changed a lot over time. For present purposes, I will assume that — following the “cognitive revolution” — what we want to study is not sets of sounds, or words, or sentences, or texts in themselves, “E-language” in the contemporary usage of linguists, but rather the knowledge or cognitive capacity that underlies our production and understanding of these things — linguists’ “I-language.”

However we eventually characterize this capacity, it does seem clear that it is a property of us as human beings. Absent severe and obvious pathology, all humans acquire and use language spontaneously and without the need for explicit instruction; and furthermore, no member of any other species appears to have the capacity to do this, with or without instruction. When we look at the communicative behavior of other species in nature, we find (as we tell our students in Linguistics) that all such systems are quite different in character from that of human language. They are based on fixed inventories of messages, essentially limited to the here and now; these inventories cannot be expanded ad hoc by combining elements to form new and different messages. In nearly all cases, these
systems emerge in the individual without the need for relevant experience, although in some cases there may be a limited amount of refinement in the precise conditions of use of a given message, based on observation. Even in those cases where vocal learning occurs, of which song in oscine birds, hummingbirds, and perhaps parrots is by far the most robust example, the actual system which is acquired does not transcend the character of such a fixed list of conveyable messages.

The most basic properties of human natural language show some limited similarities to other systems, but they are quite different in fundamental ways. On the one hand, human language seems to be distinctive to our species, and rooted in our biology, just as other animals’ communication systems are part of their specific makeup. Human language is learned, in the sense that experience affects which possibility from within a limited space (the set of possible human languages) will be realized in a given child. Birdsong provides really the only parallel to this pattern of development, while in most animals, including all of the other primates, communication is entirely innate, and develops in a fixed way that is independent of experience.

But where other species have fixed, limited sets of messages they can convey, humans have an unbounded range of things that can be expressed in language. And here there is no analogy with birdsong, since a bird’s song always carries the same message, even in species that learn a number of distinct songs by which it may be conveyed. Human language use is also unusual in being voluntary, controlled mainly by cortical centers, while with the possible exception of some ape gestures, other animals produce communicative signals under various sorts of non-voluntary control.

In more specific terms, human languages are distinctive in being based on the combination of discrete elements. Any kind of combination is virtually unknown in the communicative behavior of other species, and what flexibility they show is usually obtained by variation along continuous dimensions (as in the dances of European honeybees).

An important property of human language that is sometimes undervalued is what Hockett (1960) christened “duality of patterning.” In a human language, individually meaningless sounds combine to make words by means of a system of phonology; and these words combine by means of a completely distinct system (syntax) to make messages. The presence of productive phonology in
addition to syntax is not just an ornament: it is what makes large vocabularies practical. Understanding the structure and emergence of the properties of phonology is thus another important task for those who would understand the evolution of language, in addition to the emergence of grammar. All of these properties of human language, and especially the possibility of syntactic combination, are quite unique in the animal world.

Despite heroic efforts leading to much research that is fascinating in its own right, all attempts to teach a system that genuinely displays the properties of a human language to other animals have failed. This assertion is controversial in some quarters, and its detailed defense is beyond the scope of this paper: for an outline of the relevant arguments, see Anderson 2004. The bottom line is that there is no evidence that any other animal is capable of acquiring and using a system with the core properties of human language, one constituting a discrete combinatorial system, based on recursive, hierarchical syntax, and displaying two independent levels of systematic structure — one for the composition of meaningful units and one for their combination into full messages.

Really, though, there is no reason to expect that our means of communication should be accessible to animals with a different biology, any more than we expect ourselves to be able to catch bugs by emitting short pulses of sound and listening for the echo, like a bat. Language as we deploy it is a part of our biological nature, just as echolocation is part of the biology of (microchiroptera) bats. But once we accept the conclusion that language is a part of human biology, that provides a strong impetus to look for an explanation of its properties in the primary mechanism that accounts for structure in the biological world: evolution. The following section considers the plausibility of an evolutionary account of human language as we find it in modern *Homo sapiens*.

1 The Language Faculty as the Product of Evolution

In the famous words of the title of Dobzhansky 1973, “Nothing in biology makes sense except in the light of evolution.” Once we focus on the species-specific character of language, it stands out as a biological phenomenon, and thus the default assumption is that its character is to be understood in
terms of its evolution.

Discussion of the origins of human language was largely absent from the scientific literature of linguistics for many years, beginning with the famous proscription of the topic in a clause in the 1866 constitution of the Société linguistique de Paris, for the very good reason that there was very little relevant science that could be brought to bear on the matter at that time. In 1990, however, Pinker & Bloom argued that language has the characteristics of a faculty that has evolved by natural selection, and in that way they re-installed evolutionary questions as legitimate matters of inquiry in the field. Pinker and Bloom argued that language is a system with a complex internal structure, consisting of a number of specifically organized components and mechanisms that fit together in a specific way; and in so doing support a particular function for the organism, namely, the expression and communication of knowledge, a function which is adaptively significant in that it allows us to share and to accumulate the benefits of experience, as well as expressing effectively the character of our relations with our conspecifics.

Collectively, these properties point to a capacity that is a good candidate for having been shaped by the processes of evolution. This plausibility argument, however, is insufficient. To argue that the human language faculty is indeed the product of evolution by natural selection, it is necessary to show that the empirical requirements of such an account are satisfied. Associating a trait like language with an evolutionary explanation is not just a matter of a general commitment to scientific method; evolution of a given trait by natural selection can only take place to the extent certain prerequisites are met, as made clear in Darwin's original account and not significantly revised by subsequent research. The trait has to be shown to be variable among the members of the species, such that the variation is transmitted by hereditary mechanisms – that is, offspring are similar to their parents along the axes of variability of the trait, independent of other influences from the environment. Furthermore, variation in the trait must be correlated with differential reproductive success: that is, individuals are more or less likely to be able to transmit their character with respect to the given trait as a function of where on the range of variation they fall.
1.1 Is the Language Faculty Variable?

Looking at these issues one at a time, we can start by asking how variable the language capacity is. Actually, we ought to ask how variable it was at some point in the past when the relevant evolutionary processes came into play, but the question of variability now is still worth exploring.

It is in fact an article of faith among linguists, a premise seemingly not in need of explicit justification, that the human language faculty is uniform across the species. It is undoubtedly true that a child raised in any human society will acquire the language(s) of that community regardless of the language of the child’s biological parents. That hardly means, however, that there is no variation in the details of the acquisition of diverse languages by children of diverse parentage — only that whatever variation there may be is insufficient to pose an absolute barrier to the learning of certain languages by certain children. Indeed, many of the same linguists who maintain that the language faculty does not vary across the species are also adherents of the view that the language faculty is a property of our biology. It would be close to impossible to find any non-trivial biologically determined characteristic of humans (or any other species) that displayed no variation at all. The sort of Orwellian doublethink required to maintain both of these views simultaneously is unlikely to provide a sound basis for an understanding of human language.

In principle, it is surely unnecessary to show that some individuals are incapable of learning certain languages in order to argue that the capacity is not uniform. If we were able to study a set of neonates from diverse genetic backgrounds transposed into communities speaking languages of various structures, and compare the fine details of their acquisition of these languages with those of a corresponding set of children born into those communities, we might well find small differences. Such differences might indicate that some children have a limited but discoverable advantage in acquiring some languages but not others. In practice, such an experiment or others that could be done to establish whether or not the language abilities of some human populations differ in some respects from others would be too disruptive to the subjects involved and too politically sensitive — implying, as they might, an interest in racial differences — for there to be any likelihood of their being carried out. But despite the difficulty of empirical demonstration here, it is hard to maintain
that the hypothesis of cross-species invariability is self-evidently true, as often assumed. Evidence to be discussed in section 1.2 shows that genetically determined community-specific differences in language capacity do exist at the margins, in the form of heritable language disorders. There is no reason to deny the possibility of much subtler effects with similar bases.

We do know that the broad capacity for human languages has apparently been roughly uniform for at least 40–50,000 years, since the settlement of Australia (whose indigenous languages are comparable in structure to those spoken elsewhere in the world). This suggests that there is not much present genetic variation in the basic properties of the language faculty, or that it has not been subject to recent selection. It does not show that the human capacity for language is not an evolved one, because evolution can fix an advantageous trait at 100% in a population. It also does not show that there is no variation among individuals, at least within some (possibly narrow) limits. And in fact, there is obviously some variation: some children learn faster than others, and some individuals have abilities well below the population norm (deficits). Given these facts, there is no reason to doubt that there has long been sufficient variation in language capacities across our species for natural selection to work with.

1.2 Is the Language Faculty Heritable?

The heritability of a given trait is the proportion of phenotypic variation in the trait that is accounted for by genetic variation. Evidence from a variety of sources for the heritability of variation in language ability is surveyed by Stromswold (2001, 2010). This includes results from three sorts of study that support such heritability: monozygotic twins are more nearly similar with respect to language ability than dizygotic twins; adopted children are more similar to their genetic relatives than to their co-siblings; and certain familial language disorders within the broad class of “Specific Language Impairment” run in families in ways that pattern like simply mendelian traits.

Better evidence would of course be provided if it were possible to identify specific genes responsible for the human language capacity, but this is vastly more complex than the usual portrayal in popular discussions. A great amount of excitement has been associated with the identification of
a defective allele of the gene FOXP2 in a specific language impairment, to the extent that FOXP2 has been widely labelled a “language gene.” In fact, FOXP2 does not itself code for any particular structure, but rather for a transcription factor which influences the expression of some four dozen or more other genes in a variety of areas of the body. Evidence for the specific set of genes regulated by the FOXP2 protein is presented by Konopka et al. (2009), but the particular role of any of these in the development of language remains obscure.

Other examples in which identifiable genetic polymorphisms are related to disorders of language have also come to light, such as the association of a mutation on chromosome 16 with heritable Specific Language Impairment in an isolated population in Chile (Villanueva et al. 2010). The complexity of inferences from specific genetic material to cognitive capacities in cases like this, with a particular focus on the example of FOXP2, is explored by Fisher (2006). Various recent discoveries concerning FOXP2 are tantalizing, but quite inconclusive. For example, the modern human form of the gene seems to have undergone a selective sweep at some point. Furthermore, the derived modern human form of the gene was apparently shared by *Homo neanderthalensis*. These facts, plus evidence that the form of Foxp2 found in oscine birds is expressed in areas of the brain such as Area X that are important to song learning, are interesting but do not tell us much about what the role of this gene might be in determining the nature and structure of the human language faculty.

Another argument supporting the general point that aspects of the language faculty are shaped by heritable factors is discussed by Ladd et al. (2008). They explore two genes recently identified with brain growth and development: ASPM, which is known to be expressed in the sites of prenatal cerebral cortical neurogenesis in mice, and Microcephalin-1, a DNA-damage response protein whose inactivation in humans results in a small brain and mental retardation. New alleles of both (ASPM-D and MCPH-D) were recently identified, and one group associated with this work claimed that the polymorphisms involved were connected with brain size and intelligence. Subsequent studies have shown that there is no correlation with either, and the earlier assertions have become a kind of classic of bad inference from genetic data. There are indications of selections for the individual SNPs characterizing the new alleles, but this actually involves a large piece of the genome that includes (but is not at all
limited to) those sites, meaning that the selection may well have nothing to do with ASPM-D and MCPH-D.

The original inferences about the functions of these genes may have been bad, but data from a wide population sample showing a non-random geographical distribution is apparently reliable. Specifically, the distribution of the distinct alleles of these genes in human populations correlates significantly with the distribution of tonal contrasts in the world’s languages. Dediu and Ladd offer a map correlating the presence of linguistic tone with the population frequency of ASPM-D and MCPH-D. The correlation of the allelic variance of these genes with linguistic tone is by no means perfect, but it is suggestive: in particular, populations with high frequencies of both innovative alleles by and large speak languages without tonal contrasts, while those with low frequencies of both are much more likely to have such contrasts.

It is important to stress that Dediu and Ladd do not at all claim to have identified “genes for tone.” The effect is much subtler than that. What they do suggest is a correlation between specific genetic markers, differences that presumably arose quite independent of anything to do with tone, and the propensity of speakers to develop and/or maintain tonal contrasts in their languages.

Tone contrasts in a great many languages can be shown to have come or gone within the relatively recent past: this is a feature of languages that is relatively amenable to change. There are fairly well understood mechanisms by which tonal contrasts emerge from earlier non-tonal phonological content (see papers in Fromkin 1978 for some discussion). As a result, the observed asymmetry could result from a difference between populations in the predilection to make the kind of re-analysis that leads to the development of tone: if different individuals were more or less likely to make such a re-analysis, this would produce a difference in the likelihood of their developing a tone language, and it would not really take a huge effect for this difference to be quite significant over many generations.

The point of this example is really to demonstrate some genetic variation that is related to a feature of language. The genes involved are not the basis of that feature, but they do appear to be correlated with a disposition to develop it. In particular, the innovative alleles are associated with non-tonal languages, and so their effect seems to be to diminish the development of tonal contrasts.
Although the genes in question are shown by molecular genetic studies to have been subject to recent selection, this is almost certainly on the basis of effects they have elsewhere, such as on aspects of brain growth and development, quite independent of an ancillary effect on the likelihood of developing tonal contrasts.

The rapid progress in analyzing the human genome that is taking place today will no doubt lead to the identification of numerous additional genetic markers that are correlated in one way or another with the human capacity for language, and thus reinforce the broad conclusion that this capacity is heritable. Much more needs to be done, however, before our understanding of the relation between genotype and phenotype will be able to support claims about specific aspects of that capacity that are genetically encoded.

### 1.3 Is the Language Faculty Adaptive?

Turning to the question of adaptiveness, it might just seem obvious that having language is very advantageous. After all, humanity seems to have been enormously successful over that portion of our history that is co-extensive with the possession of language.

Perhaps that is true for language as we find it today, but explanations in terms of Natural Selection generally require us to get to the final state through a series of gradual but individually advantageous adaptations. That is, we need to show that individuals who had a little bit more of the language capacity than those who did not gained a reproductive advantage, under the conditions that obtained for humans at that time, even though they did not have language faculties equivalent to those of fully modern humans. And this is not easy. For example, the plausible notion that language provided an increase in individuals’ “inclusive fitness” as an example of kin selection is argued persuasively by Tallerman (this volume) to be illusory.

It is especially hard to show that the specific details of the language faculty, which seem to be common across the species, would have conferred that kind of advantage. In fact, there is a lot of controversy about this, and the very same features of language are seen quite differently by different scholars, in ways that are difficult to adjudicate. Communication, for example, is frequently invoked...
as a driving force shaping language, but while Pinker & Bloom (1990) argue that the details of language are excellently fitted to its use in communication, Fitch et al. (2005) and Piattelli-Palmarini (2008) argue that in many instances linguistic structure is actually counter-productive for communicative purposes.

If, as argued above, there is variation in the language capacity that can be inherited, we need to show that there is a plausible basis for selecting individuals who possess the capacity over those who do not. That is, we need to show that language provides a selective advantage. The best way to do that, of course, would be to show that aspects of the language faculty actually had been selected: that is, a molecular genetic demonstration that genes coding for Language have been under selection pressure.

As discussed in section 1.2, though, we have not identified such genes yet, much less established the relevant relations between genotype and phenotype, so it is hard to make such an argument. It is true that the human form of FOXP2 has been argued to show evidence of being a target of direct selection over the past 200,000 years, and to have become essentially fixed across the species. The expression and developmental role of FOXP2 is sufficiently diverse, however, that it is difficult to argue that whatever selection pressure has affected it was related to its role in language. The two genes referenced by Dediu and Ladd (MCPH-D and ASPM-D) have also been the targets of selection, but too recently to be involved in the emergence of language, and the selection pressures there presumably have to do with other aspects of development, with ancillary consequences (that are selectionally neutral) for Language.

As a result, we are left having to rely on the a priori argument that language ability would have conferred enhanced fitness, and that it might have been the target of natural selection as a result. In the broadest terms, this is probably quite plausible, but we are still left seeking an account of factors that could have shaped the language faculty in the specific ways we find it today. These are seldom amenable to claims of enhanced fitness in their own right, and so remain problematic from an evolutionary point of view.
1.4 The Language Faculty and Evolution

Overall, the properties of the language faculty appear to be those of a system shaped by evolution, as Pinker & Bloom (1990) argued many years ago. This is entirely to be expected – when we look at the communication systems of other species, we generally find that they are tightly integrated into the overall biology of the animal, which in turn is undoubtedly shaped by the properties of the communication system. Examples of this integration include the dual olfactory systems found in many species. One of these is centered on the vomeronasal organ, a structure specialized for a range of pheromones, which are substances of great communicative significance for the animal. This system is structurally distinct from another, involving the main olfactory epithelium, which is used for a much broader range of olfactory experience. The two sensory organs project to different parts of the brain; the aspect of this that bears on present concerns is that the response of the vomeronasal organ is highly specific to the individual species and in fact rapidly modifiable in genetic terms to suit evolving communicative needs of the animal (for discussion of this in mice and rats, see Grus & Zhang 2004).

Examples from other modalities include the tight link between the auditory properties of sound communication in various species and the structure of the corresponding perceptual system. The auditory systems of frogs, bees, and many other species have long been known to display particular, heightened sensitivity in exactly the frequency ranges that are characteristic of conspecific sound production. In comparative perspective, it would actually be rather remarkable if something as important to humanity as our faculty for linguistic communication had not been shaped in our biology along similar lines by evolutionary pressures.

But of course there are those who believe otherwise, maintaining that the language faculty is at most the product of a single global genetic change, or perhaps simply an emergent property resulting from the rest of our biology, without any connection between its specific properties and anything in evolution. One prominent argument along those lines maintains that there is virtually nothing about the language faculty that is specific to it: that the faculty of language in the narrow sense of what is unique both to humans and to language (“FLN”) is confined to the single property
of recursive combination in syntax, as argued by Hauser et al. (2002). In support of this, Hauser et al. argue (see also Fitch et al. 2005) that everything else relevant to language in a broad sense (“FLB”) finds analogues or homologues in other species or in other cognitive domains, and so is not to be analyzed in terms of evolutionary pressures related to language per se. That line of reasoning seems unpersuasive to me, however.

When we look at the components of FLB for which we might claim analogues or homologues elsewhere, it remains the case that their specific form in our species appears to show adaptation driven by increased utility for their use in supporting language. Where we find analogous properties in other species, such as the capacity for vocal imitation and learning, we still need to account for the fact that they have emerged independently in ours, since they are absent in our close relatives the other primates.

Even where we have reason to believe that a property with a role in language is a homologous one we share with non-linguistic species on the basis of common descent, it is often possible to argue that its role in language has nonetheless shaped the specific form it takes in Homo sapiens. Thus, even if categorical perception is a general trait of mammalian auditory systems, the specific set of categories that come into play in our perception of speech seems to have been shaped by the details of the motoric bases of speech production. Pinker & Jackendoff (2005) review a number of subtle but significant differences along these lines in perceptual categories between humans and other animals.

Similarly, we now know (following Fitch 2002) that the lowering of the larynx is not confined to humans, as was long thought. It seems plausible to argue, though, that the reason our larynx is permanently and stably lowered, and not lowered only when necessary for purposes such as exaggerating our size, is that the resulting position plays an essential role in facilitating a wide range of speech articulations. Although the capacity to lower the larynx was surely inherited from a common ancestor shared with non-linguistic species, the position of the modern human larynx has still been shaped to a significant extent by the advantages that position offers in speech.

It should be obvious from my remarks in this paper that I believe the language faculty contains rather more than just a single operation combining sentence parts. But wouldn't it be a lot better to
avoid attributing a lot of specific content to the shaping of this faculty by evolution, and instead to derive the details from more general principles of computation, communication and so on?

That is certainly an interesting agenda, but the one possible analogue we know of — song in oscine birds — suggests that it is not likely to work out. These birds are the closest parallel we have to some significant component of human language, in the process by which they learn their songs. In particular, for every one of the several thousand species with learned song, the specific songs that can be acquired are selected from a range that is characteristic of that individual species. This may be relatively narrow, as with swamp sparrows, or broad, as with canaries or nightingales, but we have to say that what every bird learns is delimited on the basis of a species-specific song faculty.

Suppose that we were nightingales trying to carry out a sort of minimalist program. We would observe that although members of our species can learn a large number of songs (at least several hundred per individual), all of these display a uniform four part structure (an $\alpha$, a $\beta$, a $\gamma$ and an $\omega$ part, each of which has particular characteristics: cf. Todt & Hultsch 1998). Songs that deviate from that form are either not learned or adjusted so as to confirm to it, demonstrating the force of the pattern for the nightingale learning system. By parity of reasoning with the program that sees most properties of human language not as contingent, evolutionarily shaped characteristics of Homo sapiens, but as following from the nature of the computational problem to be solved together with the apparatus available to implement a solution, we would surely want to argue that the four-part structure of nightingale song is a consequence of the nature of song, not the biological nature of nightingales.

But then our colleagues, the zebra finches, would point out that we must have that wrong. In their species, song also has a compelling and rather specific form: see the recent work of Fehér et al. (2009) showing that zebra finches converge on species-typical song even in the absence of appropriate input models within a few generations. But the pattern of that song is entirely different from that of nightingales, and our hypothetical zebra finch minimalists would want to attribute that pattern to the nature of the computational problem being solved together with the properties of vocal, auditory and conceptual systems of the birds. Since none of these factors appear to differ in relevant ways
between nightingales and zebra finches (or indeed among the several thousand oscine species for which comparable analyses could potentially be developed), it seems reasonable to see the differences as matters of species-specific biology, shaped by the particular contingent evolutionary history of the various birds involved.

When we bring this argument back to apply to our understanding of human language, we see that what differentiates the human case from that of birds is not necessarily the logic of the situation. Discussion of these matters sometimes confuses the diversity of birdsong with the diversity of human language, but that analogy is quite misleading. All of the world’s languages fall within the capacity of a single species: *Homo sapiens*. That is the only species that can learn language, and there is only a single language faculty. We must note that while we can compare the song systems of thousands of different species in the case of birdsong, in the case of human language we only have one species — *Homo sapiens* — to examine. What may seem logically necessary from our point of view might take on a much different appearance if we had thousands of distinct species of language-using hominins to examine, in which case we might well expect to find a diversity of specific language faculties to have developed across these species. From that perspective, it does not seem implausible to maintain that a large part of the seemingly arbitrary particularity we find in human language is in fact contingent and shaped by our particular evolutionary history.

2. **The Evolution of UG and the Content of I-languages**

So, to return to the relevance of these observations to our purpose here, human language is characteristic of our species. It appears that a language faculty that supports rapid and efficient acquisition and use of natural language is a consequence of our biological nature as humans, and probably arose through Natural Selection. Such a faculty supports the development of competence in the language of the surrounding community in a largely effortless way during the first years of life by all normal humans who are not handicapped in their access to that language.

We can differ in our views of whether the bases of that ability are all specific to the domain of
language, or whether some are essentially connected, in part or even entirely, with more domain-general abilities. The bottom line is that there is a package of abilities which underlie language learning and use, and which as a whole is unique to our species.

For linguists, the nature and structure of that cognitive capacity is the logical object of inquiry in the field. But how is it to be studied? In particular, how are we to identify the properties that we should attribute to the human language capacity? Teasing apart the relevant facts about language is a somewhat more difficult task than the corresponding problem in the study of most other biological traits.

### 2.1 Sources of I-language

Decomposing the problem, we can ask what factors contribute to the grammars we find in individuals. These arise, of course, on the basis of the learner's experience with utterances in the surroundings, the Primary Linguistic Data, and the grammar will of course reflect some properties of those data. Since the grammar that is acquired is not just a list of the utterances heard, there have to be some principles of inference that are applied to the available data — a learning algorithm.

Another factor is the space of grammars that are cognitively possible, given the organization of the brain. This is often conflated with the learning algorithm as the language faculty (or “UG”), but the two are logically distinct: it is at least logically possible that there are cognitively possible grammars that are inaccessible because they could not be learned by the available procedure, or systems the learning algorithm could produce that would not be possible grammars. But I will disregard those factors here and conflate these as the effects of UG in shaping the grammars we observe.

On this analysis, we say that the learning algorithm maps the Primary Linguistic Data onto a specific grammar $G$. If we now ask for the source of any particular property of $G$, we can identify at least three possibilities:

1. It might be due to regularities in the input data; or

2. It might be contributed by the way the learning algorithm manipulates the data; or
3. It might be something that is cognitively necessary, in the sense that it is constitutive of language in general.

But for any given observed property, how can we distinguish among these alternatives?

2.2 “Poverty of the Stimulus”

What we are interested in as scientists is the set of properties that are constitutive of language in general, and there is one form of reasoning that seems to identify at least some such properties in a fairly precise way. This is the argument from what is called the “Poverty of the Stimulus.” If we can show that the I-language acquired by speakers has some characteristic property, and also that in the data they had to go on in learning their language there was insufficient evidence to determine that property, we can be pretty sure that it came from the language faculty.

Although there are a number of instances of this argument in the literature, the one that tends to be discussed the most concerns the fact that children show evidence from very early stages of an understanding that grammatical principles treat sentences in terms of structural constituents, not just as strings of words. And the central example of this is the fronting of auxiliaries in forming English yes-no questions. The conventional wisdom here is that little or no data is available the language sample available to the very young child that would force a choice between structure-based and string-based analyses of question formation (and other rules). Nonetheless, children consistently demonstrate a structure-based interpretation of such grammatical regularities.

There is a lot of controversy about this, with claims and counter-claims about how poor the data really are, and at least one argument that structure-sensitivity could be inferred statistically even from an impoverished corpus. But to cut short that discussion, is it really plausible that every child entertains the possibility that the regularities she observes might be string-based or structure-based, and is only brought to the right conclusion contingently, after much analysis of the input, experience, and possibly fallible inference? That is hard to reconcile with the fact the children do not make errors of the sort we would expect if they were trying out the string-based possibility; and that in fact we never find languages in which a generation of learners has, as it were, gone astray and made the wrong
inferences. As far as we know, all grammatical rules in all languages are based on the analysis of sentences in terms of their constituent structure, not just as a string of words. And that suggests that this is a property of language, not just of particular rules in particular languages, rules and languages that could have been otherwise. It seems much more sensible to attribute structure-sensitivity to the organization of the language faculty. On that basis, learners never go astray because they never entertain anything but structure-based hypotheses.

That seems the most plausible result, but it is a lot harder to go further and show that it is a necessary one, because we cannot completely exclude the alternative that structure-sensitivity is learned, which is at least a logical possibility. There are other arguments from the poverty of the stimulus, and in general they have not been analyzed in nearly as much detail as the English yes-no question case with regard to whether the stimulus is really as impoverished as it seems, at least at the limits of logical possibility. But the point of this example is not to demonstrate a specific property that must be attributed to UG. My intent here is quite difficult: I intend to point out the difficulty of showing, for a particular property of grammars, that it absolutely must be a consequence of the structure of the language faculty.

2.3 The Evidential Value of Universals

While “Poverty of the Stimulus” arguments are extremely powerful in the abstract, they are difficult to mount in a completely convincing way, and in fact, most claims about properties that ought to be attributed to the language faculty are grounded instead in discussions of cross-linguistic generalizations. The logic here is that when we find some property in language after language, it is tempting to say that that property is determined by the language faculty, either as a consequence of the way the learning algorithm works, or as a property of the set of grammars that are cognitively possible. But that conclusion is necessarily even more tentative than in the “Poverty of the Stimulus” case. It might just be that languages are all like that because the data available to language learners always happens to instantiate the regularity in question, in which case the structure of UG need only be such as to allow for the learning of the property, not necessarily to require it.
At one extreme, it might be the case that the regularity in question was an adventitious fact about the original language from which all others are descended — “proto-World,” assuming language originated only once in human history — and language change has just never eliminated it. If that were true, there would be no need to elevate it to the status of a cognitive necessity. Of course, for universals that we find instantiated in signed languages (Sandler & Lillo-Martin 2006), this cannot be the case, since as far as we know none of these have histories going back to proto-World. But this is not in any case a terribly serious suggestion, since proposals to reduce the significance of proposed universals along these lines have not been seriously made (unless one interprets some remarks of Evans & Levinson (2009: 477) in that spirit).

More interestingly, something we find in general across languages might well derive as a necessary consequence of the structure of the language faculty. But while this is a possibility, it might also be that there is some external force operating on the data available to acquisition that imposed the regularity in question, in which case we could again avoid the conclusion that the language faculty was responsible by saying that the observed regularity is just learned in every case. These two are commonly seen as incompatible, but in fact it is at least logically possible that both are true: some external force conspires to make all languages alike in some respect, and the language faculty is organized such that learning or the space of languages is limited to languages with this property.

While much discussion from the 1960s through the early 1990s focused on potential inferences from universals to the structure of the language faculty, the balance shifted somewhat around the turn of the millennium. In particular, Juliette Blevins (2004) has argued, based on work by various people on the factors contributing to linguistic change, that virtually all of the standardly cited regularities of phonological structure are actually products of mechanisms of change, things that do not depend on the cognitive faculty for language in essential ways; and that therefore we have no basis for inferring properties of that faculty from phonological universals. Jeff Mielke (2008) has similarly argued that no general feature system needs to be provided by phonological theory, since the dimensions along which phonological systems generalize emerge from the effects of historical change.

On these views, the locus of explanation in phonology shifts back from synchronic structure...
to diachrony, more or less where our Neogrammarian ancestors told us it should be. To the extent we can ground regularities of phonological structure in the properties of change, Blevins and Mielke suggest we do not need to attribute them to the structure of the language faculty.

Newmeyer (2006) pursues a somewhat similar line with regard to some regularities of syntactic structure, based on proposals in work of Hawkins (1994, 2004). On this account, functional motivations lead speakers to choose particular structures whenever possible; later learners interpret the predominance of these structures in the data to a rule of grammar. Allowable variation in syntactic form that is perfectly within the bounds of cognitive possibility — and thus, within the limits of the Language Faculty — tends to be reduced so as to favor structures that offer various functional or processing advantages. Simplifying somewhat, later learners assume that the only structures they hear are the only ones that are possible, and so deduce corresponding rules that mirror the functional or processing properties driving the original biases in the data.

And when these rules recur in language after language, they become something like linguistic universals — but the important point is that these universals derive not from the autonomous characteristics of the language faculty, but rather from external forces that have shaped the data in particular ways. When the effects of those forces become entrenched across languages, it is not because the language faculty requires them, but because external (functional) effects have conspired to make them properties of the available data.

In the end, we are left with a puzzle. On the one hand, we know from comparative considerations that human language is undoubtedly a richly structured capacity, one that is unique to our species. But on the other hand, when we try to determine the properties of that capacity, we are faced with a general absence of necessity arguments: what we find in all too many cases could, logically, just be a result of external influences shaping the data, with learnable consequences that are of little value for determining the substantive content of the hypothesized language faculty.

I suggest, though, that it is not necessary to see these lines of argument as mutually exclusive. It might be, that is, that some — perhaps many — properties with an external basis are also characteristic of the language faculty. It is to a possible evolutionary mechanism that could have that effect that I
now turn.

2.4 The Evolutionary Source of the Language Faculty

To see how that could be the case, let us ask how the content of this language faculty, construed as part of human biology, arose. It seems quite implausible to suggest that the normal mechanisms of natural selection could have resulted by themselves in the very specific properties that seem to be candidates for part of the language faculty: try to imagine, for instance, how adherence to the principle of Subjacency might provide a competitive advantage that would increase a speaker’s likely reproductive success (Lightfoot 1991).

In fact, though, there is another mechanism that is often assumed to have been responsible for the genetic fixing of the language faculty in the form we find: the so-called “Baldwin Effect.” This is a notion that remains somewhat controversial, in part because at least some discussions have treated the “Baldwin Effect” as a special case of genetic assimilation and there are various reasons to think that is not the way it should be seen. But a number of other formulations exist that have the right consequences for our purposes, and the notion is accepted by quite a number of people. A recent collection of papers (Weber & Depew 2003) surveys the issues, with generally optimistic conclusions.

In discussion of the Baldwin Effect, what is at stake is the claim that a learned behavior may provide an advantage within the specific context of the organism; and where that is the case, it is advantageous to be able to acquire that behavior quickly and efficiently. Whether the behavior was originally acquired through generalized learning, culturally transmitted, or in some other way is essentially irrelevant: if it offers an adaptive advantage, the capacity to develop it expeditiously can be the basis of positive selection. This is not a mysterious and non-Darwinian evolutionary mechanism: it simply recognizes the fact that phenotypic variation in facility for developing particular behavioral or cognitive capacities can be related to genotypic differences, and thus heritable and selectable in the same way as other traits.

The learned behavior may itself change the environment within which selection occurs (“niche
construction”: cf. Odling-Smee et al. 2003), favoring its acquisition even more. Once language emerged in a human population, it quickly became essential to social organization and other aspects of life that provided humans with a variety of competitive advantages. That meant that to be a functioning member of a human society (and to have any chance of reproducing), an individual had to be able to acquire the language of that society. Where any specific property of that language might have come from is effectively irrelevant: learners have to learn the language as they find it.

As a consequence, the ability to learn language on the basis of utterances by members of the surrounding community is going to be selectionally highly favored, once the ecological niche in which humans found themselves had been shaped to make extensive use of language. Furthermore, to the extent certain properties recur in language across societies, it will be efficient for the learning process to incorporate those into the Language Faculty as predispositions. This follows from the Baldwin Effect mechanism. The eventual result may be to make the learning of such behavior entirely hardwired (the fastest and surest way to learn it).

Notice that this does not at all mean that some particular language should become fixed in humans, as implied by Chater & Christansen (2010). We now know that adaptive genetic change can move rather more quickly than once imagined, but it is also clear that linguistic change takes place much more rapidly still. Any specific language is too much a moving target for natural selection. On the other hand, recurring typological regularities are not subject to the same sort of rapid change, and could thus be incorporated into the human language faculty in the way suggested above.

To return to the theme of previous sections, when we look at the properties that seem plausibly to be part of the human faculty of language, it is hard to show that their presence in particular languages must be a consequence of the structure of that faculty. In some instances (e.g., basic properties like structure sensitivity) it is plausible to suggest that important characteristics of human language might have arisen spontaneously in communicative interactions over time. But at least originally, even if that is true these properties would have to be learned by new generations of speakers.

Substantive properties, both in phonology and in syntax, might in turn be driven by the external forces operative in language use and language change, forces that provide an account of the
observed regularities that does not need to appeal to structural properties of the language faculty. On the other hand, to the very extent such forces exert pervasive shaping effects on the languages humans speak, it is not implausible to suggest that evolution, through the Baldwin Effect, is likely to incorporate those same regularities into our genetically determined disposition as human language learners. And the result of that incorporation will be a duplication: the regularities for which we find external grounding in forces of usage, performance, and change will tend to recur as characteristics that the language faculty (in the sense of the system by which learners acquire their first language) expects to find in every language, since that expectation will increase the efficiency of learning the language of the surrounding community.

The importance of this line of argument is that functional or external explanations of cross-linguistic regularities are not, in principle, incompatible with the attribution of those same regularities to the human cognitive capacity for language. But with this comes a serious problem of evidence: for any given regularity that has an external basis, we still need some way to argue for whether or not it also forms part of the language faculty. It is quite possible that the external forces working on languages will be reflected only imperfectly as cognitive properties of Language, and such differences may possibly provide us with ways of teasing the two apart, but it is not clear at present how much evidence of this sort there is, and how to find and use it where it exists. The bottom line seems to be that we have no secure way of identifying a regularity as specifically deriving from the structure of the mind, and not just a product of other influences.

3 Conclusion

As linguists, in the attempt to provide a scientific account of the nature and structure of human language, we need to find ways to build substantive theories of the cognitive capacity for language on the basis of observable evidence. If the reasoning here is correct, though, there will be very few properties that we can observe for which we can provide a necessity argument that they must be due to the nature of the language faculty. Some will welcome this conclusion, seeing it as validation of
the claim that there really is little content to this “language faculty” anyway. For some (e.g., Evans & Levinson 2009), that will be because they do not believe in such a faculty at all; for others (e.g. Chomsky 2010), it will be because they believe its content is very limited, with most of the specific properties of language following from more general considerations. But that seems inconsistent with the evidence that seems to show that the human capacity to acquire and use language as we do is a quite specific and highly structured part of our nature as humans. So I, at least, reject that alternative.

The object of inquiry for Linguistics, the human language faculty, is surely an evolved part of the biological nature of humans. Pessimism about the utility of evolutionary explanations can, I think be, put aside on grounds that plausible and non-exceptional mechanisms in this domain can probably provide the account that seems required. But a consequence of that is a certain likely duplication of explanation that makes the basic task of Linguistics much harder. As linguists, we have developed a rich set of tools for studying language and languages, and a rich collection of results based on those tools. But it is still possible that although we can formulate the fundamental question “What is the structure of the human language faculty?” the tools available to us are not yet adequate to provide a real answer of the sort we seek. In the context of broader inquiry into the nature of cognition and the mind, and their relation to the brain, this result is depressing, but not very surprising.

The effort to overcome our present explanatory limitations will not be aided, though, by attempts to deny the reality and significance either of a complex and organized evolved human cognitive capacity for language, or of important forces external to that capacity that have profound effects in shaping the properties of languages — and thereby, of language.
*Some of the ideas in this paper appear in Anderson 2008 and Anderson 2011. I am grateful for comments on this paper to participants in EvoLang8, especially W. Tecumseh Fitch, Robert Berwick and Maggie Tallerman, and also to Rudie Botha and two anonymous reviewers for the present volume, although none of these people bear any responsibility where I have ignored their good advice.

1 There is a third combinatory system that is almost always left out of such discussions: morphology, the system by which portions of the meanings of complex words are correlated with portions of their form. As Carstairs-McCarthy (2010) argues in detail, the existence of such a second system for forming complex meanings is quite independent of syntax and thus apparently superfluous, posing a puzzle for theories of the evolution of language. For our purposes here, though, we need only point out that morphological organization represents yet another way in which human language differs fundamentally from the communicative behavior of all other species.

2 See Fitch 2010 for discussion of the relevant notion of recursion that characterizes this property of human language.

3 Selective pressure on beneficial mutations within a region of the genome can be inferred from that region’s remaining relatively unchanged over time. The effect can be approximately dated on the basis of presumed rates of random change in genetic material.

4 Interestingly, all three of the authors of this paper qualify that position in various ways in their contributions to Larson et al. 2010.

5 It would take us too far afield to review this matter here in any detail; see Anderson 2008 for some discussion and references.
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