Why assume UG?*

Dieter Wunderlich
Heinrich-Heine-Universität Düsseldorf

This paper deliberates for a number of linguistic features whether they are part of UG, i.e., specific to human *language*, or whether they are adapted from other cognitive capacities which were evolutionarily prior to language. Among others, it is argued that the distinction between predication and reference already belongs to the conceptual system, whereas the distinction between verb and noun (which is not identical with the former one) is one of the innovations of UG. It is furthermore argued that syntax in the sense that it deals with displacement ('movement') is a property of human language that lies outside of UG.

The paper then discusses whether linguistic typology can contribute to our knowledge of UG, and whether aiming at this is a reasonable goal for typological research. It stands against Newmeyer's position (this special issue) that typological evidence is essentially irrelevant for the construction of UG, as well as against Haspelmath's position (this special issue), who argues that typological research can do without a concept of UG.

1. Introduction

What is meant by Universal Grammar (UG)? In short, UG is assumed to be the innate language faculty of human beings. If one tries to make precise the notion of UG a little further, many facets come into mind, two of which are the most prominent ones, and of course compatible with each other (see also Jackendoff 2002).

i. UG characterizes *the set of possible human languages*. This definition emphasizes the product of language acquisition. Typologists who study the set of existing human languages (which is clearly only a subset of the possible languages) might feel that UG is too weak a notion for delimiting their field of interest. But they may also believe that their own research contributes to our knowledge of UG. For instance, an unexpected structural feature of a hitherto little-known language gives us insight into what is possible for a human language.
ii. UG is *a human-specific learning algorithm towards language*. This definition emphasizes language acquisition itself. As an innate faculty, UG becomes

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manifest in language acquisition, while languages of adult speakers depend on many more factors, such as linguistic experience and cultural contacts. Typologists might be less interested in language acquisition than, for instance, psycholinguists or neurolinguists. All innate faculties are genetically transferred, and a learning algorithm is a set of instructions of how a certain type of input is to be processed. If the input changes, the same learning algorithm yields different results. As is well-known by now, all linguistic activities are processed in certain areas of the brain, and they are based on a certain memorized inventory. UG, then, more precisely, is a description of the (genetically transferred) information for the brain of how it has to process chunks of memorized linguistic input. This is the explication of UG I am going to argue for in the following.

With respect to this explication, I would like to add two remarks. First, UG does not simply support the understanding of an input (some stretch of speech together with contextual information), but rather the analysis of memorized input (although in the very beginning only little can be memorized) because all structural notions have to be detected by comparison and minimal contrast. This does not only concern lexical items and bound morphemes, but also the inventory of phonemes. The child will detect a phoneme of the input language only by inspecting some comparison set of items. Second, I do not think that the brain gets organized in implementing UG properties first, which are then modified according to the input, but rather I think that it gets organized in processing (memorized) linguistic input, supported by genetic UG information. That is, the organization of the brain, including the memory, goes hand in hand with implementing language-specific properties under the control of UG.

Indeed, we feel that the neurolinguistic postulate is imperative: UG must be a specific predisposition of the human brain. In principle, everything of the language faculty that is innate must be translatable into genetically guided differentiation and organization of the human brain. And, consequently, everything that is characteristic of the language capacity of an individual being must be translatable into neuronal storage and processing. Even if linguists feel that they are dealing with features of quite specific linguistic objects such as sentences being read, they have to confess that the syntactic principles they are generalizing from these objects have ultimately to be regarded as processing principles. For instance, Fanselow, Kliegl & Schlesewsky (1999) clearly point out that a syntactic principle such as the *minimal link condition* has been grammaticalized from a processing principle. In this view, UG is one of the starting conditions for the human brain; it leads to a *specific* processing behaviour of the brain if it is confronted with linguistic input. The brain of any non-human being would react differently.[1]

Earlier considerations of UG have lead to an apparent paradox. Fanselow (1992) pointed out that some putative syntactic universals claimed in the literature are so specific, and at the same time complex, that it is unreasonable to assume them to be innate.[2] On the other hand, some other putative syntactic universals, though they are general enough to be innate, can be traced back to other cognitive

systems, especially to the visual or geometric system.[3] However, this 'paradox' only indicates how little linguists know about universals. It is in no way implied that linguistic universals do not exist. If certain syntactic universals turn out to be too specific, this fact rather characterizes a certain state of the art, and one is entitled to look for more general or abstract principles. And the fact that linguistic principles can make use of cognitive resources that evolutionarily were prior to the language faculty, is not surprising at all, on the contrary, it is to be expected. Nevertheless, there might be an important point in Fanselow's observation. It could be the case that syntax (in the sense that it sets out conditions of locality and constrains movement within a sentence structure) is not the right domain in which language-specific universals can be found. One could argue that conditions of locality and movement also play an important role in the geometric system. Therefore, syntax (in the above sense) could have been established independently from UG; it might be an innovation in the tradition of language which spells out a much more general cognitive capacity.[4]

To illustrate this point: The following metaprinciples, given by Eisenbeiss (2002) on the basis of many insightful studies are probably not specific for language because quite similar principles can also be found in the visual system, for instance, in the figure-ground distinction and in geometric transformations.

- Input (output) specificity: A rule α is not applied in the domain of the rule β, if the domain (range) of α properly includes the domain of β. (Here, Fanselow 1992 already argued that this is not a principle specific for UG.)
- Structural dependency: Rules specific to a level of representation only refer to functional units of this level and the relations between them.
- Economy of representation and derivation: Representations only contain necessary symbols. Rules only apply in order to satisfy well-formedness conditions.
- Preservation of relations: Every mapping between levels of representation preserves the asymmetric relations that hold between the involved elements.[5]

Hauser et al. (2002) regard discrete infinity (recursion) as the core property of the linguistic computational system, but this property also characterizes the natural numbers, hence, it is not UG-specific. (One could argue that the development of the number system has profited from the linguistic capacity, however, it could just be the other way round; note that infinite embedding is also found in the geometrical system.). Within language, recursion can be observed at different levels: in compounds, with propositional operators, and at several places within clausal structure (relative clauses, serial verb construction, verbs with propositional complements). The latter, more complex type of recursion which can affect both verbs and their arguments in any order (let us call it clausal recursion) is particularly interesting because it seems to be specific for language.

Linguistic typology is concerned with the diversity of existing human languages, trying to classify these languages according to certain prominent grammatical features. Many of these classifications lead to markedness scales, which are motivated on both internal and external grounds, internally in terms of more or less

complex grammatical feature combinations, and externally in terms of factors such as frequency, or cognitive biases. Linguistic typology may go on in establishing universal conditional statements of the type 'If a language exhibits the feature α, than it also exhibits the feature β'. Such a statement is falsified if a language turns up that exhibits α but not β. Simultaneously, this statement is also a hypothesis about the way in which the human brain is working, especially the brain of a language learner; first, the brain has to identify the feature β, and only if it was successful, it can identify the feature α.[6]

It is quite uncontroversial that linguistic diversity is affected by UG; the reason is that all possible language change is filtered by language acquisition. Whatever linguistic means the members of a community may have acquired, it must pass the filter of language acquisition in order to become significant in the course of time. Language acquisition turns out to be the bottleneck through which all linguistic innovations must be poured in order to become a property of a natural language (see also Kirby 1999, 2002). Different frequencies in the input varieties lead to different awareness of the language learners when they try to imitate the input. Language learners also try to detect the productive 'rules' by decomposing and categorizing the overheard and memorized utterance chunks, and, simultaneously, they try to generalize the categories involved, again depending on frequency.[7] All this structure-sensitive linguistic processing in the child is assumed to be governed by UG. Linguistic variation, then, results from the interplay of UG with possible variations in the input of language learners.

In the following Section 2 an attempt is made to specify the possible contents of UG in view of the fundamental properties of human language, while Section 3 deals with the question of how typological knowledge helps us to restrict the contents of UG more narrowly.

2. UG and the language faculty

Although we have established a reasonable notion of UG, my exposition suggests that certain well-known syntactic principles may have been borrowed from other cognitive resources prior to language. Therefore, it becomes necessary to substantiate the possible contents of UG in a way that does not rely on syntax. Following this program, I propose to reconsider some of the fundamental properties of human language, such as those outlined by Hockett (1960) and many other researchers.[8]

It seems that the driving factor in language acquisition is the child's astonishing *faculty of imitation*. Every child tries to imitate gestures of all kind, in particular those that have specific communicative content, to an extent that clearly outranges that of other primates (Tomasello et al. 1993; Tomasello in press). There is reason to believe that this specific human imitation faculty evolved from a faculty that other primates already possessed. As Rizzolatti et al. (1996) observed, if an ape sees another ape handling in specific ways, a part of the motoric region of its brain

becomes active, as if the ape tries to imitate the hand movements of its partner. This observation has led to the so-called mirror-neuron hypothesis: some neurons of the motoric region serve to mirror the motoric actions of other individuals, given that these actions are intended to handle food. Two conclusions have been drawn from these findings. First, the further development of mirror neurons (occupying also neighboring regions of the brain) could have given rise to the evolution of other kinds of intentional actions, in particular those signalled by facial gestures. Second, manual gestures may have played an important role in the evolution of language because these gestures could easily be interpreted by internal reconstruction.[9] According to this interpretation of the mirror-neuron hypothesis, it was only later that mirror-neurons also developed for vocalic speech.[10]

The following scenario may help us to understand how this could have happened. First, vocalic gestures (besides their function as attention and structuring signals) may have accompanied manual gestures in order to support reference to absent participants and to modify gestural predication. The vocalic utterances may then have been detached from the gestures they were associated with, for instance, to enable other than face-to-face communication under visibility conditions. Whereas the manual gestures largely functioned iconically, the detached vocalic utterances were only able to carry out the task symbolically: While they still represented a similar concept as the gestures, the relationship between the vocalic utterances and the concept became arbitrary.[11]

If it is true that the evolution of the imitation faculty laid the basis for the evolution of language, it becomes clear at once why *symmetry* (Hockett's *interchangeability*) is one of the basic pragmatic factors of language. Every human language is a speaker-hearer symmetric system in that it allows for a fast turn-taking; speaker and hearer can exchange their roles at nearly every moment. For the same reason do personal and spatial deixis play an important role in all languages; these domains belong to the best-documented fields of cross-linguistic study (Fillmore 1982; Levinson 1998, 2003).

There are two other innate features of language that can be correlated with its motoric origin, given the hypothesis that manual gestures were prior to vocalic utterances.

i. *Iconicity*: Features of utterances mirror features of meaning. For sign languages it is evident that manual expressions are in many ways iconic;[12] however, iconicity also plays an important role in the temporal order of phonetic expressions (such as 'cause precedes result', 'agent comes first'), as well as in other phenomena based on cognitive scales. Iconicity not only allows for a first, default interpretation, but also enables effective parallel processing in which morphosyntactic parsing and the building-up of a semantic interpretation go hand in hand. Iconicity itself is certainly not UG-specific, however, in a more articulated system, it lays the ground for compositionality (every additional phonetic material is connected with some additional meaning), as well as form-meaning isomorphism.

ii. *Structure-sensitivity*: Generalizations based on features of utterance structure are more feasible than those based on features of associated meanings or contexts. If the motor theory is right, the generation of a copy of the utterance is the primary factor of understanding, hence, it is always structural features (rather than purely semantic features) that determine which interpretation is to be derived. Moreover, it is this structure-sensitivity that allows us to establish 'rules' with discrete elements, which in turn serve to relieve our memory, and, simultaneously, make us able to improve expressivity. Structure-sensitivity paired with distinctive features (see below) is one of the core properties of human language; this property must have been present at the time when vocalic utterances were detached from gestures (see above) because otherwise the communicative advantage for speech (that it was not any more restricted to visibility) would have been counterbalanced by the loss of expressivity.

The drive for imitation explains why the child is eager to communicate and to receive linguistic input. Imitation allows the brain to become organized for the processing of input and to then use the acquired routines for self-expression. In the process of acquisition the memory gets richer and richer, representing more and more utterance chunks with associated meanings or contexts. Here, then, another driving factor of language acquisition comes into play: *economy of representation*, a force that leads to a continuous reorganisation of the memory. Structural decomposition in the presence of structural similarities reduces memory load, and, simultaneously, it promises further success in imitation because it improves both the interpretation and the expression of intentions by using simpler units compositionally. Of course, economy itself is not specific to language, but its particular application to linguistic chunks being stored seems to be specific.

Another precondition for language as a communicative means is the presence of logical thinking in terms of predication and proposition. Predication means that some contextual instance is subsumed under a conceptual category, thus building up a particular proposition. These propositions constitute a language of mind, which almost certainly evolved prior to the language faculty. It is these propositions that form the possible content of linguistic utterances, and therefore became much more differentiated alongside the means that allow them to be communicated.

Further candidates of UG properties come into play once structural decomposition has started in the mind of the language learner. These properties are often taken for granted because they are so omnipresent. However, I think that the combination of exactly these properties is responsible for UG. At least, it allows us to give UG some more substantial content. It is hard to see why exactly these properties could result from a brain organization developed to solve general purpose tasks; it is much more plausible that they result from a *specific* brain organization, and, hence, are true candidates of UG properties. Some of these special-purpose features of language are briefly discussed here.

– *Distinctive features*: The elementary linguistic units ('phonemes' or 'signemes') are characterized by robust categorical (distinctive) features rather than by

fuzzy features (Eimas et al. 1971); evolutionarily this was an advantage because distinctive features allow us to ignore noise. In general, the working of the brain would rather result in fuzzy categorization. For instance, it depends on fuzzy categorization whether a collection of trees counts as *wood* or not, or whether a certain container object counts as *cup*, *bowl*, or *vase* (Labov 1973).

– *Double Articulation*: The elementary units themselves do not bear meaning, only some combinations of these units (such as syllables or feet) do, with the exception that functional meanings might be expressed by just one unit (or even just one phonological feature) in the case of affixes (probably resulting from a process of reduction). Evolutionarily this was an advantage because it allows for a large lexical inventory, based on quite a small inventory of phonological features. It is, however, open to discussion whether this kind of 'hierarchical' lexical organization has been fixed in UG or rather automatically emerges when the lexical inventory increases.
– *Predication and reference* (the two elementary semantic functions): Semantically, all lexical items are predicates, making it possible to subsume an instance under some conceptual category. An instance has to be anchored in *some* context, that is, it is represented by an argument variable of the predicate, which allows us to relate propositions to external states of affairs in a rather flexible way. The instance may be given indexically or iconically, or (finally) by means of a symbol. This allows us to express elementary propositions. Under the premise that logical thinking evolved prior to the language faculty, UG must include some mechanism to relate logical propositions to linguistic expressions.
– *Lexical Categories*: The lexical inventory is partitioned into at least two (widely complementary) categorial types: nouns, prototypically relating to 'spatial' objects, and verbs, prototypically relating to 'temporal' events. If this distinction is pushed into the context of predication and reference, it is feasible to add some mechanism of conversion, by which nouns can be delegated to verbs, and, vice versa, verbs to nouns (so that instances of both categories can fulfil the semantic functions of predication and reference). Evolutionarily this was an advantage because it allows for a clause-internal combination noun + verb (as the articulated expression of a minimal proposition), as well as for clausal recursivity if the possibility of conversion exists. (Note that if conversion is possible, verbs can be subcategorized for deverbal nouns, which allows for all kinds of propositional attitude verbs, including those that are classified as raising or control verbs.) Certainly, already the general operation of the brain produces partitions in a memorized inventory if it becomes large enough, but these partitions could be based on any kind of semantic or structural features, and it is hard to see why they should end up just with nouns and verbs and the possibility of conversion (which is not dictated by fuzziness). In a more developed grammar, the categorial distinction between nouns and verbs is strengthened by category-specific *functional categories*, such as aspect and mood for verbs and

definite articles for nouns. In my view it is rather improbable that these functional categories evolved first, and then have shaped the lexicon into verbs and nouns (an idea, which lies behind Baker's 2003 proposal that lexical categories are determined by the syntax). It is still an open question whether functional categories already belong to UG or evolved later for specializing the function of lexical categories, with regard to their role in predication and reference.

– *Argument hierarchy*: The arguments of a predicate are strictly ordered. For several cognitive reasons prior to the emergence of the language faculty, relational predicates must be possible in UG. Relational predicates are necessary to express social or part-whole relationships, as well as goal-directed actions, which must have played an important role in the cognitive mastering of elaborated tool-making. Therefore, a predicator should in principle be able to have two argument positions: an object-related predicator (a noun) should be able to have a possessor, and an event-related predicator (a verb) should be able to make a distinction between the actor (the causer, instigator, or controller of an event) and the undergoer (the patient, or theme of an event). Whatever semantic distinctions are made, and regardless of whether the two arguments participate in the same way (as in symmetric predicates such as *meet*), the two argument roles must be ordered. Argument hierarchy allows for a distinction of the possible instances of a relational predicate under every condition. I would be inclined to say that argument hierarchy is part of UG, so that relational predicators (such as transitive verbs as well as body-part and kinship nouns) are expected; UG thus predicts object/subject asymmetry, which goes much beyond the agent-undergoer distinction. However, it is certainly not the case that UG has any provision for ditransitive verbs, given the amount of linguistic variety in the realization of the simplest transaction predicate *give* which has three argument variables. Not everything which is simple in logical or cognitive terms must be likewise simple in UG; if that is true, we have a strong argument why UG must be separated from cognitive resources.
– *Adjunction*: Predications can be combined under the condition of argument sharing, with one predicator being the head of the construction and the other being the non-head. Evolutionarily this allows for the expression of more complex propositions, with all constituents being anchored in one and the same context. It is conceivable that the human brain has the general tendency to produce figure-ground constellations, so that, for instance, predication functions as the figure and the context in which it is anchored as the ground. Such an asymmetry might have been generalized in the case of complex predication as an asymmetry between head and non-head. It could likewise be the case that the distinction between head and non-head is already forced by an UG constraint itself, which, for the sake of simplicity, is termed here as BE ASYMMETRIC. (Note that such a constraint can also serve in the categorial verb-noun distinction as well as in the context of argument hierarchy.)

– *Reference-tracking*: A series of predications can attach to the same instance. This property allows for discourse economy, and simultaneously, for a fast and unambiguous interpretation of a piece of discourse. Given that reference tracking devices vary much across languages, one is not inclined to consider any specific one of them to be part of UG. For UG, it might be enough to allow for a combination of predicates, either by means of propositional attitude verbs, or by means of adjunction. Consequently, then, these means must be handled adequately to ensure both economic and unambiguous reference. A possible UG constraint that does this work could be termed as PARSE REFERENCE; all more specific devices such as same subject — different subject, obviative, antecedent — anaphora, reflexive, control etc. can then be regarded as complying with this general constraint.
– *Quantification*: A sentence such as *every man thinks he is clever* connects instances from {x is a man} with instances from {x thinks that x is clever}; generally, quantifiers connect a domain with a value, which inherently involves variable binding. Thus, quantifiers have a scope and allow *bound* pronouns (in distinction to *anaphoric* pronouns). This property almost certainly is specific to human language and is found in many variations (such as scalar adverbials, negative polarity items, focus-inducing particles, conditionals, etc.); see the overview in Bach et al. (1995), a volume that grew out of a NSF-supported project on cross-linguistic quantification and semantic typology. I am uncertain about how much of this property has to be ascribed to UG itself, and what evolved in the later interaction of linguistic means and cognitive requirements. At least, I think, UG must specify that predicates have argument *variables*.

All the afore-mentioned properties of language are not trivial ones. In the process of language acquisition they do not automatically emerge from a global neuronal organization, neither do they depend in obvious ways on other cognitive domains. Therefore, one should consider them to be candidates of an autonomous linguistic capacity that is genetically determined. However, the way in which these properties are implemented in the brain depends on the input to the language learner. Different input may lead to different implementations, therefore we consider changes in the linguistic input to be the primary source for typological variation.[13]

It is generally taken for granted that UG characterizes a faculty of *all* human individuals, regardless to which ethnic group they belong, and that UG therefore should be traced back to the time when the modern *homo sapiens* came into existence, which took place somewhere in East Africa about 150,000 years ago. Since records of human language do not date back further than 6,000 years (which comprises only the last 4% of homo sapiens' history), there lived more than 7,000 human generations that were in possession of UG and from which we lack any linguistic data. This is quite a long time for many of the typological features observed today to have developed by the interaction of UG with successively more articulated inputs.

Linguists generally believe that under normal circumstances every newborn

human child is able to acquire any of the languages spoken today. This serves as one of the arguments that UG is a fixed device, identical for all human beings. I am not sure whether there is a clear positive evidence that this assumption is true in every respect. I know of no investigation showing that, for instance, a European-born child masters the rather complex morphology of an Amerindian or Australian language similarly to other natives in all respects, including, among others, the parsing of these complex structures. It might well be the case that ultimately, some differences show up in parsing inverse morphology, or in parsing a 'same subject — different subject' device, that is, descendents of the ethnic group in which these devices have developed and descendents form other ethnic groups could behave slightly differently. Given the long history of homo sapiens, involving thousands of generations, UG could have been affected by certain mutations (see also Jenkins 2001). At least, the idea of UG variation is not totally unwarranted if one considers UG to be a genetically determined device. Yet, as reasonable as such an idea is, it is far from being explicative for any features of typological variation considered so far. All these features appear to be compatible with the assumption that UG is identical for all human beings, and that typological variation is induced in the process of thousands of generations, each of them confronted with slightly more differentiated inputs.

3. UG and typological variation

The typologist who is concerned with the variation among languages can observe that a few features are common to most languages in some way or the other, for instance, the marking of person and number, or of aspect, tense, and mood. These *referential features* either specify the individual arguments or the predicative event in which these arguments are involved. In this context, cross-linguistic variation can be traced back to a set of universal features, instantiated in each particular language to a larger or smaller extent. Some languages exhibit a formal marking of dual as being distinct from plural, while other languages include the dual category in the plural marking. Similarly, some languages exhibit a formal tense marking for past and future, while other languages only have a differentiated aspect system on the basis of which it is implied whether the event has taken place, or will take place. Thus, whether one of the universal feature values is actually found in a language depends on the extent to which the respective feature domain has been generalized. In the course of feature generalization, for instance, plural (which captures any number greater than one) wins over dual, and past (which captures any type of event) wins over completive aspect — both has often been observed in the history of languages. Referential features fulfill the UG requirement PARSE REFERENCE, but it seems to be the task of the conceptual system (rather than of UG itself) to predict what the system of referential features has to look like. In any case, the language learner can easily identify the relevant referential feature values from a given input; typologists will not argue about this.

On the other hand, when considering certain *morphosyntactic constructions* across languages, the typologist will soon realize that there is too much variation which cannot be traced back to a single system of constructional features. Based on detailed observations, the typologist can reasonably *exclude* certain constructional features from UG, and I would like to suggest that only *he* or *she* can.

For instance, given that cross-linguistically arguments can be marked by means of pronominal affixes on the verb (head marking), or by means of morphological case on the argument NP (dependent marking), or by none of these devices but rather purely positionally, the typologist can exclude the existence of morphological case from UG. The (widely complementary) notions of (generalized) accusative versus ergative could, nevertheless, be UG-conform, since all three constructional possibilities (head, dependent, or positional marking) can treat either agents or patients (undergoers) similar to the only argument of an intransitive verb.[14]

However, several varieties of head marking follow neither the accusative nor the ergative strategy. For instance, the so-called active systems (Lakhota) encode whether an argument instigates/controls an event or not; the voice systems (Philippine languages) encode the most prominent argument, and the inverse systems (Algonquian) encode whether the agent is higher or lower on a particular salience hierarchy than the patient. These typological observations exclude the notions of accusative and ergative altogether from UG.

Another instance of very high constructional variation is the ways in which a third argument of a predicate is encoded, such as the recipient of a 'give' verb, or the causee of a causativized transitive verb. In a system based on animacy, the recipient is likely to be treated like the patient of transitive verbs because it is usually more animate than the theme, i.e., the object to be given. However, in a system based on accusative or ergative, the recipient is often treated as a medial argument, to be marked by dative or a medial position. Systems that do not so easily accept a third argument may either suppress one of the other two arguments in order to express the third one, or they may use a serial verb construction, in which the third argument is introduced by a second verb. Again, the typologist will find that UG says nothing about how to realize a third argument.

One can easily multiply these kinds of examples. Relative constructions can be formed by a clause added to a noun in which this noun is gapped or indexed by a relative marker, or they can be formed by a full clause that includes the relativized noun, or they can be formed by a nominalization strategy, and so on. UG seems to imply nothing of how relative constructions have to be formed. The question, then, is how a language learner can identify relative constructions, and a possible answer is: All he has to do is to relate predicates to their arguments; in case of a relative construction he is confronted with an additional predicate and has to find its arguments. For conceptual reasons, individual predicates have one, two or even three arguments, and all UG requires is PARSE ARGUMENTS.[15]

The most remarkable domain in which UG is silent is whether the constructions of a language are morphologically or syntactically realized. 'Morphologically'

means that the constructions are realized by head or dependent marking, whereas 'syntactically' means that they are realized by positioning of uninflected elements. For encoding the role of arguments, some languages exhibit case *and* agreement morphology, some languages exhibit either case or agreement morphology, and some languages exhibit none of these. Reasonably, any distinction between morphology and syntax should not be seen as part of UG, and, consequently, any notions that are exclusively based on either morphological or syntactic properties should be absent from UG.

So far, typologists are able to expel many features from UG, features that have been proposed on the basis of insufficient cross-linguistic knowledge. In other words, UG is less restrictive than usually assumed. It seems that human languages allow much more options with respect to constructions than with respect to referential properties.[16] As a result, constructions must be seen under a more general perspective; one has to investigate whether certain linguistic *functions* performed by a variety of constructions are constrained by the same type of (semantic) factors.

As a beginning, let us point out that the realization of morphological case often depends on (differently weighted) cognitive scales concerning animacy and referential specificity. One often finds instances of differential object marking: an object is marked by accusative only if it is animate or definite, otherwise it is unmarked (nominative). Likewise, one finds instances of differential subject marking: a subject is marked by ergative only if it is inanimate or indefinite, otherwise it is unmarked (nominative). How one can deal with these so-called linking splits in systematic ways will be discussed in the first excursus below.

Similarly, word order depends on (differently weighted) factors of language processing such as information structure and locality. In view of information structure, topic precedes focus, and focus precedes the rest of the predication. In virtue of locality, objects (such as patients or recipients) belong closer to the verb than subjects (such as agents). This will be discussed in the second excursus below.

According to the functional premises of Optimality Theory (OT), language variation is generally conceived of as an interplay of three factors: expressivity (faithfulness), economy (markedness), and alignment, and it is these factors that determine the optimal construction. A successful communication requires that every intended semantic feature is expressed, and conversely, that no unnecessary semantic feature is expressed (because it leads to additional marking, and thus is costly), and, furthermore, that every semantic feature correlated with a predicative head α is expressed in the immediate locality of α (either to the right or to the left). Thus, any linguistic feature f is connected with a set of relevant constraints, such as MAX(+f) 'Realize +f', *(+f) 'Do not realize +f', and ALIGN(+f, α) 'Align +f with α'. Languages differ in the way in which these universal constraints are ranked with respect to each other. The language learner is assumed to be able to detect these rankings on the basis of whether the constraints are violated in some pieces of the input or not (Tesar & Smolensky 1998a,b).

A linguistic typology that is based on such a conception can be termed *differential typology*. The types of universal constraints just mentioned implement some typical processing behavior of the brain, which, however, does not mean that these constraints specifically belong to UG. On the contrary, all three types of constraints mentioned above should be relegated to the general cognitive resources which also function outside of language. In the following two excurses I will illustrate a further aspect of differential typology, namely, that the possible constraint rankings can be restricted by harmonic alignment of (independently given) scales. More specifically, I will argue that a specific linguistic scale (which probably *is* part of UG) interacts with some general cognitive scales.

Linking splits

First, I would like to elaborate the principal structure of linking splits. For transitive verbs it is characteristic that their arguments are realized asymmetrically, which also includes various factors concerning the values of the arguments; this allows the hearer to identify the respective arguments more easily. It is more likely that the subject (or higher argument) of a transitive verb is also high in salience, being, for instance, an animate and specific entity, while the object (or lower argument) is low in salience, being an inanimate or unspecific entity. That is, under normal circumstances one can infer that the more animate or more specific argument functions as the subject, and the less animate or less specific argument as the object. Given that arguments only need to be marked if they are instantiated by non-prototypical values, languages often mark their arguments (by means of a specific morphological case, or a specific set of pronominal affixes) only if they exhibit *unexpected* values, that is, if subjects are low in salience, or if objects are high in salience (Comrie 1989; Dixon 1994). This phenomenon of marking an argument only under special circumstances is known as differential subject marking or differential object marking, respectively, both yielding a linking split: some instances of an argument type are marked, while other instances of the same argument type are unmarked.[17]

It seems that linking splits constitute a domain in which considerations about UG and cross-linguistic observations made by typologists can successfully cooperate. Following basically a proposal made by Aissen (1999, 2003), and revising it for various reasons that need not concern us here, Stiebels (2000, 2002) made a substantial progress in unifying all instances of differential argument marking. Regardless of whether the language exhibits the ergative or accusative type of marking, of whether it includes dative, and of whether it realizes the marking by means of morphological case or by means of specific sets of pronominal affixes, it is reasonable to assume that all the following considerations hold cross-linguistically.

Let us first assume that argument roles are encoded by means of the features [+hr] 'there is a higher role', and [+lr] 'there is a lower role'. Let us furthermore assume that both morphological case and pronominal affixes are specified by the same sort of features: [+hr] for 'accusative', and [+lr] for 'ergative', with unmarked

[ ] for nominative (or absolutive). This ensures that the subject can only be realized by ergative or nominative, and that the object can only be realized by accusative or nominative, given the normal understanding of feature unification.

(1) λy λx EAT(x,y)
+hr +lr
acc/nom erg/nom

The two argument role features are inherently ordered, as shown in (2a).[18] The marking of an object is preferred over the marking of a subject because subjects can more easily be identified with contextually given elements, and thus are often dropped from realization. In order to implement the function of salience, one of the scales in (2b) is assumed, with the value A being cognitively more prominent than the value B.[19]

(2) a. Argument roles: [+hr] > [+lr]
'Marking an object is preferred over marking a subject.'

b. Possible salience scales: A > B
'The value A is more prominent than the value B.'

discourse participation:	1/2 person	>	3 person
discourse relevance:	pronoun	>	full noun
animacy:	animate	>	inanimate
referential prominence:	specific	>	unspecific
aktionsart:	dynamic	>	static
aspect:	imperfective	>	perfective

In the following, one has to understand that one of the argument roles is to be realized in the context of one of the salience scales A > B. We assume that the two scales are harmonically aligned (Prince & Smolensky 1993), which yields the two contextualized scales given in (3).

(3) a. (+hr)/A > (+hr)/B
b. (+lr)/B > (+lr)/A

This result can be reinterpreted in terms of markedness hierarchies, as in (4), with the reading 'Do not realize the feature +f' for *(+f). Obviously, differential object marking behaves just reverse to differential subject marking.

(4) a. Differential object marking: *(+hr)/B » *(+hr)/A
'Avoiding accusative in a B-context is better than avoiding it in an A-context.'

b. Differential subject marking: *(+lr)/A » *(+lr)/B
'Avoiding ergative in an A-context is better than avoiding it in a B-context.'

Finally, linguistic variation arises if one of the constraints MAX(+hr) 'Realize accusative' and MAX(+lr) 'Realize ergative' intervenes at different points of the scale; in principle, one of the possible options must be chosen for object marking and one for subject marking, with respect to all possible values of A and B. (5) only illustrates this for object marking.

(5) a. MAX(+hr) »*(+hr)/B » *(+hr)/A: Accusative is marked on all objects.
b. *(+hr)/B » MAX(+hr) » *(+hr)/A: Accusative is only marked on objects of high salience.
c. *(+hr)/B » *(+hr)/A » MAX(+hr): Accusative is never marked.

As an example, option (5a) may be relevant for animacy, but option (5b) for specificity; in this case, object marking is only sensitive for specificity. These two options could, however, just be reversed, resulting in a language in which object marking is only sensitive for animacy. In this way, a typology based on these considerations offers a multiplicity of individual variants.

Such a typology is compatible with all the facts found in various languages (see the extended demonstrations in Aissen 2003; Stiebels 2000, 2002; Morimoto 2002a; Wunderlich 2003; and many other papers), hence, it has uncovered linguistic universals in a realistic sense. The question is where in these considerations UG fits in. Harmonic alignment itself seems to belong to the cognitive resources that are prior to (or at least independent of) UG; harmonic alignment serves to make judgments by combining features from different sets being ordered in scales. Furthermore, all possible scales A > B derive from certain instantiations of pragmatic and semantic features, which are generally relevant to be communicated. For all I know, however, the particular scale [+hr] > [+lr] is specific for language, and therefore a true candidate for UG. Once the concept of a transitive verb has been detected, such a scale must be part of this concept.

Proponents of Functional Grammar often overestimate the influence of cognitive strategies in explaining typological variation. A good example in question is Jäger's (2003) attempt to derive the existing patterns of differential case marking (ergative/accusative vs. nominative) as possible equilibria in an evolutionary game theory, in which both speaker and hearer strategies are optimally fulfilled. The crucial point in his account is the initial condition under which each of the games starts: In order to determine the weight of strategies, Jäger uses the quantitative distribution of pronominal vs. nominal subjects/objects found in corpora of English and Swedish, which is representative for the quantitative distribution of other salience factors for subjects and objects.[20]

(6) Distribution of pronominal vs. nominal subjects and objects in Geoffrey Sampson's CHRISTINE corpus of spoken English.

	pronominal objects (pO)	**nominal objects (nO)**
pronominal subjects (pS)	198	716
nominal subjects (nS)	16	75

It is well-known that corpus data confound several factors. One of these factors is that speakers who follow the salience scales given in (2b) of course produce more pronominal subjects than pronominal objects (914/214 = 4.3), and more nominal objects than nominal subjects (781/91 = 8.6). Moreover, the second ratio clearly exceeds the first one, which shows a further object/subject asymmetry.[21] It is much better to mark an object (rather than a subject) with a full noun than to have pronominal subjects (rather than objects). This is in line with the scale in (2a) saying that object *marking* is preferred because it is less costly than subject marking. The game, then, introduces the possibility of ergative and accusative marking, which both are assumed to be more costly than zero marking (nominative). It is not surprising that the game develops to an equilibrium in which only the rather few nominal subjects are ergative-marked and only the rather few pronominal objects are accusative-marked. Moreover, with a different cost factor only accusative turns up in a stabile equilibrium, i.e. accusative is favoured against ergative. The game thus produces results which are typologically valid. Jäger concludes that no assumption about universal principles is needed in order to derive these results.

However, the corpus data does not only reveal the operation of a salience scale, but also the object/subject asymmetry, which in my interpretation of Stiebels' account is a possible UG factor. Since every game starts with the same distribution of weights (according to the distribution in (6)), all the factors which I claim to be universal are already built into the game. If one interprets successive games as 'iterative learning' (which is not quite the way in which Jäger interprets his account), one easily sees that every input — not only the first one — reflects this universal factor. In other words, if Jäger were ready to spell out the hidden factors involved in his study, he would arrive at the same results as I did.

Nevertheless, studies like the one by Jäger are valuable, and also necessary, because they allow us to see the rich typological variation as the product of very few basic assumptions. It is quite clear from both what I have said and what Jäger has shown that UG does not need to contain any stipulation about (generalized or abstract) case, contrary to what many generative grammarians still think.

With regard to the same set of phenomena just discussed, Haspelmath (this special issue) votes for a type of functional explanation that does not rely on any theoretical framework.

> "Differential case-marking […] basically says that case-marking on direct objects is the more likely, the higher the object referent is on the animacy scale.

> A functional explanation for this is that the more animate a referent is, the less likely it is that it will occur as a direct object, and it is particularly unlikely grammatical constellations that need overt coding…" (p. 570)

There is much intuitive insight in that type of explanation. Why is the more animate referent less likely in the position of a direct object? This is because of the universal object/subject asymmetry just described. Whatever the source of an intuitive explanation is (typological observation, frequency data, or theoretical awareness), it deserves to be mentioned and to be explicated. Moreover the simple statement in the first of the quoted sentences is likely becoming more complex in the presence of more detailed information, which then has to lead to more complex explanations. It is the framework of Optimality Theory that helps us to manage this complexity. A good illustrative example is the marking of direct objects in Hindi. Roughly, the direct object of transitive verbs is realized in the accusative only if the referent of the object NP is human, animate-specific, or inanimate-definite, whereas the direct object of ditransitive verbs is always in the nominative (Mohanan 1994).

(7) Ditransitive verbs in Hindi

a. *ilaa-ne mãã-ko baccaa /*bacce-ko diyaa.*
Ila-ERG mother-ACC child.NOM/*child-ACC give.PERF
'Ila gave a/the child to the mother'

b. *ilaa mãã-ko baccaa /*bacce-ko detaa hai.*
Ila.NOM mother-ACC child.NOM/*child-ACC give.IMPERF be.PRES
'Ila gives a/the child to the mother'

First, there is obviously more than one scale concerned, and these scales must have different cut-off points in the sense I described in (5). Second, there must be an explanation why all these scales become irrelevant for direct objects of ditransitive verbs. Intuitively, double accusative is forbidden, whereas double nominative is allowed. Is this a functional explanation, and on what basis? Note that double accusative is allowed in many languages. And why is the indirect object of Hindi more likely to be coded by accusative than the direct object? Thus, the coding of the direct object in Hindi is beginning to become complex as soon as we take ditransitive verbs into consideration, and it is this observation that forces a more elaborated technique for handling the several interacting conditions.[22] We are not interested in oversimplified statements.

Information structure and word order

Another domain in which typology and UG-considerations can go hand in hand is the study of information structure. In a broad sense, the topic of an utterance is related to the given information, and the focus of an utterance is related to the new information. A topic can be left unspecified, while a focus needs to be expressed. First, harmonic alignment shows that the arguments of a transitive verb attract

topic and focus differently. In order to see this, let us have the two scales in (8) be aligned, similarly to the scales in (2) above:

(8) a. Argument roles: [+hr] > [+lr]
b. Discourse prominence: +foc > +top
'Focus is more salient than topic.'

Harmonic alignment yields the following markedness hierarchies:

(9) a. *(+hr)/+top » *(+hr)/+foc
This implies that objects are better candidates for focus than for topic.
b. *(+lr)/+foc » *(+lr)/+top
This implies that subjects are better candidates for topic than for focus.

Both topic and focus can be indicated by a lexical marker, and focus can also be expressed by a cleft construction or by intonational means. In addition, both topic and focus can be expressed by syntactic word order (but usually not by morphological means, for reasons not to be discussed here). It is therefore particularly interesting how information structure interacts with word order in realizing argument structure.

A clear word order preference arises in the case of V-initial type languages. Iconicity predicts that topic (related to the given information) precedes focus (related to the new information). Since focus usually fills a slot in a presupposed predication, the operator-scope principle predicts that focus precedes the rest of the predication. One therefore expects that V-initial type languages exhibit the ordering topic-focus-V, which indeed is true (see Kiss 2002 for Hungarian; Dahlstrom 1995 for Algonquian; Aissen 1987 for Tzotzil). The positions for topic and focus can, however, be generalized to argument positions, in accordance with (9): the topic position, in which subjects are more often found than objects, can be generalized to a subject position, and the focus position, in which objects are more often found than subjects, can be generalized to an object position. SVO type languages would then develop by only generalizing the position of topic, and SOV type languages would develop by generalizing the positions of both topic and focus.

This is an interesting result, suggesting that syntactic argument positions have derived relatively late in the history of languages. All (or at least most) human languages may have started with head-marking, that is with a state in which arguments are encoded by pronominal affixes on the verb, while full noun phrases were only rarely used (as adjuncts). If that is true, V-initial word order is the most fundamental one, and preverbal positions could have developed by the need of expressing topic and focus. As has been shown above, these positions could then have been generalized in terms of subject and object, so that all three dominant word order types in Greenberg's sense, namely SOV, SVO, and VSO, could have resulted from generalizations during language history.[23]

Another interesting result arises for syntactic SVO type languages, that is, languages that lack any morphological case. In these languages it often suffices to use the feature values [+hr] and [−hr]. All [+hr] arguments (the objects) are

projected into postverbal positions, and only the subject (being [−hr]) is projected into preverbal position.

(10)

λy	λx	EAT(x,y)
[+hr]	[−hr]	
postverbal	preverbal	

The two markedness hierarchies derived in (9) can then be reinterpreted as follows:

(11) a. *(+hr)/+top » *(+hr)/+foc
In an SVO type language, postverbal positions can be blocked from hosting the topic.

b. *(−hr)/+foc » *(−hr)/+top
In an SVO type language, preverbal positions can be blocked from hosting the focus.

In other words, SVO type languages may allow the word order topic-V-focus, even if the object is topicalized and the subject is in focus, but never the word order *focus-V-topic, including situations where the subject is in focus and the object is topicalized. Examples that correspond to the former situation can be found in the so-called inverted subject-object construction of Bantu languages (Morimoto 2001, 2002b).

Finally, SOV type languages do not offer any specific syntactic position for topic or focus, nor do they block one of their syntactic positions from hosting topic or focus. Therefore, these languages (such as Japanese) have to develop lexical or constructional means, such as a topic marker or a focus construction, to express topic and focus.

In these two excurses, I have shown that the assumption of a UG-determined scale [+hr] > [+lr], interacting with other cognitive scales or principles, offers interesting fields of typological study. The harmonic alignment of scales is a means by which parameters specific for language can interact with external parameters independent of language. The interaction of constraints also offers a perspective of optimal interpretation. Given some sequence of NPs, the hearer has to decide about their argument roles, and simultaneously, he has to decide about their informational status. This twofold task seems to be one of the central topics of contemporary linguistic research.

Now, let us summarize what linguistic typology can teach us about UG.

– Linguistic typology can identify a universal set of linguistic features, including referential features, determined conceptually, but also categorial features, being candidates of UG (such as features that specifically distinguish between nouns and verbs, and features that relate to argument hierarchy).
– Linguistic typology can establish a realistic view on variation. In certain subdomains, all languages select representatives from a small bundle of features, while in other subdomains, the languages differ considerably. Only typological research can give evidence about the actual range of constructions,

and, in particular, can show us how little restrictive UG in certain constructional domains actually is.
– Differential linguistic typology can offer a set of universal types of constraints, to be instantiated for any relevant individual feature. These constraints are simple enough for implementing the behaviour of the brain. Moreover, the possible rankings of these constraints can be restricted by harmonic alignment. Importantly, some of the scales to be aligned in this view may turn out as UG innovations.

In general, linguistic typology helps us to elaborate the notion of UG vis-à-vis cognitive resources and vis-à-vis linguistic variation. Without linguistic typology, all considerations of UG are blind because of the lack of knowledge about languages, and without some conception of UG, all linguistic typology is mindless because it is purely descriptive. In other words, typology without some concept of UG is misguided.

Linguistic typology can also make predictions about language acquisition. The language learner must have a device to evaluate

– in what respect cognitive scales can be important for the realization of linguistic features such as morphological case, and
– in what respect discourse factors such as information status can be important for variations in word order.

More general, the language learner must be able to construct for each linguistic feature f a set of relevant constraints (such as MAX(+f), *(+f), and ALIGN(+f, α)) and to determine the ranking of the constraints on the basis of instances in which some of the constraints are violated. These constraints are assumed to be universal, though not necessarily part of UG, whereas the ranking of the constraints is assumed to be language-specific.

4. Conclusions

Under the assumption that linguistic diversity is the result of language change and that all language change must pass the filter of language acquisition, UG becomes an important notion also for linguistic typology.

Linguistic typology, which compares structural properties of languages on a broad basis, can give us evidence for what can reasonably be assumed to be part of UG. It can establish a set of categorial features and a set of constraints that determine how these features are realized under varying conditions. It is, then, a matter of discussion of how much of this framework is dealt with by other cognitive domains and what remains to be specific for the linguistic domain.

Fundamentally, language is a system of sound-meaning connections (which sets it apart from other cognitive systems); that is, all internal linguistic representations serve the mapping between the sensory-motor interface and the conceptual-intentional interface. It is almost certain that a progress made in the sensory-motor

interface also enabled some progress in the conceptual-intentional interface, and thus required a more articulated computational system. Several potential factors specific for UG have been identified: structure sensitivity paired with distinctive features, the requirement of asymmetry at several levels (consonant-vowel, verb-noun, head-nonhead, subject-object, binder-variable), and the requirement to parse reference. These factors are general enough to be involved in the neural architecture of the brain. In any case, UG is a description of the (genetically transferred) information for the brain of how it has to process chunks of memorized linguistic input.

For this reason, it is advisable for typologists to design language descriptions under the view of the language learner, who starts with nothing but UG and other, more general, learning devices.

Notes

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1. The assumption that UG is a predisposition of the human brain arises from logical reasons. However, a question that can be discussed reasonably is whether all (or most) of what one ascribes to UG ultimately turns out to be in fact determined by more general cognitive predispositions, in which case UG as a language-specific instruction would be empty (or nearly empty). Needless to say, any serious concept of UG presupposes monogenesis of human language, because otherwise different versions of UG would have to be distinguished. If, however, everything of UG would have to be relegated to other cognitive resources, multigenesis of language would not be excluded a priori. Conversely, if UG turns out to be a meaningful concept vis-à-vis every known language, the monogenesis view of language is strongly supported.

2. Examples: Empty Category Principle, Subjacency Principle, and Binding Principle B (for anaphoras).

3. Examples: geometrically defined locality domains, global harmony (verbfinal languages have suffixes, verbinitial languages have prefixes) as well as other parallelisms, underspecification, elsewhere condition, minimality, earliness, economy.

4. Interestingly, Chomsky (2000: 12f.) considers the 'displacement property' as one of the imperfections of human language (besides uninterpretable features such as those for case); imperfections of human language, however, are not determined by UG, but result from the interaction with other capacities. "Why language should have this property is an interesting question, which has been discussed since the 1960s without resolution. My suspicion is that part of the reason has to do with phenomena that have been described in terms of surface structure interpretation […]: topic-comment, specificity, new and old information, […], and so on. If that is correct, then the displacement property is, indeed, forced by legibility conditions: it is motivated by interpretive requirements that are externally imposed by our system of thought". This leaves open to discussion whether the displacement property was already present in the proto-language spoken by the first generations that possessed UG or was innovated in later traditions of language. My own intuition on the basis of typological insights is that displacement has been innovated in later stages (see Section 3).

5. One instance of such a principle is Müller's (2000) *Parallel Movement Constraint*: 'If α c-commands β at structure L, then α c-commands β at structure L'. This principle is reminiscent of a projective mapping which preserves the relationship between vector points.

6. Kirby (1999) demonstrates how implicational universals such as the above one can arise when there are competing functional pressures on two features which in other ways are independent of each other; in this case, he argues, there is no necessity for acquisition.

7. Lexical suppletion is only found in very high-frequent items, e.g. forms of *to be* and *to go*. On the other hand, high-frequent similarities are more easily generalized than low-frequent similarities in a set of items, so that lexical idiosyncrasies may survive in the low-frequent items. Interestingly, Indefrey (2002) has found in an experimental study that the German weak declension rule for the small class of masculine nouns ending in schwa (where all singular cases have to end in *-n*) gets acquired rather late, not before the age of 5, and that there are even adults that did not generalize this as a rule. In this case, animacy highly correlates with masculineness, but Indefrey gives evidence that gender and not animacy triggers the rule. (See below on structure-sensitivity).

8. Hockett's list of features includes vocal-auditory channel (together with some consequences of it), interchangeability (of speaker and hearer), semanticity, arbitrariness (rather than iconicity), discreteness, displacement, productivity, traditional transmission, and duality of patterning (double articulation). See also Hockett (1966) for a slightly modified list of features. Imitation was certainly never considered by Hockett to be a linguistic universal.

9. The assumption that the evolution of language started with manual gestures is supported by the observation that deaf children easily adopt a sign language; even if they do not get sufficient linguistic input from their hearing parents they are nevertheless able to construct a language-like gesture system (Goldin-Meadow 1999, 2003). This suggests that UG is not specialized for the vocalic-auditory channel. However, it is still controversial whether this capacity of deaf children is inherited from an earlier stage of language evolution. The following passage is from Goldin-Meadow's homepage:

> "[…] We have shown that, despite these impoverished language-learning conditions, American deaf children are able to develop gestural communication systems which are structured as are the early communication systems of children acquiring language from conventional language models. Moreover, deaf children of hearing parents growing up in a Chinese culture develop the same gesture systems as their American counterparts, suggesting that the deaf children's gesture systems are resilient, not only to the absence of a conventional language model, but also to cultural variation. Where do these deaf children's gesture systems come from? — One candidate is the gestures that hearing adults produce as they talk. Indeed, the gestures of Mandarin-speakers are similar in type to those of English-speakers. However, the gestures adults use when speaking languages typologically distinct from Mandarin and English — verb-framed languages such as Spanish or Turkish — differ strikingly from the gestures used by speakers of satellite-framed languages such as English or Mandarin. These four cultures — Chinese, American, Spanish, and Turkish — thus offer an opportunity to examine the effects of hearing speakers' gestures on the gesture systems developed by deaf children. If deaf children in all four cultures develop gesture systems with the same structure despite differences in the gestures they see, the children themselves must be bringing strong biases to the communication situation. If, however, the children differ in the gesture

> systems they construct, we will be able to explore how children's construction of a language-like gesture system is influenced by the models they see." (http://psychology.uchicago.edu/socpsych/faculty/meadow.html)

10. Note that the motor theory by Liberman (1957) already claimed that phonetic utterances are analyzed by generating an internal copy; it is therefore legitimate that phonology is mainly based on articulatory features.

11. This can answer the question raised by Hurford (forthc.), namely how the central link between meanings and sounds was established. The sounds replaced a gesture for which this link was not arbitrary.

12. Manual gestures can express deictic relations directly, they can distinguish between several referents by placing them at distinct places in space, they can signal source and goal, and they can model many kinds of modification. Nevertheless, in an established sign language all these iconic gestures have developed into conventional means.

13. The alternative view that typological variation is determined by parameter setting (Baker 2001) is rather problematic. Most serious candidates of UG principles do not have an open parameter that can be switched on or off; they rather lead to a default realization, which might be overridden in various ways. It is also hard to see how genetic information works with open parameters. Although I basically agree with Newmeyer's (this special issue) criticism of Baker's proposal, his conclusions are much too negative. Of course, the child does not acquire 'knowledge of language typology', there are nevertheless many restrictions on possible languages that determine what the child will possibly acquire, as well as what can possibly be observed cross-linguistically.

14. If the linguistic input distinguishes arguments by means of case, or pronominal affix, or position, the child will detect this in accordance with argument hierarchy. There is no need for any parameter to be set by the language learner, notwithstanding the fact that the linguist may use typological parameters for obvious descriptive reasons. The distinction between accusative and ergative itself cannot be a parameter because all four possibilities are documented: both accusative and ergative (Hindi, Georgian), only accusative (German), only ergative (Basque), none (see the next paragraph). Only in a positional system are the two generalized notions strictly complementary to each other; if transitive verbs are realized as agent-V-patient, only two options exist for intransitive verbs: either arg-V ('accusative system') or V-arg ('ergative system'). Again, a possible typological parameter does not play any role for the language learner.

15. For instance, *the policeman attacked in the street shot the aggressor* contains only two arguments, but also two transitive verbs. And therefore each of the two arguments must be linked to both verbs.

16. Under this perspective, studies like Kirby's (2002) are illuminating (see the discussion in Kirby et al. this special issue). Kirby shows by means of simulation experiments that human agents equipped with a fixed learning strategy are able to construct a rather articulated grammar by iterated learning within thousands of generations. This indicates that the emergence of a rather rich morphosyntax needs in fact very few preconditions: one is the learning algorithm, which in this case was a heuristically-driven grammar inducer. Another precondition for Kirby's study was the structure of meanings (to be) expressed. The meanings took the form of simple predicate logic expressions with the possibility of recursion. Thus, the meanings already contained the property of argument hierarchy as well as propositional attitude predicates; both factors have been identified as possible UG factors above. It is not at all obvious that the elaborated predicate calculus assumed by Kirby was prior to human

language; it could as well be the case that it evolved alongside with language. (Recall that in my conception clausal recursion is enabled by the invention of the verb-noun distinction.) In any case, studies like the one by Kirby have to be welcomed because they constitute a new type of evidence, which is able to flank the more intuitive reasoning of typologists.

17. There is no inherent reason why differential direct object marking figures much more prominent in the literature than other instances of differential argument marking, concerning subjects, indirect objects (see Wunderlich 2001 on Yimas) or possessors (see Ortmann 2003). Both Haspelmath (this special issue) and Newmeyer (this special issue) restrict their considerations to direct objects.

18. (2a) also explains why accusative systems outnumber ergative systems, which otherwise are symmetric to each other. Note also that the ranking in (2a) is morphosyntactically oriented, in contrast to the well-known hierarchy subject > object of grammatical functions, a hierarchy that plays an important role in Aissens's (1999, 2000) account of linking splits.

19. Most of these scales have first been discussed by Silverstein (1976); only the two latter scales are added here in order to account for ergative splits determined by aktionsart or aspect (see also Dixon 1994).

20. In this respect his account is at variance with the stochastic OT propagated by Bresnan et al. (2001).

21. For definites vs. indefinites, the definite S/O ratio is 2.1 and the indefinite O/S ratio is 16.8; for animates vs. inanimates, the animate S/O ratio is 9.3 and the inanimate O/S ratio is 14.0. Only for local vs. 3rd person does the local person S/O ratio (17.1) exceed the 3rd person O/S ratio (4.7). Note that Jäger's game theory would produce slightly different results, favouring ergative.

22. The interested reader can find a full analysis on my homepage (Wunderlich 2000).

23. Since argument positions, and topic or focus positions can still conflict with each other, there might have been the further need to encode syntactic arguments by means of case.

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Author's address

Dieter Wunderlich
Institut für Sprache und Information (Abteilung Allgemeine Sprachwissenschaft)
Heinrich-Heine-Universität Düsseldorf
D-40225 Düsseldorf
Germany
wdl@phil-fak.uni-duesseldorf.de