SVO – Attractor in the declarative-to-procedural shift in grammar evolution

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Abstract

Diachronic changes in phrase or clause structure are vectored rather than oscillating. A century ago, E. Sapir identified a drift towards fixed word order and another one towards the invariant word (including the levelling of the forms for subject and object marking). What is still missing is a theory that predicts such drifts. As will be argued, the theory that explains Sapir's observations and, in passing, makes the concept of Universal Grammar dispensable is the theory that grammars are products and targets of cognitive evolution. It is argued that Sapir's drifts are shifts from systems based primarily on the consciously accessible declarative network to systems based on the consciously inaccessible procedural network. This also explains why the [S[VO]] clause-structure is a point of no return and why languages do not change in the reverse direction, starting with a grammar like English and eventually moving to a grammar like Sanskrit.

1. Background

It is a fact that already in the Middle Paleolithic, roughly 300.000 years ago, homo sapiens has settled in North Africa, as excavations in Jebel Irhoud revealed (Richter et als. 2017). This contrasts with the fact that even the oldest texts available for the study of grammars, such as Akkadian, Avestan, Vedic, or Old Chinese reach a time depth of hardly more than 3000 years. Therefore, the available data for the theory of diachronic changes covers about 1% of the relevant time span and no more than one tenth of 1% of the human languages that have ever existed. This is a fact and we should bear it in mind whenever we speculate on the diachronic dynamics of grammars. Essential data on the emergence and development of grammar systems are principally inaccessible to us. It is a truism that grammars don't leave fossils and therefore, the time depth of written records is a narrow, uncrossable horizon. Research on grammar change is bound to deal with only the most recent[1] grammar changes, knowing that each of these grammars has a hidden history of more than three hundred millennia.

As for the general idea behind this paper and for the sake of argumentation, readers are asked to grant the following hypothesis, explicated in more detail in Haider (2015a, 2021a, 2021b): Grammar changes are steps on ramifying paths in the ongoing cognitive evolution of grammars when they concern aspects subserved by the procedural memory network,[2] which, unlike declarative contents, is inaccessible to introspection. Cognitive evolution is an instance of Darwinian evolution, that is, the interplay between random variation and constant but 'blind' selection (i.e. the sieving out of variants). The subject of this area of cognitive evolution is the cognitive capacity that linguists refer to as the mental representation of a grammar. It is not *biological* evolution, which operates on the genome, but it is evolution that operates on a cognitive entity, shaping a cognitively based system, namely the domain-specific 'programme

[1] If we compressed the 300,000 years into a single year, the available data would cover the time from December 28th to New Year's Eve. Evidently, a whole year cannot be reconstructed by studying only the last four days.
[2] The procedural/declarative model of language processing has been worked out by Ullman (2001), (2004).

package' that, in modern jargon, constitutes a mental 'language app'. As explicated in the papers just cited, the evolutionary approach is explanatorily more fruiful than the Generative concept of an allegedly *innate* UG.

One of its major defects is the lack of genetic substance for the innateness claim. UG in the rich version of the Principles & Parameter theory[3] has no realistic chance to be innate, contrary to the accompanying rhetorics. There is no genetic evidence[4] of a species-specific, genetically coded, complex grammar capacity, and there are no predecessor systems in closely related species. Bees have an innate grammar for their communication system, even with dialectal differences being innate (Johnson et al. 2002), but no pertinent journal has published a paper that documents any direct evidence for an *innate* UG. If there were evidence, at least pieces of it would have had to show during the past decades of genomic research.

The UG concept of the Minimalist Program (i.e. faculty of language in the narrow sense), on the other hand, is minimalist, too. Chomsky (2007:10) suggests that UG might be very simple, consisting only of a mechanism for combining symbols, which he calls "merge". In this case, UG would merely provide the starting point for the development of grammars of natural languages, namely efficient programs for sound-to-structure-to-sound mappings, and remain silent on their variants and restrictions. Under cognitive evolution, the properties of grammars are emergent properties. No innate general plan is required.

Evolution is not substance-bound. There is biological evolution, based on the genome, and there is cognitive evolution, which is another instance of evolution, also defined by natural selection, by drift or flow (see Haider 2021a:18), just like biological evolution, but operating on the level of cognitive systems. Its target is the pool of grammar variants in a population of language users. Only those grammar variants will spread that find a brain of a child who acquires this grammar variant and not a competing one. A grammar is a domain-specific cognitive system that runs on a domain-general computational system (viz. the human brain with its neuro-cognitive 'operating systems'), or in other words, our general information processing system embodied in our brains. The mental grammar is the core part of a language app, with a long but unknown history of *cognitive* evolution.

The bonus program that functions as the selection environment for grammar variants in cognitive evolution is the general mental computational system itself. Grammar variants that happen to be better adapted to the computational resources of our brain involved in language processing will receive a bonus by being preferred by more brains than less adapted, more clumsy variants, since they are 'easier' to acquire and use. In the long run (of more than 300 millennia), grammars have adapted to the brain resources since these resources underly language acquisition, language production and language understanding:

[3] The rich version equals a fully assembled mental switchboard with numerous switches (aka parameters) to be set during language acquisition. The version of the Minimalist Program, on the other hand, is minimalist too. It merely defines the starting point with 'merge' as the basic cognitive-grammar procedure. Being minimalist, it cannot and does not account for cross-linguistically invariant grammatical intricacies.

[4] The author is well aware that the notorious FoxP2 gene is implicated in speech production, but this gene is neither species specific nor the 'grammar gene'. There is no evidence of selection in the recent evolution of homo sapiens, see Atkinson et al. (2018). The gene is also involved in birdsong (Teramitsu et al. 2004), but birds don't use human grammars, so FOXP2 cannot be regarded as the 'grammar gene'.

"*Overall, language appears to have adapted to the human brain more so than the reverse*" (Schoenemann 2012: 443) and Kirby (2001: 110) emphasizes that we should "*concentrate less on the way in which we as a species have adapted to the task of using language and more on the ways in which languages adapt to being better passed on by us.*" The following paragraphs partially repeat passages from Haider (2019).

It is not far-fetched to assume that our human ancestors, just like today's children, started with two to three word utterances, with little to no restrictions that would deserve the denomination 'grammar'. From then on, cognitive selection has been working steadily and inescapably, rewarding and conserving (emerging) variants that turned out to be more effective and easier to process and acquire.[5] The cross-linguistic invariants of grammars are the result of convergent evolution[6] (see Reece et. al. 2015: 586) within the same cognitive 'habitat', that is, the interaction with the human brain.

The processes of evolutionary selection (as a channelling factor of change) are dependent on the availability of variation on the one hand, but on the other hand, selection is not deterministic. Just as in biological evolution, it is unpredictable which specific step will happen and when. Evolution does not provoke changes. It merely channels changes in terms of sieving out variants. It may happen that in absence of competing variants, a system attains a relatively stable and undisturbed equilibrium and continues without significant changes for longer periods of time.[7]

For the present purpose, Haeckel's biogenetic law of 1866 – "*Ontogeny recapitulates phylogeny"* – is a good starting point, even if it had to be revised in relevant details by Von Bear (1928), claiming that the general characters of a taxonomic group show earlier in an *embryo* than the specialized characters do. He concluded that only the stages an embryo passes through during ontogeny represent embryonic stages of other species, but not adult forms, as Haeckel had originally claimed.

As for the evolution of grammars, the analogous situation seems to be the following: The acquisition paths in first-language acquisition recapitulate steps in the evolution of grammars. Von Bear's linguistic version would be this: In early stages of language acquisition – until leaving the two and three-word stage – children proceed independently of the type of their respective mother tongues. For instance, children may choose V-before-subject orders even in languages in which the subject would invariably precede the main verb (Deprez & Pierce 1994: 64-65), or they prefer an OV order when acquiring a VO language. These behaviours arguably resemble the "*embryonic stages"* of human languages in the evolutionary history. For children, grammar acquisition takes at least seven years during which they proceed from a two-word to end up in a steady state that governs complex utterances. It will remain unknown how long it

[5] That language economy is involved in language change is a familiar topic at least since the 19th century. What is missing is a theory that explains how it works in some languages and why it does not work in others.

[6] Today, the descendants of some mammals that returned to sea superficially look like prototypical fish (e.g. dolphins, whales, etc.), with streamlined bodies, dorsal fins and flippers. This is a result of convergent evolution (Foote et al. 2015). Not only sea-dwelling mammals, but grammars, too, inevitably adapt to their respective habitat in the course of evolution, without an innate UG for sea-life or language. This is true for sea-dwelling mammals as well as for language-gifted ones. There is neither need for a universal format of sea dwelling life nor one of language processing. The format is an emergent quality of evolutionary processes.

[7] An extreme example from zoology is the species of coelacanths, viz. Latimeria menadoensis and Latimeria chalumnae, who are considered living fossils with a pedigree of 400 million years.

took for mankind to arrive at this point. Another window into the 'embryonic phase' is the isolated emergence of new languages, as in the case of a Nicaraguan sign language (Senghas et al., 2004) or in experimental tasks (Goldin-Meadow et al., 2008). In each of these cases, an SOV order seems to be preferred for denoting transitive events.

A precondition on the way to phrase structuring, with phrases differentiated by their head categories, is lexical categorization. The lexical categories of heads as formal distinctions partition the set of morphological markers that are attached to them (and vice versa). This design of morphological identification is in turn a precursor of a design in which the *morphological* coding of grammatical relations (as in 1a) gets replaced by *topological* [8] coding in terms of head-initial and strictly linearized phrase structures, as in the gloss (1b), which allow for an efficient *procedural* identification of essential relations without much recourse to morphological marking.

Cognitively, this amounts to a shift from declarative memory load to cognitively less costly[9] procedural memory capacities. (1a) is an example of classical Latin, a language dreaded for its rich morphological inventory by generations of pupils who had to memorize it. The English gloss of (1a) in (1b) contains four prepositions and no case or agreement morphology on nouns and adjectives. The Latin original contains no preposition but a lot of case and agreement morphology.

(1) a. Datur haec venia antiquitati, ut miscendo humana divinis
primordia urbium augustiora faciat. Titus Livius[10]

b. is-given this privilege (to) antiquity so-that (by) mingling (with) human divine (things)
(the) beginnings (of) cities more dignified become
'It is the privilege of antiquity to mingle divine things with human,
and so to add dignity to the beginnings of cities'

This state of affairs – morphological coding (as in Latin) replaced by topological coding (as in English) – is diachronically a one-way road. No language is known to have developed in the reverse direction, that is, starting from an English- or Chinese-like [S[VO]] grammar and ending up with a grammar resembling that of Latin or Sanskrit; see Gell-Man & Ruhlen (2011) and Maurits & Griffiths (2014). A peer-reviewer rightly asks what exactly prevents such an inverse development. At least since the time of Gabelentz (1901/2016: 269), cyclical developments have been discussed (see Haspelmath 2018). Even in an entirely 'analytic' language, changes might turn relational particles or (doubled) pronouns into clitics which could develop furth into affixes and differentiate into case paradigms. Eventually, the morphologically identifiable phrases might admit the kind of word order variation we see in an SOV languages. Is this a realistic scenario?

At least for the last step we know for sure that it is not. Faroese and Icelandic are SVO languages with a rich case and agreement morphology. Nevertheless, word order is as strict as in the caseless continental Germanic SVO languages. Direct objects do not switch place with indirect objects, nor would prepositional objects find room in between. In an evolution-based approach,

[8] 'Topological' $=_{def.}$ relating to the way in which constituent parts are connected, arranged and interrelated.
[9] It is less costly since topological rules apply to all items of a lexical category while morphological rules typically require lexical access, especially when the language is an inflecting language.
[10] http://data.perseus.org/citations/urn:cts:latinLit:phi0914.phi0011.perseus-lat1:pr.7

such ‘restorationist’ developments are blocked for the following reason (see Haider 2021a: 42). The [S[VO]] architecture is a strong attractor. So, in terms of evolution theory, any change that gives up the [S[VO]]-architecture would be a change that reduces the efficiency of a grammar that has arrived at a local maximum, namely the topological identification of the arguments of the verb. In other words, there is no selective advantage for variants that would have to accumulate in order to reach a tipping point.

From a diachronical standpoint, languages like English, that is, languages with uniformly head-initial phrases and a structurally unique, obligatory subject position preceding the verb phrase, are diachronically younger. Topological coding is an outcome of diachronic changes rather than a *starting* point. In other words, many SVO languages have free-word-order languages as ancestors, but free word order languages with [S[VO]] ancestry in the course of non-disruptive evolutionary changes (that is, changes free from external interference such as bilingualism) are predicted to be inexistent. The rare cases of SVO-to-SOV are cases of disruption, that is, cases in which a dominant SOV language supersedes the dominated language.[11]

Some alleged cases are misunderstandings because of the ill-defined typological category “SVO”. An example is a widely cited paper on VO to OV by Li & Thompson (1974). They claim to deal with “so-called” VO to OV, but what they discuss is not object-before-verb but PP-before-verb. In Chinese, nominal objects are canonically postverbal. Chinese is a language with category-specific headedness directionality and in this respect the opposite of the West Germanic languages. It is head-initial for verbs and head-final for nouns, and moreover, it has a re-analysed serial verb construction. The former serial verbs 把 (bǎ: take) and 给 (gěi: give) have been reanalysed as prepositions and thereby, these PPs ended up in a preverbal position. Object noun phrases however are canonically postverbal. If Chinese were on the way to VO, noun phrase objects would have to be licit in immediately pre-verbal positions, which is not the case.[12] OV languages are languages with obligatorily preverbal noun phrase arguments of the verb.

For the statements relating to SVO and SOV in this paper, and especially the “no return from SVO” claim it is important to bear in mind that the term "SVO" is used differently in grammar theory and in typology. In grammar theory, an [S[VO]] language is a language with an obligatorily head-initial VP and an obligatory preverbal subject position. In typology, an SVO language is a language in which the subject-verb-object order is “more frequently used” (Dryer 2013) than other admissible orders. This covers not only [S[VO]] languages but other languages too, such as Type-3 languages or languages that front the finite verb, such as the Germanic

[11] Language contact and bilingual populations are stronger factors in language change than evolution by positive selection of favourable treats. The corresponding concept in population genetics is Horizontal Gene Transfer (HGT). Because of HGT, "*gradualism is not the principal regime of evolution*" (Koonin 2009: 1027). However, word order properties may also resist a dominant language in bilingual settings, as the example of Farsi demonstrates after the Arab conquest of Iran in the middle of the 7th century. Modern Persian is still SOV.

[12] Mandarin Chinese is a topic-prominent language, with options of fronting phrases to clause-initial areas, which produces word order variation, as for instance object fronting in (i). However, (ii) is unacceptable, as Tai (2008:10) reports, based on native Beijing informant interviews, although (ii) would be a canonical SOV order.

i. 狮子，老虎吃了。 (Shīzǐ, lǎohǔ chī le)
lion, tiger eat PFV (‘a lion, the tiger eats’)

ii. ∗老虎, 狮子吃了. (Lǎohǔ, shīzǐ chī le)
tiger lion eat PFV (‘The tiger eats a lion’)

languages. This kind of handling is a source of potential misunderstandings. Here is an example. WALS (Dryer & Haspelmath 2013) files Russian as SVO but neighbouring Belarus as language with "*no dominant order*". This is empirically inappropriate and shows a lack of selectivity[13] of the term "SVO" since the two languages are virtually identical with respect to word order.[14] Both languages are Type-3 languages (Haider & Szucsich 2022a), with S-V-O as an order that is *pragmatically* compatible with more contexts than other orders. All orders are grammatical, but some require more specific contexts of utterance. In [S[VO]], such "other orders" are structurally barred.

A reviewer, who focuses on typological issues, maintains that "*it is not hard to find apparent cases of SVO languages changing to SOV*" and points out that "*if Austroasiatic languages were originally SVO, as reflected by modern Mon-Khmer languages, then the Munda languages changed from SVO to SOV*." Another example is the Oceanic branch of Austronesian. These languages "*were originally either SVO or VSO, but a number of Oceanic languages in New Guinea have become SOV*."

This situation is similar to the diachronic fanning-out of Indo-European languages into SOV, VSO, and SVO languages, but with one key difference. For these languages, we have a time series of data and can determine the order of diachronic changes. In the absence of diachronic data, typologists must attempt to infer past changes from the present distribution of types, with a fundamental difficulty. If there is a split in a language family, there are two logical options, namely the forking-off of a novel variant or the transition into two or more novel variants, with the 'mother' variant disappearing.

For the Indo-European situation, the available data support a forking-off scenario. A basic innovation was the change from variable positioning of lexical heads to fixed positioning (Haider 2014). In other words, the proto-language arguably was a type-3 language (i.e. no fixed position of the head of a phrase and thus syntactically free word order). The fixing of head-positions implies a choice between head-initial or head-final. The head-final option results in an OV sentence structure, while the head-initial option leads to VSO or SVO. All options found their implementation, with VSO in Celtic languages, SVO in Romance, North Germanic plus English, and OV[15] in Afrikaans, Dutch, Frisian, and German. The Indo-European T3 grammar persists in the Slavic languages.

If we did not have sufficient diachronic data for the Western Indo-European languages (Romance, Germanic, Celtic), we might be misled by the current situation into assuming a forking-off scenario in which a minority has switched to OV, when in fact VO and OV are innovations.

The cases brought up by the reviewer are similar. We are comparing outcomes of an unknown time depth that resulted in two different clause-structure types, such as uniformly head-initial languages (SVO: Mundari, Dani) and uniformly head final ones (SOV: Vietnamese. Arapesh).

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[13] Because of the lack of selectivity, Hawkins (1983: 114-16) abandoned SVO altogether as typological indicator.

[14] "*Belarusian and Russian are genetically very close and structurally very similar languages.* [...] *The structural distance between Belarusian and Russian is of the kind prototypically acknowledged for different dialects of one language*." (Hentschel 2014: 93-94).

[15] Argumental noun-phrases *obligatorily precede* the base position of the verb in the VP. If the only verb of a clause is a finite verb, the order gets masked by the V2 property, that is, the fronting of the finite verb.

However, in the absence of diachronic data, we cannot decide conclusively whether one group developed out of the other or whether both are innovations. As for the New Guinea situation, Dunn et al. (2002: 57) note that "*SOV, or more accurately V-final, order of the clause is typically Papuan, while Austronesian languages – at least the Oceanic ones – are typically object-final."* However, we also see quite a few Papuan languages that are uniformly head-initial and SVO. For instance, "*the Papuan languages spoken on New Britain all have an SVO order*" (Dunn et als. 2002: 32).

On the other hand, there are languages like Saliba, which is a uniformly *head-final* SOV language but displays linguistic features of SVO Oceanic languages. In the absence of diachronic data for the given language, it is not possible to decide whether such a language is an Oceanic language that assimilated to the word order properties of a Papuan language or a Papuan language that took over several Oceanic features. In any case, this is a likely result of close language contact but not of the gradual evolutionary processes of variation and selection.

The respective mechanism in evolution theory is known as horizontal gene transfer.[16] It is a disruptive mechanism since it mixes genes of different organisms, that is, of different evolutionary 'biographies'. The corresponding linguistic situation is the transposition of grammar packages by intensive language contact, and especially in bilingual periods.

Let us revert to the general issue. Word order changes are not instantaneous;[17] they usually take many generations, as in the case of the fixing of the head-final (= OV) vs. the head-initial (= VO) property in Germanic languages (Prell 2003, Haider 2014). However, due to the absence of script in the past of the majority of modern languages, the historical depth of documented grammar changes is comparatively shallow. Nevertheless, even the little we know is sufficient for recognising clear effects of the ongoing cognitive evolution geared by variation & selection. Here are just two examples of the numerous insights produced by population genetics research that linguists may cautiously insource and apply to their own domain of research.

Fisher (1930: 35) detected and proved a fundamental theorem of natural selection: "*The rate of increase in fitness of any organism at any time is equal to its genetic variance in fitness at that time*." In other words, the intensity of selection and hence, the rate of evolution due to selection, is proportional to the magnitude of variation in an evolving population, which, in turn, is proportional to the effective population size (Koonin 2012: 7). This immediately accounts for the fact that Logudorese Sardinian, Faroese, or Icelandic[18], to name a few examples, have changed less and have conserved more of the earlier traits than Italian or Norwegian, although they are offspring of the very same ancestor languages, respectively. A small population confined to a small (insular) region produces less variation and therefore less chances for change.[19]

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[16] Gene transfer pertains to the transfer of genes between organisms. In horizontal transfer (aka transposition), genes, referred to as transposons or jumping genes, are transferred from the donor organism to the recipient organism by gene copying and insertion. [Source: https://www.biologyonline.com/dictionary/gene-transfer].

[17] Changes are instantaneous only with respect to the mental grammar in an *individual* brain, In the *population*, the change, if successful, must spread, and this takes many generations.

[18] The major settling up of Iceland by Norwegians took place in the 7th to 9th century. Today's Icelandic is closer to the language of the ancient settlers than to modern Norwegian.

[19] Note that communicative functionalism would have to come to exactly opposite, wrong predictions, since small communities would in principle be able to change their habits rapidly and homogeneously. Consequently, the concomitant communicative functions would change homogenously und these changes would therefore be easier to stabilize and retain than in speech communities covering large territories.

Another illustrative parallel is the fact that the paths of evolutionary changes in an organism (Northover et als. 2020) and in grammars (Dunn et als. 2011) are *lineage-specific*. What this shows is the interdependency of evolutionary steps. Changes do not arise from an arbitrary revaluation of any odd parameter but they develop in cascades. The individual change is an arbitrary event, the following steps may be partially necessary ones.

2. The basic organization of phrase and clause structure

In our days, that is approximately 300.000 years after the first documented appearance of homo sapiens in the Mediterranean region, we see at least three major types of phrasal and clausal architecture. Generally, phrases are organized 'around' phrasal heads, which presupposes the existence of lexical categories. In field-linguistics literature, Salish languages have been showcased as testimonies for languages without lexical categories. Later, this has been vehemently contested.[20]

Grammatical morphology is the grammaticalized successor of previous means[21] of discriminating the expressions that represent participants of the eventualities denoted by verbs. Evolutionary streamlining has turned them into formal markers of formal relations, among others case and agreement. Note that such systems are indispensable steps on the road to topological systems. UG theory, on the other hand, would not be violated if a language with the grammar of English came into existence out of the blue[22] since it is a language that matches UG requirements. Evolution theory, on the other hand, presupposes a stepwise development, starting from 2-to-3 word stages, that eventually reaches a stage like English after the free-word-order and morphological marking stages. Crucially, an [S[VO]] clause structure has necessary diachronic precursors that are structurally less complex (at the expense of a complex grammatical morphology) but provide the necessary pool of variants that furnish the building blocks for a development that leads to [S[VO]]. Even if a language ends up without morphology it has reached this stage only via preceding stages with morphology. Most often, the precursor is a free word-order language (see Haider & Szucsich 2021a,b). Here, evolution theory and UG clearly differ.

Typical morphology-based systems provide morphological tags for linking the dependents to the head. The best known examples are the oldest documented Indo-European languages and their classical successor languages. In the absence of tight order relations, these languages are so-called free word order languages, as illustrated by the Latin[23] example (1). If morphological linking is the only linking relation for a given language, the resultant word order freedom has motivated the concept of a "non-configurational" language.

A frequently observed step in the grammatical evolution is the step from 'morphology only' to 'morphology plus structure', followed by 'structure only'. 'Structure' means that order relations are imposed by the grammar in terms of phrase structures projected above a head element whose category yields the category of the phrase. The effect of phrase structuring imposed on a string

[20] Jelinek & Demers' (1994: 698) claim of the lack of *lexical* category distinctions in Salish is contested by Koch & Matthewson (2009) and Davis et. als. (2014: e199): "*No one working on Salish holds to category neutrality these days*."

[21] This includes all kinds of differential identification of nouns by means of appositions or class markers, some of which still exist, for instance in the form of noun classifiers.

[22] Note that creole languages are not created 'out of the blue'; they are formed on the basis of an input, namely pidgins, and pidgins are devoid of grammatical morphology.

[23] Spevak (2010: 1) exemplifies this by variants of a clause, with OV, VO, and OVS order.

of elements becomes evident when bracketing is used in a syntactic notation. Phrase structures map a one-dimensional string of items on a two-dimensional box-in-box structure, which greatly enhances parsing and production.

A fundamental order relation in phrase-structuring is the linear order of the head relative to its dependents. Logically, there are two serializations which can be implemented in three alternative structural options, namely 'before, 'after' and 'before or after' (= flexible). If we disregard for the moment the internal structure of the respective phases, we see the following linearization patterns for a VP with a ditransitive verb. (2a) is the option we see in SOV languages. (2b) is the option of SVO and VSO languages. (2c) is the option that typically diachronically precedes (2a) or (2b). These are the respective subsets of (2c) that result from setting a directionality value of the head for licensing the position of its dependent:

(2) a. head-final: [IO < DO < V°] SOV
b. head-initial: [V° > IO > DO] VSO, SVO
c. variable: {[IO < DO < V°], [V° > IO > DO], [IO < V° > DO]} Type-3[24]

Let us turn now to the internal structure of the VP. There are compelling reasons[25] for assuming that complex phrases, that is, phrases with more than one complement of the head, are binary rather than n-ary branching, 'flat' structures, as some schools of linguistics, including functional typology, assume. Across schools, there is consensus that phrases are endocentric, that is, every phrase contains a head element whose category determines the category of the phrase. Given the universal right-branching restriction (BBC[26]), the OV-structure is the most simple structure. The dependents of the head are binarily associated ('merged'). The price to be paid for the simple, right-branching structure (3) is the late presentation of the head of the phrase.

(3) a. [α [β [γ V°]]]
b. [keiner$_{\alpha\text{-nom}}$ [jedem$_{\beta\text{-dat}}$ [alles$_{\gamma\text{-acc}}$ neidet]]] (German)
nobody everyone everything begrudges

Since the lexical head is associated via its lexical entry with a lot of syntactically relevant information, early presentation of the head is an advantage for the parser of the message recipient in the time-bound task of processing the incoming information. However, the early presentation of the head of the phrase cannot be achieved by a mirror-image, left-branching structure of (3) as in (4):

(4) [[[V° γ] β] α]

Left-branching structures such as (4) are known to be difficult to parse since the parser principally cannot know in advance how deeply embedded the item is that happens to come in first.

[24] The term refers to the "third" option, in addition to head-final and head-initial. A typical example of such languages are the Slavic languages (see Haider & Szucsich 2022a,b).

[25] In languages with head-final VPs and a fronting option to the clause-initial position, as in German, one can virtually reproduce the stepwise, binary layering of phrase. Any one of the bracketed constituents in (i) can be fronted, in order to arrive at an acceptable declarative main clause.
i. --- würde sie [jedem [etwas [darüber [erzählen]]]] (German)
would she [everyone [something [it-about [tell]]]]

[26] BBC (basic branching constraint) =*def. Universally, the internal structural build-up (merger) of phrases (and their functional extensions) is right-branching* (Haider 2013: 3). In other words, any node on the projection line of the head follows its sister phrase. It was proposed first in Haider (1992).

In other words, the parser cannot know in advance how many left brackets to open. So, it is prone to constantly backtrack.

Since the late eighties, see Larson (1988), it has become uncontroversial for theoretical linguists that the VO counterpart of (3a) is not the mirror image structure (4), illustrated in (5a), a variant of which Chomsky (1981: 171) had originally assumed for double object constructions. The evidence converges on the VP structure (5b).[27] In fact, Larson suggests a more complex derivation that starts from a structure like (5a). The re-instantiation of V in (5b) is the source of the shell structure in head-initial VPs. The licensing-triggered re-instantiation in a right-branching structure has been suggested first in Haider (1992) and elaborated in later work (1997, 2000, 2005, 2015b).

(5) a.*[$_{VP}$[[begrudges everything] everyone] nobody]
b. [$_{VP}$ Nobody [begrudges$_i$ [everyone [e$_i$ everything]]]]

Why are phrases not built up as left-branching[28] as in (4), but only right-branching, as in (3b) or (5b)? The answer is already one in terms of adaptive selection in the course of grammar evolution. Although it is preferable to have the head presented early, as in (4), compared to (3), the structure (4) is disfavored by the general processing system that runs the parser. (4) is too clumsy for parsing by a left-corner parser with bounded memory (Jin & Schuler 2020), compared to a right-branching structure (2a), as a comparison of (2a) and (4) shows. It suffices to notice the brackets accumulating at the beginning rather than at the end.

The situation is entirely different with (3). Right-branching structures, which are embedding phrases on the left side of the head or one of its projections, guarantee that an item, when it is parsed, is *higher* in the structure than any other item that *follows* within the same phrase. The immediately dominating constituent node is always the node, that dominates the rest of the phrase.

The build-up of the structure (5b) follows directly from the interaction of directional licensing and a universal constraint, namely the *Basic Branching Constraint* (BBC), see Haider (1992), (1997), (2000), (2013:3). It states that phrases are universally right-branching. Left-branching projections of lexical heads do not exist. So, universally, we see an asymmetry.

Given that phrases are universally right-branching and that the licensing directionality of heads of *head-initial* phrases is thereby opposite to the direction of merger, the shell structure of complex head-initial phrases is the emergent outcome of structuring. (6a) to (6d) are the respective steps of merger. The arrows denote the licensing directionality.

(6) a. [*begrudge*$_{\rightarrow}$ everything]
b. [everyone [*begrudge*$_{\rightarrow}$ everything]]
c. [begrudge$_{\rightarrow}$ [everyone [~~*begrudge*~~ everything]]]
d. [nobody [*begrudge* [everyone [~~*begrudge*~~ everything]]]

[27] In clause structures, the subject eventually will end up in a VP-external functional spec-position in English.

[28] In fact, Dryer's (1992) „*Branching Direction Theory*" which uses the term "left branching" for VO is not a theory of branching but a version of the *peripherality condition* of X'-Theory for phrasal heads, s. Stowell's (1981: 70) wrap up of the X'-Theory: The head of a phrase is peripheral. In Dryer's view, it either precedes or follows its dependents in a flat, n-ary-branching VP. Flat structures do not have a branching direction. In X'-Theory, structures are binary branching.

First in (6a), the lowest argument joins the verb and receives the canonical directional licensing by the verbal head. Then, the indirect object is merged with the structure (6a) in the right-branching structure (6b). Since the canonical licensing direction is to the right, neither the verb nor V' can license to the left. So, the verb needs to be re-instantiated for licensing the indirect object directionally in (6c). This is how the shell structure emerges in complex head-*initial* phrases, and only in head-initial ones. In OV languages, the VP has no shell structure because the verb remains in the foot position of the VP, with all arguments in the directionality domain of the verbal head or one of its projection nodes.

Finally, the subject argument is merged VP-internally (6d). Again, a licenser on its left is needed. In [S[VO]] languages, this is a preceding functional head, viz. T°, or I° in the previous nomenclature. The subject phrase predictably raises to the spec position of the functional head.[29] This is enforced since the condition that triggers V re-instantiation and subject raising is the *mutual c-command requirement of* directional licensing: The licenser and the licensee have to c-command each other (Haider 2010: 29, 2015b: 84) and the licensee must be in the canonical directionality domain of the licenser. For head-initial phrases, this entails that in a complex projection, the licensing verb needs to be re-instantiated higher. For the subject, the mutual c-command requirement entails 'movement' to the spec-position. Here, it c-commands the functional head, and the functional head c-command a chain-link of the subject, namely the base position of the subject, which it licenses directionally.[30]

In OV structures, the head but also each projection of the head is a directionally licit licensers. In VO languages, however, the projection nodes of the head are on the 'wrong' side, directionality-wise. The way out is a re-instantiation of the head, whence the so-called shells in complex head-initial phrases. Finally this theory not only entails the existence of a functional projection for accommodating the subject in SVO languages but also its absence in OV languages. For details please consult Haider (2015b).

Next, let us recapitulate and assess the different systems. First, morphological linking heavily draws on the *declarative* memory system since the (numerous paradigms of) case and agreement morphology must be memorized and retrieved. Second, in the T3-system (2c), directionality of licensing does not impose a linear order. This provides headroom for other components of grammar (information structuring, scoping, binding, etc.) to capture and thereby pragmatically partition linearization patterns.

Fixed positions for heads enhance the predictability for the parser. The least complex organization of phrase structures with a fixed head-position is head final (2a), with the dependents successively merged at the left. The position of the verb is the signal for the end of the phrase. The highest predictability and least order variation is achieved in the head-initial organization, which is more complex, however, as illustrated by (6). The head always comes in first position and 'precede' equals 'c-command' for phrases within a given projection of a head. Eventually,

[29] In VSO languages, the verb is re-instantiated once more, that is, above the subject position.

[30] A reviewer raised an intriguing question. If a functional head licenses the subject in (6d), why couldn't there be a functional head in (6c), too, licensing the indirect object. The Generative theory would admit it but evolution does not deliver. Evolution does not invent functional heads; it selects among variants in a gradual series of steps. The functional head for subjects is a reanalysis of the positioning of the agreeing (finite) verb. There is no such context for indirect objects that would lend themselves to reanalysis.

strictly head-initial phrases are fixed-order phrases. The latter can be observed in a kind of minimal-pair setting in languages in which the directionality of the head is sensitive to the lexical category of the head, such as German (7), with a head-*final* VP (7a,b) and a head-*initial* NP (7c,d). Such a constellation is cross-linguistically by no means exceptional.[31]

(7) a. das Geld an die Armen verteilen
the money$_{Acc.}$ to the poor distribute
b. an die Armen$_i$ das Geld e$_i$ verteilen
to the poor the money$_{Acc.}$ distribute
c. das Verteilen des Geldes an die Armen
the distribute(ing) the money$_{Gen.}$ to the poor
d.*das Verteilen an die Armen$_i$ des Geldes e$_i$
the distribute(ing) to the poor the money$_{Gen.}$

In the head-final VP, the word order is variable (7a,b). In the head-initial NP (7c,d), the word order is rigid, just as in English. Note, by the way, that 'scrambling' is not so much language specific than phrase-structure specific. Head-final structures (as well as T3 structures) provide variation space that is principally and predictably absent in head-initial structures, see Haider (2015b, 2020).

As argued in more detail in Haider (2021a,b), the cognitive evolution of grammar systems entails a shift and drift from declarative (= morphological) to procedural (= topological) coding. The cognitively encapsulated, i.e. consciously inaccessible, aspects of grammars as cognitively represented systems, that is, the procedural parts of grammars, including structuring, are subject to, and results of, Darwinian evolution, applying to a domain-specific cognitive program. Other, consciously accessible, aspects of language, viz. the declaratively coded ones, such as the lexicon or morphological markers, are open for other kinds of change, too.

Morphologically coding systems are costly since first of all, they involve and strain the general-purpose memory system, that is, the share of it which is 'subcontracted' by the declarative network of language processing. Second, they become even more costly in the course of time since morphology is exposed to phonological changes, which leads to dissipative patterns. For instance, the Latin version of the inherited Proto-Indo-European case-system codes *six* different cases on *five* different classes of nouns, namely a-, e-, i-, and u-stems plus the consonantal class, in singular and plural. Every time a noun is used, decisions between sixty different forms, some of which are not distinct, await the speakers or hearers in Latin.

English nouns, in a clear-cut contrast, function with *one* invariant form plus *one* suffix for plural. This is made possible by topological coding. Diachronically, topological coding is the precondition for the gradual loss of morphological case marking. The change to topological coding makes morphological coding redundant, as Jespersen has emphasized already more than a century ago,[32] but it does not automatically replace it, as Icelandic shows. Icelandic is a topologi-

[31] Numerous languages display the same directionality profile, as for instance, Afrikaans, Amharic, Dutch, Frisian, German, Kurdish, or Persian, to name but a few examples. Chinese is inverse, with head-initial VPs and head-final NPs.

[32] Jespersen (1894: §75, 96-97) has explicitly rejected the still widely propagated idea that topological coding *compensates* the loss of morphological marking.: "*A fixed word order was the prius, or cause, and grammatical*

cally coding SVO language, still equipped with a rich morphological case and agreement inventory.

Let us briefly compare a few languages in this respect. In Germanic languages, unstressed pronouns are fronted within their domain. The respective domain in German is the so-called Mittelfeld (midfield), which is the region between the position of clause-initial complementizers and the V-position at the end. Structurally, this is the VP domain. Icelandic (8d), just like English (8c), with its complex VPs, does not change the relative order of objects, neither nominal nor pronominal ones. The fronting domain is the VP,[33] too, but the head-initial VP is 'narrower' and tightly structured. So, unlike German (8b) and Latin (8a), a pronominal object cannot be fronted across a subject (8c,d). In a free word order language such as Latin, ample order variation is expected.

(8) a. Tum *mihi* Roscius et alia multa dixit. Latin (Cicero Quinct. 78)
then (to) me Roscius also many other (things) said
b. Damals sagte *mir* Roscius auch *vieles andere.* German
then said (to) me Roscius also many other (things)
c. Then Roscius told *me* also *many other things.*
d. Þá sagði Roscius mér líka margt annað. Icelandic
there said Roscius (to) me also many other (things)

Let us proceed now to the potential evolutionary gain of topological coding of grammatical relations. In SOV and free word order languages (9a), case and agreement disambiguate the arguments, which may come in any surface order due to word order variation (aka 'scrambling'). Topological coding (9b) disambiguates even without case and agreement and the *relative* order of the arguments is always the same (unless exactly one item is fronted in wh-clauses, relative clauses, or in V2-declaratives, such as in the Scandinavian languages).

(9) a. $[\alpha_{nom}\ [\beta_{dat}\ [\gamma_{acc}\ V°]]]$ order variation among arguments available
b. $[\alpha\ [V_i°\ [\beta\ [e_i\ \gamma]]]]$ no order variation among arguments available

In the structure sketched in (9b), each argument is identified by its unique structural position. The subject is the only argument that precedes the verb in VO. The direct object is in the lower shell position of the VP while the indirect object is in the higher postverbal position which is the position preceding the empty V° base-position. The relative order is invariant, irrespective of interpretability, as (10a) illustrates.[34] In a head-final VP such as in German, the order is variable (10b,c).

(10) a.*The King awarded *to the sailor* the Albert Medal / *the Albert Medal the sailor
b. Der König überreichte die Urkunde dem Nobelpreisträger
the king presented the certificate$_{Acc}$ the Nobel-laureate$_{Dat}$

simplification, the posterus, or effect". In simple words, people are not forced to give up morphology, they are glad to do so.

[33] This shows only in special contexts, as for instance, in particle constructions and with resultative predicates.
i.*He gave up/back *it*. – He gave *it* up/back. ii.*He cut loose *it* – He cut *it* loose.

[34] In Dutch, an OV language without hardly any scrambling of noun phrases, PP objects may scramble easily, unlike in VO languages (Geerts et al. 1984: 989):
i. Toen hebben de autoriteiten aan de moeder$_i$ het kind e_i teruggegeven
then have the authorities to the mother the child back-given

c. Der König überreichte dem Nobelpreisträger die Urkunde
the king presented the Nobel-laureate$_{Dat}$ the certificate$_{Acc}$

Present day Icelandic is particularly instructive: rich morphological marking, but strict word order due to its SVO phrase structure. It is a perfect example of a transitional period of grammar change. The clause structure is SVO but the morphological markings are still well conserved, in contrast to its sibling variant (West-)Norwegian, which transmuted into a language without morphological case or verbal agreement. Icelandic demonstrates clearly that the structural identification overrides the morphological distinctions. For instance, in the passive of ditransitive verbs, the dative may end up in the structural subject position and the object remains in-situ, in spite of its nominative case. Such a "dative subject" (aka "quirky subject") inherits subject properties by virtue of occupying the subject position (see Sigurðsson 1992). In OV-languages such as German, the "quirky subject" phenomenon cannot occur because there is no VP-external, *structural* subject position, see Haider (2005).

3. From declarative to procedural – reduction of work load

The fact that a majority of languages are either head final ("OV") or head initial ("VO")[35] in their phrasal and clausal structure demonstrates that both types of structuring are likely outcomes of the cognitive evolution of grammars during the past millennia. In other words, grammars of either type are sufficiently well-adapted and in a stable state. Evidently, the cost-benefit relation is salutary for both, with a different price-gain profile, though. SOV offers a simpler phrase structure at the cost of a late presentation of the verb in the clause. [S[VO]] scores with an early accessible verb at the price of a more complex phrase structure. It is crucial to realize that structure building is a domain of grammar that is based on the *procedural* memory system, which is cognitively encapsulated.

The fact that cross-linguistically, the two structure systems have coexisted already over very long periods shows that there is no massive advantage of one over the other. Japanese, for instance, is a strict SOV languages that has been SOV since the earliest available Old Japanese texts; see Katsue (1978). In this respect, Japanese is representative of a large group of languages.

Which languages change more dynamically from one word order type into another? The typical Eurocentric answer cites Indo-European language families, such as the Romance and the North Germanic one. These languages are said to be descendants of SOV languages. However, the evidence for this claim is weak and highly questionable. None of the predecessor languages was a strict OV language and none of them was an [S[VO]][36] language. In fact they were all T3 languages, with OV as a frequent pattern, besides many other frequent order variants. This had been realized already by Miller (1975). Detailed argumentation is available in Haider (2014) and Haider & Szucsich (2022b: 114, 125-130), for Germanic, Romance, and Slavic.

[35] Please note that the typological labelling "SVO" is false positive to a high extent since T3 languages are typically misclassified as SVO, see Haider & Szucsich (2022a), on the example of Slavonic languages.

[36] The brackets indicate that here, "SVO" refers to languages with head-initial phrases and a clause structure with an obligatory, VP-external subject position. In typological literature, "SVO" is construed as word order type of languages in which a clause with a typical transitive verbs is *preferably* serialized as subject-verb-object. This is too loose a criterion since it is too often false positive.

Evidence for a strictly SOV IE-language is exceptional and comes only from Hittite (cf. Hoffner & Melchert 2008), a language without existing successor language(s). For all other IE-languages, "SOV" is merely the *least inappropriate* type assignment (out of VSO, SVO, and SOV). Unlike Hittite, in which clauses with nominal arguments in post-verbal positions do not occur, the other IE-languages display a high degree of variable word order, with and without postverbal *nominal* arguments within the same text. SOV languages do not admit postverbal argumental noun phrases, but Type-3 languages do. Here is a report that is representative not only of Sanskrit Vedic (Viti 2010: 58).

> "*In Vedic, different word orders are associated with different pragmatic situations, according to two main principles. First, the fronted argument is more specific, animate, and topical* (*in SOV, SVO, and VSO, the subject is more topical than the object; in OSV, OVS, and VOS, the opposite occurs*). [...] *Second, subject and object tend to be adjacent when they are semantically and/or pragmatically similar* (*in SOV, OSV, VSO, and VOS*)"

The same kind of order variation is known for other classical IE-languages (Speyer 2018), such as Latin (Danckaert 2015) or Ancient Greek,[37] and Old Scandinavian (Faarlund 1994). Note that the word order patterns found in Vedic, as discussed by Viti (2020), and in other ancient IE-languages, are the word order patterns of a Type-3 grammar. Information structuring takes a free ride, captures and partitions the word order freedom of T3 clause structures (Haider 2020) but does not enforce word order variation by itself. English is a good example for a language with rigid word order that resists any loosening of it by information structuring.

Having removed the SOV bias from ancient IE-languages, we are in a position to sketch a more plausible scenario for the changes that happened after the Proto-Romance and Proto-Germanic times and led to the present day grammars. The starting point in both cases – varieties of Vulgar Latin for Romance and Old Germanic varieties in the case of North- and West-Germanic languages – were T3 grammars. The present state of affairs is the following. Presently, all Romance languages are [S[VO]] languages; all Germanic languages are V2-languages and have split into an [S[VO]] group (North Germanic) and an SOV group (continental West Germanic and Afrikaans).

The shared overarching change is the change from a directionally unconstrained licensing property of the head of a phrase (viz. T3) to a *fixed* directional licensing property, see Haider (2014). In the whole of Romance and in North Germanic, the verbal heads license 'to the right.' The result is a head-initial VP in a clause-structure with a functional head as directional licenser of the VP-internal subject in its otherwise directionally unlicensed position to the left of V°.

The Germanic situation is less simple than the Romance one because of the OV-VO type split. In North Germanic, the verbal heads license 'to the right', whereas in the continental West-Germanic group, the verb licenses 'to the left'. This split becomes better understandable once one takes into account the temporal overlapping of the fixing of head-directionality with the emergence of the V2-property as another change (see Haider 2014). Because of the V2-structure of declaratives, the OV vs. VO difference was masked in sizeable set of utterances, namely

[37] Speyer (2018:161): "*If we look at other early attested Indo-European languages, the 'Latin' state of affairs is the prevalent state: Ancient Greek and Sanskrit word order is equally 'free', that is, the word order is sensitive to information-structural, conceptual, even stylistic requirements*."

any main clause in which the finite verb is the main verb, as in (11). The options for constraining the licensing directionality amount to a binary choice, that is, targeting left vs. targeting right. It must not come as a surprise that either option has found its linguistic realization.

(11) a. Das Objekt folgt$_i$ meistens dem Subjekt $\leftarrow$**e$_i$** German
the object follows usually the subject
b. Objektet följer$_i$ vanligtvis **e$_i\rightarrow$** subjektet Swedish
object$_{Def.}$ follow$_{pres.}$ usually subject $_{Def.}$

The continental Scandinavian languages are strictly head-initial, morphologically caseless, and without verbal agreement. This comes close to a terminal step in the grammar evolution since such grammars are peaks in the adaptive landscapes of grammars and thus very stable. The arguments of a head are structurally identified, without any case and agreement morphology. This a purely procedural system of argument linking and phrase structuring. Icelandic and Faroese are handy examples of a transitional state, namely systems with both, morphological and topological linking.

Let's emphatically note, however, that there is no causal nexus between topological linking and loss of (case) morphology. Grammars may employ both over many generations or abandon case morphology even in a T3 language. Icelandic, as already mentioned, uses both. It is a strict SVO language but with a rich inflectional system. Bulgarian, on the other hand is a Type-3 language without nominal case morphology, and there are many languages with an in-between-status on the way from morphological to topological coding, just as would be expected in an evolutionary scenario.

The preceding considerations implicate an explanation of Sapir's (1921:174, 177, 180) three diachronic megatrends, namely the drift to fixed position, the drift to the levelling[38] between the subject and the object, and the drift toward the invariant word, as shown in Haider (2021a: 40-41): "*These three processes are entangled.*[39] *These are changes that on the one hand, shift the working load from the declarative to the procedural network in production and reception and on the other hand enhance predictability in parsing*." The drift to fixed position is the drift to head-initial structures. This makes morphological linking redundant, resulting in a language with "the invariant word", that is, no agreement and case morphology and consequently no morphological differentiation of subjects and objects.

The interim summary is a follows. Evolutionary grammar change, based on variation and selection, gradually converges on systems with topological linking. In the course of this development, morphological linking becomes redundant. Evolutionary change is furthered by the fact that morphology strains the declarative memory networks since in the course of phonological changes it tends to become dissipative, with numerous sub-patterns and exceptions. Structure-based linking, on the other hand, is a procedural task subserved by the procedural memory system, with a much better cost-benefit ratio. A topological system that subserves non-morphological linking best is one with head-initial phrases and an [S[VO]] clause structure. So, SVO

[38] "levelling between subject and object" = abolition of morphological case distinctions (s. Sapir 1921:714)

[39] "*The drift toward the abolition of most case distinctions and the correlative drift toward position as an all-important grammatical method are accompanied, in a sense dominated, by the last of the three major drifts that I have referred to. This is the drift toward the invariable word.*" (Sapir 1921:180).

has become a stable constellation and a grammar, which, after having reached this stage, is beyond the point-of-return in the diachronic development.

4. [S[VO]] – An inexplicable singularity or an expected result of grammar evolution?

For historical reasons,[40] the current theory of clause structure in Generative Grammar closely traces the clause structure of SVO languages and invites the hypothesis that languages tend to end up as SVO languages because SVO is the default grammar defined by UG. Arguably, this is empirically incorrect. Here is a selection of empirically *unsubstantiated* assumptions:

i. [S[VO]] is the cross-linguistically universal basic clause structure.
ii. OV languages are languages with a VO past (determined by the UG default) and therefore diachronically more recent.
iii. Children will pass through an SVO stage in the acquisition of SOV language (because of the VO default).

UG theory still owes an answer to the following question. If the [S[VO]] architecture is basic, why would so many languages have apparently developed away from it? If UG narrowly constrains the acquisition of grammars, it would have kept them close to the SVO default. Let us adduce a concrete example, namely Slavic languages. Siewierska & *Uhlířová* (2010: 109) recount that "*in each of the Slavic languages all twenty-four possible combinations of a subject, direct object, indirect object and verb occur as grammatical declarative orders."* This is not how modern Romance or Germanic SVO languages behave. Of course, there are technical means of deriving such variants by various kinds of movement, but independent evidence for these rearrangements is missing. Haider and Szucsich (2022a,b) argue that such languages are not 'distorted' SVO languages but a type of its own without an SVO core architecture, that is, they are type-3 languages.

As for the diachronic perspective (ii), no language is known that has changed from a language like English into a T3 language like Russian, or into an SOV language like Japanese. So, how did these languages come into being if these are not diachronic deviations from an SVO language? Generative Grammar would have to reverse the diachronically attested course of development. SVO language whose history is attested such as Germanic and Romance languages have non-SVO predecessors. No Indo-European language has an SVO past, but all Indo-European SVO languages have a non-SVO past.

For grammars, the ecological restrictions operating in cognitive evolution are the restrictions of our general cognitive capacities that the language app depends on (and crucially not our communicative needs which are merely parasitic on the language app). They have a non-linguistic evolutionary history and have not been 'designed' for language processing. They act as the sieve or the bonus-malus system of selection that incurs emergent adaptation. These adaptive characteristics are what is perceived and misinterpreted as UG effects by Generativists. These traits are fully explicable without any recourse to innateness of a unique UG that would have to have fulgurated in just one species, namely homo sapiens, without any traces in closely

[40] Dixon (2010: 182) notes that every modern grammar theory "*was developed by a native speaker of English, and is in the first place overwhelmingly justified for and exemplified by English*" (and languages similar to English).

related species. This is definitely not the way how biological evolution (s. "innateness") works, no matter how fervently one insists on innateness.

5. Mono- or polygenesis of grammars

This seems to be the right point for briefly touching the monogenesis vs. polygenesis topic. In a neuro-cognitive perspective, grammars are computational programs of mental language apps. Therefore, it is legitimate to ask whether there could have existed a single 'lingua adamica'[41] ('language of Adam', recte 'grammatica adamica', as the mother of all subsequent grammars. An innate UG would be the positive answer. UG would serve as the blue print for the grammar of the lingua adamica. Since highly specific mutations have their starting point in a single genome, an innate UG would have come into being in the head of a *single* human in a *single* tribe. This person's innate UG would be the 'mother of all grammars', that is, the first ancestor of all grammar-processing brains thereafter. But how would it spread and what happened to all others? This person could not take advantage of his linguistic talent since the others would not have been able to follow him. The mutation would neither have a biologically not a cognitively selective advantage and therefore disappear again in the population.

The evolutionary perspective invites a more promising perspective on this issue, that is consistent with the state of the art of the theory of evolution.[42] Given the scarcely populated African and Eurasian continents at that time, polygenesis of grammar right after the two-to-three words epochs is more probable than monogenesis. In Nichols (2011: 572) words "*language originated gradually over a diverse population of pre-languages and pre-language families*".

The cross-linguistic invariants of modern languages are the expected reflex of convergent cognitive evolution by constant cognitive selection of grammar variants by the invariant neuro-cognitive processing background that constitutes the human language-processing facility. In the evolutionary perspective, this is a well-known phenomenon. From the UG vantage point, the dissipative nature of language change is unexpected and hard to explain. Why are there languages like English on the one hand, and so-called *non-configurational* and *split-ergative* languages like Dyirbal on the other hand? For UG believers, this is a scandal since in the best of all Generativist worlds, every language should be close to UG and grammatically resemble English. In the evolutionary perspective, diversity is an unspectacular and expected situation. Evolution is dissipative. It is basically stochastic in nature. In the interplay of variation and selection, the outcome is unpredictable since one cannot predict which variants may appear at which time. Partially cross-linguistic invariants are either lineage-specific or effects of convergent evolution, or both.

Today, linguists are confronted with an apparently domain-specific language capacity. But this impression is merely a tunnel-view perspective on the question. The *specific ensemble* of brain resources recruited for the language app may appear to be domain specific. However, its components are not domain-specific at all. They have all been recruited from the repertoire of already existing and therefore available cognitive processing resources of the primate brain. If

[41] "The idea of the divine origin of a first language was the common theory in the Western tradition from the first century CE until the first half of the eighteenth century." Schmidt-Biggemann (2016: 572).
[42] The following paragraphs draw on Haider (2019).

viewed from this angle, there is no need for an innateness conjecture. The computational resources have been available for being recruited for novel tasks.

Take for instance human acoustic decoding. It capitalizes amongst other things on categorial perception. This capacity of our brain is not even primate-specific. Chinchillas, monkeys, chicken or rats possess it, too (Kriengwatana et al. 2015). However, as it is an available and useful resource, it has been recruited for language processing. Language processing is parasitic on available brain functions. There is no single function that could be shown to have evolved just for language. The time span needed for biological evolution is much too long for such a recent isolated capacity in homines sapientes. On the other hand, the whole ensemble of human computation resources is the selecting background environment for the evolution of grammars, which is much faster. Grammars adapt to them. A grammar variant has a chance to occupy more brains if it is better adapted, that is, if it is rewarded by brains that reward structures that can be learned and processed and used more easily and effectively. This is the normal course of evolution by natural selection and it is the course of the cognitive evolution of grammars, too.

6. Conclusion

Grammar change, as far as the procedural components are concerned, is a facet of cognitive evolution. The degree of word order variation – from nearly free to near zero – is determined by the phrase and clause structure, which is a target of cognitive evolution of the grammar system. SOV is a stable peak in the 'fitness landscape' of grammars and so is SVO. Many alleged SOV-to-SVO changes are T3-to-SVO changes. For IE-languages, this is a fact, since no ancient IE-language was a strict SOV language, except for the dead-end branch of Hittite. The particular change from T3 to OV is the change of a single property. Heads get associated with a directionally operating linking constraint. Instead of associating with dependents on either side, as in T3, phrasal heads either follow (in "OV" structures) or precede their nominal arguments (in "VO" structures). The numerous collateral properties follow from independently motivated conditions (Haider 2013, 2015b).

Diachronically, [S[VO]] is predicted to be the most recent development. In this clausal architecture, the procedural network has taken over. Such grammars are at the core of the most efficient solutions to the string to structure mapping tasks of grammars.

In a nutshell:

- Grammar change as a result of Darwinian cognitive evolution correctly models directions and outcomes of grammar changes.
- The unidirectional changes of grammars trade in 'cheaper' procedural routines for 'costly' declarative contents.
- SOV and SVO languages are systems in a rather stable equilibrium. Most changes involve "free word order languages" (= Type-3) that change to OV or OV in the course of constraining the linking directionality of lexical phrasal heads.
- In the absence of interfering external influences, [S[VO]] is a point of no return in diachronic grammar development since the way (back) to any other type is more costly.

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