ON THE COGNITIVE EVOLUTION OF GRAMMATICAL SUBJECTS

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Abstract

An empirically adequate concept of "grammatical subject" is the key to avoiding self-inflicted dilemmas in comparative grammar theory. One of the rare consensualities between Functional Typology and Generative Grammar is the identification of grammatical subjects based on the semantic content of core arguments – but it turns out to be untenable. The shortcomings are particularly patent when it comes to identifying subjects across different alignment systems. This article presents an evolution-based approach to the emergence and cross-linguistic realization of grammatical subjects that avoids these dilemmas and outlines the evolutionary developments in grammars that have led to a wide variety of systems, ranging from languages without grammatically defined subjects, to morpho-syntactic subject management, and eventually to exclusively topologically organized systems.

1. Cognitive evolution of grammars

This paper is based on the assumption, set out in detail elsewhere,[1] that today's grammatical systems are all the current results of evolutionary processes on the level of the *cognitive* evolution of our neuro-cognitively based language processing system. In Dawkins' words (1991: 317), "*The theory of evolution by cumulative natural selection is the only theory we know of that is, in principle, capable of explaining the existence of organized complexity.*" In the sense understood here, grammars are an essential part of self-replicating cognitive systems that can be described as language apps. These programs replicate like viruses and like a virus,[2] they are dependent on a host for replication. The host is the ensemble of domain-general information processing capacities of our brain on which the language app runs as a domain-specific cognitive program. At the same time, this platform is the selection environment. As with the replication of biological viruses, variants arise in the reproduction of grammars in the course of grammar replication in cycles of acquisition. Hence, comparative grammar, just like comparative biology, needs to focus on the processes behind variation and disparity for understanding the structures of grammars.

Self-replication and variation plus selection are the basic prerequisites for evolution by natural selection. Natural selection refers to the different replication success of individuals due to differences in phenotype in an environment that 'blindly' sieves out variants. Variants that reproduce better and spread more widely, we consider to be better adapted to the selective environment. In other words, grammar variants that are 'easier' to acquire and use in production and perception will 'infect' more brains during language acquisition than less efficient variants and thus spread the changes. This is what we observe in the diachronic perspective on grammars.

[1] See Haider (2015), (2019), (2021a), (2021b), (2023a), 2023b).

[2] The relevant analogy between biological, computational, and cognitive viruses is this. They are programs that need a successfully 'infected' host for replication. Language apps are mutualistic viruses, see (Haider 2021a: 11). Their host is the human brain, and in particular, the ensemble of information processing functions recruited for language processing.

A key feature of these processes is the shifting of the processing load from the consciously accessible, but more costly general memory system, i.e. the *declarative memory* system, to the less costly but cognitively encapsulated *procedural memory* system. The domain of the consciously inaccessible system is the domain of the cognitive evolution in the developments of grammars.

The evolution of grammatical subjects is a good example of this. What we see in the accessible history of languages, such as in the history of Indo-European languages, is a drift, in Sapir's understanding of this term, from grammars with ample morpho-syntactic inventories to systems in which topological coding (viz. in terms of distinct positions in a well-articulated phrase structure) replaces morphological coding (viz. in terms of distinct head- and/or dependent-marking). Luckily, typologists have also produced evidence from languages with grammars that do not define what we are used to call grammatical subjects.

Three basic constellations can be distinguished in the emergence and development of grammatical subjects. First, there are languages whose grammars manage without subjects. Each core argument is coded uniquely. Second, the evolutionary step that leads to the emergence of the subject relation is a step that reduces the processing effort involved in the morpho-syntactic encoding and decoding of core arguments by establishing dependency relations between at least two core arguments. Third, the final step in the efficient coding of argument relations in a phrase or clause is the purely topological identification with little or no morphological coding (Haider 2023b).

2. Persistent concerns regarding grammatical subjects

This section is to make it clear that the status of "grammatical subject" needs to be clarified. It is a term that is as ubiquitous as it is elusive, easy to confuse and difficult to define adequately. Bakker & Siewierska (2007: 141) note that "*Subject is both one of the most controversial notions in linguistics and the one most often taken for granted*". A consensual, empirically adequate and precise definition is wanting and there is a reason for this situation. It seems that those striving for a universal, cross-linguistically easily applicable definition of 'syntactic subject' are chasing a phantom since they are after a *theory-neutral* definition of a term that is *theory-dependent*.

'Subject' is a grammatical function regulated by the interaction of at least five grammatical factors, namely the lexical argument structure of lexical items, the case system, the alignment mode, the agreement system and the structural organization of phrases and clauses. Since these factors are cross-linguistically variant, the characterization of 'subject' is cross-linguistically variant, too, at least superficially. Consequently, an *easily applicable*, cross-linguistically invariant and *empirically adequate* set of properties that could be easily ascertained by just superficial inspection of small samples of simple sentences is principally out of reach. The task tends to be underestimated as long as 'cross-linguistic' does not cross alignment systems. As soon as this is the case, the situation becomes intricate. What are the invariant core properties of subjects if their grammatical environment is variant?

Presently, "grammatical subject" is more often than not construed in a way that leads typologists as well as theoretical linguists astray. A case in point is the mistaken claim that one of the two major word order types, namely SVO, is absent in the set of languages with absolutive-

ergative alignment. Both, typological as well as theoretical linguists, make this out as a problem. It is not only an issue in word-order typology but also in Generative syntax. This shows in a recently revived discussion (Taraldsen 2017, Roberts 2021) on the alleged non-existence of *ergative* SVO languages. Both, in syntactic and in diachronic typology, see Siewierska (1996) and Trask (1979), respectively, as well as in Generative grammar, see Mahajan (1997) and Lahne (2008), the combination of ergative alignment plus SVO has been declared inexistent. Siewierska (1996: 149) emphasizes that there is "*an association between ergative alignment and non-SVO order*" and "*an association between ergative alignment and object-before-subject order*". According to Mahajan (1997: 38), "*verb medial* (*SVO*) *languages are never ergative.*" If true, this would be puzzling. After all, SVO and SOV are the two major word order types of the languages of the world. It will turn out that the alleged puzzle is a pseudo-problem, the cause of which is an inadequate concept of the "syntactic subject".

It is true that there is a pattern that is not documented, namely a strict [Erg [V Abs]] clause structure. However, this is neither surprising nor an instance of SVO. It is the ergative counterpart of the cross-linguistically equally absent [Acc [V Nom]] clause structure in Nom-Acc systems, the only difference being that no one is worried about the absence of languages instantiating the latter clause structure. The solution is straightforward once it is realized that ergative case is *not* the case of the grammatical subject. The syntactically appropriate analysis of the *missing* Erg-V-Abs word order pattern is O_{Erg}-V-S_{Abs} rather than S_{Erg}-V-O_{ABS}. Under the appropriate analysis, the absence of such a word order pattern is predicted. No language has an [O[VS]] clause structure, neither in the form of [Acc [V Nom]] nor in the form of [Erg [V Abs]].

There are quite a few languages filed as OVS in the typological literature and the majority of them are ergative languages with an [Abs [V Erg]] structure. The syntactically adequate classification of these languages is "SVO language with ergative alignment" (see Haider 2023a). A small residuary group, such as Cubeo, Hixkaryana, Katukina-Kanamari, and Urarina, displays a canonical O-V-S order the cause of which is a rare sentence structure. These languages are consistently *head-final* and their clause structure is not [O[VS]] but [[OV]S]. In this structure, the head-*final* VP is in a fronted position in the clause. A more detailed argumentation can be found in Haider (2023a). Unexpected and compelling evidence for such a structure is also provided by Queixalós (2010: 241, 254), based on Katukina-Kanamari, whose [[OV]S] structure is instantiated even in alternative alignment modes. The frequent clause type is [[Erg V] Abs] and a less frequent one is [[Acc V] Nom]. He argues that the clause structure of Katukina-Kanamari is [[Object V] Subject] and shows that this structure remains constant under alternative alignments in this language

In the majority of presently spoken natural languages, the noun phrase representing the argument of a *monovalent* verb and one of the noun phrases representing the arguments of a *transitive* verb are morpho-syntactically treated alike. In nom-acc languages this is signified by nominative, in ergative languages by absolutive case and/or by corresponding agreement patterns. Presently, a minority group of linguists (including the author) insists that the grammatical subject of a transitive verb in a finite clause is the noun phrase with the same case, agreement, and other syntactically relevant properties as the single noun phrase of a finite clause with a monovalent verb since this seems to be the straightforward characterization. It has been maintained

already by Schmerling (1979) and Trechsel (1982), and more recently by Bakker & Siewierska (2007: 292) in a succinct statement: "*Under coding properties, we find case marking (typically Nominative or Absolutive for subjects; Accusative and Ergative for objects*) *and agreement marking on the verb (typically, the marker varies for Person, Number and Gender features of the subject constituent)*."

This contrasts with the fact that the majority of typologists and field linguists typically assume that the *subject* of an agentive transitive verb is the noun phrase that denotes the *agent*, irrespective of the alignment system. Here is a representative statement: "*A, S, and O are the basic relations. As a secondary step, A and S are grouped together as 'subject'."* (Dixon 2010a: 76). "*Subject is simply the association of S, the only core argument of an intransitive clause, and A, that core argument in a transitive clause which could initiate or control the activity*." (2010a: 229).

This statement is remarkable because it goes against Dixon's own characterization of ergative alignment: "*The term 'ergativity' will be used in the standard way, for referring to S and O being* [grammatically]$_{HH}$ *treated in the same way, and differently from A. 'Ergative' is then used in relation to A, the marked member of such an opposition, and 'absolutive' in relation to S and O, the unmarked term*." Dixon (1994: 22).

This characterization in fact implies, contrary to Dixon's own understanding, that under ergative alignment, the *subject* of a transitive clause is the *absolutive* noun phrase. This is an inevitable conclusion if the S-argument and the "O"-argument are "*treated in the same way*" in ergative systems, with S being the subject of a finite clause. Consequently, the "O"-argument will qualify as the syntactic *subject* of a transitive clause in an ergative system. Dixon (2010b: 119), however, insists on a 'headstand' construal of the relation: "*There are two recurrent patterns – S marked like A and S marked like O*." This inverts the relevant target of comparison since the target of comparison is S, not O. S is the *subject* of the simple, intransitive finite clause. Hence, wherever "O" is (morpho)-syntactically treated like S, "O" is the syntactic subject. Nobody would deny that the promoted O argument in a passive clause or the O-argument of an English middle is the syntactic subject of the clause.

A cause of the confusion is the terminological choice of "O" (= object) instead of "the argument that under *nom-acc alignment,* is mapped on the function of the syntactic object", or the "P-argument", as Comrie (2005) prefers. Under ergative alignment, this argument is not only treated like a subject, it is the subject.[3] Here is a randomly chosen illustration of the criticised misconception.

The commentary on the data points (1) and (2) from Konjo is telling. Konjo is a VSO language with ergative alignment, with NPs fronted optionally to the clause initial position and order variation among postverbal arguments. Friberg (1996: 141) reports that "*either the subject or object can be fronted as topic*." The post-verbal relative order of subject and object is variable, as Friberg (1996: 141) notes and "*it is quite common for the subject to follow the object, in which case the context clarifies the participants*." This explication describes (1) and (2):

[3] The terminology of ergative and absolutive is infelicitous, too. 'Ergative' is a semantically based notion referring to the agent role while 'absolutive' refers to the form, namely the unmarked case.

(1) Naallej tasi'ku meonga. Konjo (Friberg 1996: 141)
3ERG.take.3ABS bag.1POSS cat.DEF
'The cat took my bag'
(2) Naondangj meonga asua.
3ERG.chase.3ABS cat.DEF dog.DEF
'The dog chased the cat'

Again, in Friberg's understanding, the agent is the subject and she comments (2) as follows: "*Technically* [...] *'the cat' is in subject position, yet everyone knows that dogs chase cats, not vice versa*." Why 'technically'? 'The cat' IS the syntactical subject of the clause. It does not matter that in the very nom-acc language in which this paper is written, "*the dog*" would be the syntactic subject. It is a fact that cross-linguistically, most grammars systematically select one of the two arguments of a transitive verb for the syntactical subject function. In nom-acc languages it is the NP linked to the agent slot, in abs-erg languages it is 'the other' argument slot of a transitive verb.

Those who insist on the thesis "*Agent-argument = subject*" would typically rely on the fact that both, in nom-acc and abs-erg systems, agent noun phrases have at least some properties in common across alignment systems. This is the source of the – arguably unnecessary – distinction between "morphological" and "syntactic" ergativity, cf. Coon & Abenina-Adar (2013), Deal (2015). It is a confusing terminology since morphological case and agreement are *syntactically* governed phenomena. Syntactic relations are expressed by morphological means in languages with grammatical morphology.

That in some cases, non-subjects such as ergative-marked NPs share some properties of nom-acc subjects does not make them grammatical subjects in an ergative language. It will be argued below that the few parallels between ergative and nominative noun phrases are parallels in terms of *argument* structure but not in terms of *syntactic* structure. What is taken to be a *subject* property of ergative languages is in fact a property of an *argument*-structure category. The ergative and the nominative noun phrases are each associated with the same theta role of a given agentive verb and it happens to be the *highest-ranked argument* in the lexical argument structure, whence the shared properties.

Abs-erg alignment, just like nom-acc alignment, is not restricted to languages with (case and agreement) morphology; see for instance continental North Germanic languages as nom-acc languages without case & agreement morphology on verbs or nouns, or ergative languages with without case morphology. Languages with grammatical morphology merely present a wider window for studying the syntactic collaterals of alignment systems.

As a preliminary summary, let us note that many field linguists identify a subject based on the lexical semantics[4] of a core argument, namely the agent(-like) argument.

Generative linguists share the typologists' preference of an *argument-structure-based* characterization of the *syntactic* category 'subject.' The clearest formulation of this viewpoint is an axiom formulated by Baker (1988, 1997), namely the "Uniformity of Theta-Assignment Hypothesis" (UTAH), which states that *identical thematic relationships* between predicates and

[4] Queixalós and Gildea (2010: 8) are explicit in this respect: "*So for now we adopt the theoretically problematic but heuristically useful practice of relying on intuitive-impressionistic identifications of A and P*."

their arguments are represented by *identical structural relationships* between these items in the syntactic base structure.

This may be largely the case *within* a particular language,[5] but not across alignment systems, since it neglects an essential moment, namely the grammatically determined option for the grammatically governed choice of the argument for the subject function.

The argumentation of the generativist school is formulated more technically than in Dixon's Basic Linguistic Theory, but it is equally misleading. Two questionable axioms are combined, namely the "Extended Projection Principle" (EPP) and UTAH. The EPP is "*the requirement that clauses have subjects*," see Chomsky (1982: 10). In combination, these two axioms are satisfied if every sentence of every language contains a grammatical subject (by virtue of EPP), and the (agentive) argument of a given verb that is subject in one language, for instance English, is the subject of translationally equivalent verbs in any other language, too. This is a simple recipe for a complex problem that is easy to understand and handle, but it guarantees an incorrect result once the alignment mode differs from English.

Let's therefore amend our preliminary summary: Field linguists identify the subject of a transitive verb as the agentive core argument and generativists supply a theoretical motivation. With this in mind, let us briefly compare typical syntactic properties of the *absolutive* noun phrases in languages with abs-erg alignment with *nominative* subjects in languages with nom-acc alignment, see (3).

(3) Typical syntactic properties of nominative and absolutive arguments, respectively:

a.	indispensability (i.e. no *optional* omission)	☑ Nom ☑ Abs
b.	signalled omission (by passive and anti-passive, resp.)	☑ Nom ☑ Abs
c.	default structural case in finite clauses of case-marking languages	☑ Nom ☑ Abs
d.	licensing case of dependent case in case-marking languages	☑ Nom ☑ Abs
e.	target of a promoted argument with dependent case otherwise	☑ Nom ☑ Abs
f.	obligatory agreement with the finite verb in agreement languages	☑ Nom ☑ Abs
g.	not lexicalized in sentential infinitival constructions	☑ Nom ☑ Abs
h.	pro-dropped in null-subject languages	☑ Nom ☑ Abs
i.	top accessibility in languages with accessibility restrictions	☑ Nom ☑ Abs

Given these immediate correspondences, how could it be possible that there is no consensus on the subject status in the community of researchers? To seriously deny the obvious parallels between the typical properties of the nominative subject in nom-acc languages and the absolutive in abs-erg languages seems unreasonable. Subjects, unlike objects, cannot be omitted (3a). Their omission is controlled by grammatical rules (3b). In finite clauses with a single argument, it is the default case (3c). The structural object-case is assigned in the presence of the subject case (3d), otherwise the structural object receives the case of the subject (3e). In languages with

[5] But even within the same language (e.g. German), there are non-matching doublets. (i) means the same as (ii), and (iii) means the same as (iv). Such doublets are unexpected under the putative regime of UTAH.

i. dass er$_{Nom}$ mehr als drei Häuser$_{Acc}$ besitzt
that he more than three houses owns

ii. dass ihm$_{Dat}$ mehr als drei Häuser$_{Nom}$ gehören
that (to)him more than three houses belong

iii. dass sie$_{Nom}$ den Vater$_{Acc}$ entbehrt hat
that she the father lacked has
'that she missed her father'

iv. dass ihr$_{Dat}$ der Vater$_{Nom}$ gefehlt hat
that her the father lacked has
'that she missed her father'

subject-verb agreement, the finite verb typically agrees with the subject (3f). „*There are no languages where agreement is only with ergatives (transitive subjects), a known typological gap*“ (Woolford 1999: 5).[6] In clausal infinitival complements, the argument that receives the subject case in a finite clause is not lexicalized in infinitival clauses (unless the infinitive is inflected), see (3g). In null-subject languages, a pronominal subject is not lexicalized in a finite clause (3h). This affects nominative and absolutive equally. The subject is top-ranked in syntactical accessibility hierarchies,[7] and this applies to nominative as well as to absolutive (3i).

Here are two proponents of the position rejected in this paper. For Dixon (2010a: 229), the alignment system – viz. nominative-accusative vs. absolutive-ergative – does not make a difference for subject selection since "*even in ergative languages, S and A share a number of properties – as addressee in imperative constructions, as controller of reflexive, and so on.*" Polinsky & al. (2012: 268) agree, with reference to ten other papers: "[…] *the ergative DP has all the criterial properties of a subject: it is the addressee of an imperative, it binds the absolutive but cannot be bound by it, it participates in control and raising, and often it has preferential properties in the control of cross-clausal anaphora*".

Given the empirical facts, one cannot agree that the criteria of Dixon (2010a) and Polinsky et al. (2012) are "*all the criterial properties of a subject*". In fact, the core properties are missing altogether, such as indispensability, subject-object dependency, object-to-subject advancement, or accessibility. Instead, it should have been acknowledged that an agent argument is the highest-ranking argument in the argument structure, regardless of its grammatical function and that this can have grammatical side effects, and indeed it does.

With respect to binding properties, Manning (1996a, 1996b) has argued that binding does not make a reliable indicator of syntactic subjecthood of ergative noun phrases since the construal process operates mainly on the ranking information provided by the lexical argument structure and only to a minor extent on syntactic structure. "*We have to accept that binding in such languages is again not defined on surface phrase structure or grammatical relations, but rather on a level of argument structure or perhaps thematic relations*", see Manning (1996b: 6). Before, Williams (1987) has argued along the same lines, based on data from English. In HPSG, binding involves a mix of thematic and configurational properties, see Müller, St. (2021, Ch. 20). Even within Generative Grammar, Reinhart and Reuland (1993) insist that the domain of reflexivisation is defined over predicates without making reference to syntactic structure.[8] If, as Polinsky et al. (2012: 268) emphasize, an absolutive does not anaphorically bind an ergative reflexive, this is not a reflex of a syntactic asymmetry but crucially one in terms of argument structure. The latter asymmetry is the relevant one for the binding of reflexives

As for *imperatives*, they are evidently directed towards agents and not to inanimate participants. So, even in an ergative language, nobody would expect speakers to tell the salt that it be passed on. It is safe to assume that the respective grammars regulate this satisfactorily independently

[6] Correspondingly, there is no language in which the finite verb agrees only with the accusative, but not with the nominative. However, this is not regarded as a typological gap.

[777] See the Accessibility Hierarchy described in Keenan & Comrie (1977, 1979).

[8] As for Generative Grammar, Truswell (2014: 236) summarizes: "*After fifty years of binding-theoretic research, and over thirty years after Chomsky (1981), we are still far from a definitive binding theory*."

of alignment. Imperatives of non-agentive verbs are odd also in nom-acc languages, too, for pragmatic reasons.[9]

With respect to *control*, evidence is not reliable unless it comes from *sentential* infinitival constructions and not from merely *translational* equivalent construction since in OV languages, infinitival constructions are often *clause union* constructions in combination with verb-clustering. Such infinitival constructions do not involve a PRO subject (see Haider 2010, Ch. 7.5). In Basque (Arrieta et al. 1986: 31) or in Warlpiri (Legate 2002: 127) both, absolutive and ergative, may serve as controllers or controlees. Example (4) from Arrieta et al. (1986: 30) shows that the controlled item is the noun phase that would surface as absolutive in a finite version of the infinitival construction.

(4) Miren Jonetik ezkutatzen da hark Ø ez engana--tzeko
Miren$_{ABS}$ Jon$_{GEN}$ hide$_{GER}$ AUX/3SG him$_{ERG}$ to not-trick-out--in-order-to
'Miren^{i} hides from John^{j} in order for him$^{j/k}$ not to trick-out her^{i} (= Ø)'

Second, we know from nom-acc languages such as Icelandic that in a structural subject position, even an argument designated for an oblique case may represent the controlled null-subject in an infinitival clause; see Thráinsson (2007: 420), on so-called quirky subjects in Icelandic.

Third, it must be excluded that the infinitive constructions in question involve congruence. In Tongan (Otsuka 2000: 326, 345), for instance, the alleged ergative null subject of infinitivals is the same null subject as of *finite* clauses (pro-drop), because of agreement in the form of inflected infinitives. In such a case, null pronominal subjects alternate with overt NPs, which is the case in Tongan.

Raising is no reliable criterion either. In many languages, as for instance in German (Haider 2010: 298-308), the construction that corresponds to an English raising construction is a clause union construction, without any subject raising. Clause union with verbal clusters may produce the same result, and in this case, there is no PRO-subject involved; see for instance Ershova (2019: 201), on West Circassian. Here is an illustration with *subjectless* clauses (5a,b). Unlike English, German permits impersonal ‚raising' constructions but it rules out impersonal control constructions, see (5b) with an intransitive verb such as *vertrauen* (trust)[10] contrasting with the transitive verb *schätzen* (value).

(5) a. dass Wissenschaftlern nicht mehr [vertraut zu werden scheint/pflegt]$_{V\text{-cluster}}$
that scientists$_{Dat\text{-}pl.}$ no longer trusted to be seems$_{3\text{-}sg.}$/tends$_{3\text{-}sg.}$
b. dass Wissenschaftler^{i} beklagen, [PRO^{i} geschätzt/*vertraut zu werden]$_{CP}$
that scientists complain [not valued/*trusted to be]

Subjectless clauses such as (5a) do not exist in SVO languages like English since in this type of languages, the preverbal, structural subject position must not remain empty. Hence, a so-called German 'raising' construction is technically no instance of subject raising but a verb-clustering construction. It is safe to expect the same for ergative OV languages.

As an interim summary, we note the following: Ergative DPs do *not* have *"all the criterial properties of a subject,"* contrary to what is claimed in the literature. They do *not* qualify as

[9] i. #Last one hour! ii. #Dauere eine Stunde! [German; = (i)] iii. #Dure une heure! [French ; = (i)]
[10] In German, the object of 'vertrauen' (trust) is a dative. Datives are not promoted to subject in German,

syntactical subjects. However, they are linked to the highest-ranking argument slot in the argument structure of the respective verbs and this accounts for the few parallels to the nominative subject of a transitive verb under nom-acc alignment.

3. What constitutes a grammatical subject

Let's ask ourselves what we should be able to deduce minimally about a language L which is unknown to us when being *correctly* informed that this language makes use of *grammatical subjects* and direct objects. Note that this question does not presuppose that subjects exist in every language. Furthermore, let us assume that we do not know whether L marks cases or whether the verb agrees with the subject or to which alignment type L belongs. So, what would and should we know, nevertheless? Given an adequate understanding of "grammatical subject" and "direct object," we should be justified to infer that the grammar of L defines a type of ordering relation for core arguments known in computer science as a "stack."

A stack[11] is characterized by two fundamental operations: push and pop. The pop operation removes an item from the top of the stack. The push operation adds to the top of the list. When the top item is removed by a pop operation, the previously immediately lower element becomes the next top element. Whenever the push operation adds an element to the stack, this becomes the new top value and the former top value is lowered.

Well-known linguistic examples of pop operations in syntax are passive in nom-acc systems and anti-passive in abs-erg systems. The syntactically top-ranked item (viz. the subject) is grammatically eliminated and the direct object becomes the derived subject. An example of a push operation is causativisation in nom-acc systems. The causer becomes the new subject and the previous subject candidate of the verb is 'lowered' to the object function. In abs-ergative languages, an example of a push operation is transitivisation, which introduces a new absolutive candidate, see Nichols et al. (2004) or Mora-Marín (2003: 203; Ex. 38).

A stack-structure is the reflex of a particular order relation. If such a relation is implemented morphologically by head- or dependent-marking, that is, by agreement or case, or both, it covers the following properties. When the argument that would otherwise appear as the subject is grammatically eliminated, the grammatical relation of the direct object candidate changes and appears in the function of the grammatical subject. Its case will be the canonical case of the subject. If an agreement relation holds between core arguments and the verb, the verb at least agrees with the grammatical subject. If this is grammatically eliminated, it agrees with the successor subject. This is the consequence of the stack structure.[12] Finally, in a language that positionally identifies the core arguments, the object ends up in the position of the subject if the canonical subject argument is eliminated. This is what we see in English and languages similar to it. It is this basic dependency between core arguments in a clause that is essential for the subject status. In general, the *syntactic* subject is the morpho-syntactically or positionally *privileged*[13] noun phrase aligned with an argument slot of the finite verbal predicate. The full range

[11] The processing concepts of computer science are arguable closer to the linguistic reality than the abstract concepts used in some contemporary grammar theories.

[12] The existence of a stack structure provides the explanation for the following generalization:
Agreement Universal: If in a language, the direct object agrees with the finite verb, the subject agrees also.

[13] Mel'čuk (2014: 179) proposes the following characterization: "*The SyntSubj is the most privileged Synt-actant of the syntactic predicate (≈ Main Verb) in L; what exactly are syntactic privileges in L has to be indicated by a*

of grammatical *privileges* is relative to the morpho-syntactic inventory of a given language, as Keenan (1976) showed, with a cross-linguistically assembled pool of about thirty properties that show in varying family resemblances.

Syntactic functions such as grammatical subject and (direct) object are *formal* relations. If they appear to be *constrained* by semantic, pragmatic, or prosodic factors, this is a misapprehension. It simply means that a given, *syntactically* well-formed option may or may not be appropriate for a particular semantic, pragmatic, or prosodic constellation. It is not ruled out *syntactically*, however.[14] The fact that in a *nom-acc* language, in a finite, declarative, active sentence, the agent role of a verb never surfaces as an object of this verb is not a semantically controlled property. It is a reflex of a purely formal relation, namely the following:

In nom-acc alignment systems, the *top-ranked*,[15] (structurally case-marked) core argument in the argument structure of a verb will be the candidate for the subject function. Since the agent role is top ranked, it is the candidate for the subject function in clauses with an agentive verb in nom-acc systems. In abs-erg alignment systems, on the other hand, the candidate is the *bottom-ranked* argument with structural case. In each case, the 'other' structurally cased argument surfaces as the dependent[16] argument, that is, the direct object. Viewed from this perspective, there is a logical alternative for the choice of the candidate with the non-dependent status, that is, the subject, since it is a two-place relation. As expected, each of the two possibilities has found its implementation (see Table 1).

Table 1: A-structure of a transitive verb with structural case

Lexical argument tier:	$[\Theta_{AG} < \Theta_{TH}]$
	↓ ↓
Syntactic argument tier:	[<u>A</u>, A]
Nom-Acc alignment:	A = dependent argument
Abs-Erg alignment:	<u>A</u> = dependent argument

McFadden's (2004: 28) succinct summary: "*The difference between nominative-accusative and ergative-absolutive systems is which argument receives the default structural case when two structural arguments are present, as in transitive clauses without lexical case-marking*". In case-marking languages, the dependent argument receives the dependent case. In nom-acc systems, the accusative is dependent and nominative is independent; in abs-erg-systems, absolutive is independent and ergative dependent.[17] The dependent structural case can only be assigned

specific list of SyntSubj privileges elaborated for L." I am grateful to Martin Haspelmath for making me aware of Igor Mel'čuk's definition.

[14] Remember Chomsky's locus classicus "*Colorless green ideas sleep furiously.*" Truth-conditionally, it is nonsense but otherwise grammatically well-formed.

[15] Ranking follows from the decomposition structure (Wunderlich 2012: 327). Here is the structure of an agentive predicate: λy λx λe [ACT (x) & [BECOME [STATE (y)]]] (e), with (x) as the highest nominal argument variable.

[16] The dependency relation (accusative depends on nominative, ergative depends on absolutive) is elaborated in Marantz (1984; 1991), in Haider (1985a: 72; 1985b: 13; 2000: 31), and it is taken up by Baker (2015).

[17] In split-ergative languages, both dependency relations may be operative simultaneously, one for lexical nominals and one for pronouns. Analogously, splits may occur in agreement systems. In addition, Bickel et al. (2013) note a high discrepancy between alignment type and identity/non-identity of morphological forms.

when the independent structural case is realized too. Otherwise, the candidate for the dependent case surfaces with independent case. This is known as "promotion/advancement to subject".

An astonishing fact in the debate on subjects of clauses with ergative alignment is the refusal to face reality with respect to object-to-subject advancement: Why would the *absolutive* 'object' *never* advance to an ergative *subject*, if it were correct that an absolutive NP is a syntactic object? This fact could not have been overlooked, but apparently it tends to be neglected. In every nom-acc language, the syntactic elimination of the primary subject, aka passive, triggers the promoting of the structurally-cased object to a derived subject, but there is *no corresponding absolutive-to-ergative* promotion in ergative languages. Quite to the contrary, in many ergative languages, the otherwise ergatively marked argument is promoted to absolutive when the default absolutive is eliminated by the so-called anti-passive.

This should ring a bell since in *no* nom-acc languages there is a corresponding syntactic operation that *demotes* the subject to a *direct object* in a *finite* clause whenever the original direct object is eliminated. Why would there be such an exotic demotion in ergative languages? In fact, there is none. In each case, the dependent case is replaced by the subject case, that is by nominative or absolutive, respectively. The emerging picture is simple and consistent (Table 2). An absolutive cannot be promoted/'demoted' to an ergative 'subject' because the absolutive is the case of the subject and the ergative noun phrase is promoted to absolutive, as expected.

Table 2: Promotion to subject (when the default subject is eliminated)

Nom-Acc alignment:	Dependent case is Accusative
Promotion to subject:	Accusative to *Nominative*
Abs-Erg alignment:	Dependent case is Ergative
Promotion to subject:	Ergative to *Absolutive*

Any theoretical conviction – typological or Generative – to the effect that it associates agenthood with syntactic subjecthood impedes the understanding of passive and anti-passive as sides of the same coin, modulo alignment mode. Subjects cannot be omitted; they must be grammatically 'withdrawn'. In abs-ergative languages, the subject as the privileged argument is the *lower*-ranked argument of the argument structure of a (transitive) verb (see Table 1). As a subject argument, its elimination must be grammatically signalled and accomplished. This is called "anti-passive", although it does exactly what passive does in nom-acc languages, namely eliminate the would-be syntactic subject argument.

In each case – passive and antipassive – the primary subject candidate is grammatically neutralized and the argument that would receive the dependent case receives the subject case instead. It is only the irrelevant focus on the thematic roles of subjects and objects that has prevented the apprehension of the formal identity of the two variants of the same grammatical process. The two facts alone – indispensability & promotability – are compelling evidence for regarding the absolutive as the case of the syntactic subject rather than the ergative.

Let us summarize: It is only legitimate to use the term "grammatical subject" when the grammar of a given language implements[18] a stack-like dependency between core arguments. Otherwise, "grammatical subject" is not defined in the given grammar (see the following section)

4. From subjectless to topologically based grammars

Grammars do not leave fossils and the horizon set by the availability of texts from historical stages of languages is extremely narrow in comparison to the history of mankind. Script is a late invention and it covers less than 2% of the history of less than 1% of human languages. The fossil record of Homo Sapiens has currently been extended to 300,000 years,[19] see Stringer (2016), Richter et al. (2017), Vidal et. al. (2022), Berger & Hawks (2023). The oldest texts that allow a reconstruction of their grammars date back about 5000 years. Hence *at least 99%* of the history of human grammars is inaccessible. A full reconstruction of the development of grammars is definitively out of reach. However, we (still) have access to the diversity of the results of the cognitive evolution of grammars.

Just like biologists who reconstruct steps in the evolution by comparing the variant outcomes, linguists can at least roughly reconstruct steps of the cognitive evolution of grammars in general, and of syntactic subjects in particular. The data basis comes from comparative grammar research, enriched with statistical methods that have proven successful in studying biological evolution (cf. Petroni & Serva 2008). These methods are based on the observation that the development of grammars is fundamentally divergent. In this way, phylogenetic trees (aka evolutionary trees) can be created for – in the linguistic sense – *genetically* related languages. These are graphical representations that show major grammatical bifurcations in the evolutionary history of a number of languages over time.

Another, more recent approach is computational simulation. Hypotheses concerning grammar evolution can be tested in multi-agent simulations, in which computational and mathematical models are used in experiments with populations of virtual agents. Van Trijp (2017) shows how the efficiency bonus that results from the morphological disambiguation of the participants in a message and leads to the grammaticalization of a marking system that qualifies as a morphological case system.

Figure 1a (Van Trijp 2017: 7)

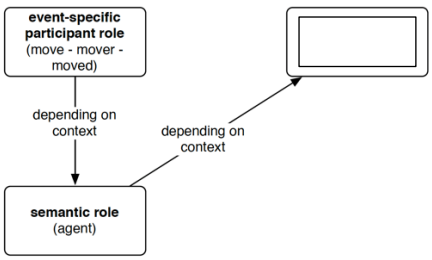

Figure 1b (Van Trijp 2017: 9)

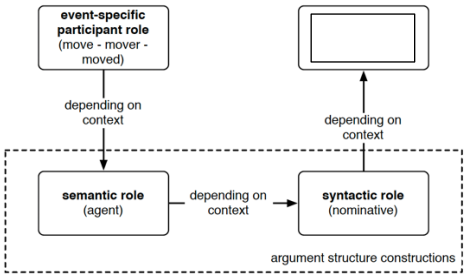

Figure 1: "The argument structure constructions [in 1b]$_{HH}$ can combine several semantic roles into a larger pattern." (Van Trijp 2017: 9).

[18] The implementation may be *morphological*, by head- or dependent-marking (also known in the typological literature as indexing and flagging, respectively) or *topological*, that is, by means of structural positions.

[19] Geneticists, however, calculate that "*the divergence date of the neanderthalensis and sapiens lineages can indeed be placed earlier, between 550 and 765 ka."* (Stringer 2016: 9)

Viewed from a grammar-theory perspective, Figure (1a) illustrates the step to a system type with distinct case for all core argument. Today's tripartite and stative/active alignment comes closest to it (see below). Figure (1b) is the necessary step towards the subject function. Case is linked to argument-structure positions and is decoupled from lexical semantics.

The crucial evolutionary step on the way to grammatical subjects is the *decoupling* of linking from lexical semantics. A particular morphological marker (case, agreement) is not directly associated any longer with a particular semantic role. It is linked to a syntactic argument slot in the lexical entry of verbal or adjectival heads. The connections between lexical semantics and grammatical functions are established on the level of lexical argument structure. Argument structure is the level at which information about the semantic content is linked to argument slots, which in turn are linked with the respective fillers in the syntactic representation of a clause. This decoupling of semantic content from the linking of arguments opens the way to grammatical relations that link syntactic forms to the lexical head without direct reference to the semantic values. Grammatical subjects come into being as collateral effect of the reinterpretation of semantic relations in terms of formal relations of morpho-syntactic forms in a stack organization.

Table 3 – Identification of core arguments, with/without a grammatical subject function

Alignment mode	Terminology	Subject?
Linking by role semantics	Tripartite; stative-active	No
Linking by form	Nom-Acc; (split) Abs-Erg	Yes
Linking by position	topological	Yes

Tripartite alignment refers to a family of grammars with a wide range of variants, as Bickel & Nichols (2009, Sect. 3.1) point out. "*Full-fledged tripartite systems would have distinct cases for all major roles.*" (Bickel & Nichols 2009: 309). The core-arguments of multi-valent verbs are discriminated by distinctly marking/indexing forms while the argument of a monovalent verb differs in marking/indexing from the arguments of transitive verbs. Monovalent verbs are typically combined with an unmarked/unindexed noun (group). In this grammar type, morphological markers are used 'on demand,' that is, if an utterance consists of more than one core argument, but (in the basic variants) without dependency between them. In a basic tripartite system, all cases of core arguments (and of adverbials anyway) are *inherent* cases and hence the respective grammars do not define a grammatical subject.

In stative/active systems, alignment by semantics shows in the marking of the argument of monovalent verbs. Depending on the interpretation of the verb, the participant of the verb is marked in the same way as one of the two arguments of a transitive verb. „*Split-S, or stative-active (or similar terms), is generally taken to be an alignment type on a par with accusative, ergative, etc. Languages with this alignment type are considered to have no single basic subject alignment, and the coding of S is based on agency, Aktionsart, or a similar factor.*" Bickel & Nichols (2009: 316).

Mithun (1991, 2006, 2008) shows in great argumentative detail why the postulation of a subject function is empirically unfounded in languages such as Cayuga, Selayarese, Mohawk, or Central Pomo. In these languages, an indispensable feature of grammatical subjects is missing, namely the dependency between subject and object marking and the grammatical management of subject omission (see the following section).

Both types of alignment show that there is no general, overarching dependency relation, else the argument of monovalent verbs would be covered by the case relations holding for multivalent verbs. The forms that identify the arguments of verbs are specified in their respective lexical entry. Arguments are inherently associated with an identifying form. For the language user this is declaratively stored information. In the semantic alignment mode, there is no overarching dependency relation established in case management that would trigger object-to-subject advancement.

The development towards grammatical subjects involves an essential step, namely the step from inherent to structural case. The step from alignment by semantics to alignment by form is the step of construing a dependency relationship in structural case assignment and morphological realization the outcome of which is a stack structure. What we are used to call a grammatical subject in the nom-acc languages we speak is the structurally-cased top argument of a stack. It is the target of the advancement effects of marking or indexing, which are corollary effects of the basic dependency relation. The morphological identifier of a subject is not inherently associated with the argument in the lexicon anymore. It is an identifier of the top element in the stack. This is possible only if the case of the subject and the dependent case is defined as a structural relation.

'Structural' means defined on argument *structure* rather than by the semantic *content* of an argument. Thus, depending on the context, a patient argument of a transitive verb may appear in the default case relation otherwise reserved for the agent (cf. passive and anti-passive). On the other hand, the default subject-argument may appear in the case of the object if the context introduces a new top element for the stack, as for instance by causativisation.

Syntactical subjects typically do not involve morphologically explicit dependent-marking (see absolutive or nominative), that is, explicit morphological case markers on the head of the noun phrase. This 'invites' a reanalysis of linking by abstract *case*, viz. morphologically null, as linking to to a unique *position* in the clausal phrase structure (viz. topological linking). This evolutionary step can only take place if two stepping stones are available, namely phrases with a fixed, phrase-initial head-position and, second, word order variants with S-V-O order which 'invite' reanalysis as an [S[VO]] clause structure.

From this point of view, the grammar of a genuinely [S[VO]] language, with little or no grammatical morphology, is the outcome of a series of steps in grammatical evolution. Fortunately, we have the opportunity to follow grammatical developments in at least one language over a sufficiently long period of time, namely the last one and a half millennia of the well-documented history of the English language. What we see is how a Type-3 grammar gradually has evolved to a topological system. What we have not seen and will never see, if this theory is correct, is the reverse development, i.e. that a language with a system like English has developed into a language like Old English or Sanskrit. This is excluded by the theory of evolution. Evolution is

defined by adaptation to the respective environment. For grammar, this environment does not change since the human information processing capacities do not change. Sieved out variants are not re-installed since they would be sieved out again if traces of them reappeared. Evolution by selection does not dethrone the (better) adapted variant with less perfectly adapted variants. "Better" is always the enemy of "good enough." Let us review major stepping stones:

(6) a. Semantically associated participants with role-identifying appendages ⇒
b. Appendages reanalysed as linking markers (aka dependent-marking) or
c. Disambiguating pronominals cliticised to a predicate (aka head-marking) ⇒
d. *Same form* per sentence (instead of per verb) ⇒
e. *Stack-structured* dependency relations on markers ⇒
f. Stack-based operations (promotion, demotion) on linking relations
g. Heads as *directional* licensers (cf. OV, VO) ⇒
h. Licensing reanalysed as a stack-based topological relation: [S[VO]]

(6a-c) characterises systems that operate in the style of tripartite or active/stative systems, that is, identificatory marking by semantic role, on a fuzzy semantic basis, without formal order relations. (6d) is an essential step. Forms are reinterpreted as patterns across clauses and not as reflexes of the semantics of the arguments of the respective verbs.

Subjects come into being with step (6e), which depends on the preceding step (6d). Stacks are order relations and trigger promotion-to-subject or demotion-to-object. Advantages are easy to spot. In production, you can start with a subject before you have decided on the choice of the particular verb since the morpho-syntactic form of the subject is independent of the semantic nuances of verb. This contrasts with a tripartite system, in which the choice of the verb is essential for determining the forms of the arguments. So, an anticipated form of an argument does not guarantee that it harmonizes with the following verb. In parsing, the subject is a predictable constant and therefore not explicitly marked.

The zero marking of the subject invites a reinterpretation in the sense of a topological identification instead of a morphosyntactic marking. However, this reinterpretation requires a special structural environment. The subject's position must be identifiable as unique. This is the case if the head-position of phrases is fixed and VPs are head initial. In this case, there is only a single position preceding the verb while the canonical argument positions are post-verbal. The outcome is the clause structure of [S[VO]] languages. The tightly documented diachronic data of languages such as English and North Germanic languages tell us that such a sentence structure is not the beginning, but the end of thousands of years of grammatical changes.

5. The adaptive gain of subjects in the cognitive evolution of grammars

If the emergence of grammatical subjects is a result of the cognitive evolution of grammars, there must be a corresponding selection scenario that rewards effects on the way that promotes their emergence. Here is a sketch of contributing factors. All of them contribute to reducing the entropy in the organization of utterances and thereby facilitate reception and production. In other words, they allow for the formation of patterns, the processing of which becomes accessible to the procedural memory system. Unlike declaratively controlled processing based on lexically stored information, the procedural routines are cognitively encapsulated and therefore

do not compete for resources that are needed for the mental planning or mental assimilation of the content of a message.[20]

The shift of the workload from the declarative to the procedural system is part of the constant selection background of the grammatical changes that lead to the emergence of subjects and their entirely topological implementation. It is precisely for this reason that no language is known whose diachrony mirrors the development from Old Germanic via Old English to modern English.[21] It is an ironic coincidence that the currently dominant models of grammatical theory were all developed against the background of English and that other languages are therefore seen as strange variations of it.

6. Summary

- "Grammatical subject" is a *syntactically* determined, structural concept with cross-linguistic validity but without cross-linguistic uniformity.
- What a grammatical subject is differs *relative* to the alignment system of a given language.
- The grammatical subject under abs-*ergative* alignment is the *absolutive* noun phrase.
- The grammatical subject under *nom-acc* alignment is the *nominative* noun phrase.
- The omission of the primary subject candidate is formally explicitly marked.
- Antipassive and passive are syntactical equivalents, modulo alignment system.
- The evolutionary paths lead from systems without subjects to systems with formally identified subjects and from there to topological systems, in which a subject is positionally identified.
- The relative chronology leads from subjectless systems (cf. tripartite) to systems with morpho-syntactically defined subjects (cf. nom-acc or abs-erg alignment) and from there to topologically linking systems, with case- and agreement-less [S[VO]] languages as outcome.

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[20] Anyone who is used to giving a free speech presentation in a language that is not the native language will be familiar with this effect. The 'on-line' exercise of a non-native language competence drains many routines of declarative memory and executive control functions.

[21] The diachronic sequence of the grammars is closely related to the fact that they involve processing operations that start from a one-dimensional representation (in reception) or lead to such a representation (in production) since the phonetics-to-phonology interface is one-dimensional. Sign languages on the other hand are based on an at least two-dimensional sign space. Their – unfortunately little documented – diachrony is expected to be different therefore.

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