

# On two substantial differences between biological evolution and grammatical evolution

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Sonia Cristofaro

Sorbonne Université

# Grammatical evolution

**Grammatical evolution:** In usage-based approaches to language, particularly the functional typological approach that originated from the work of Joseph Greenberg, grammatical structure emerges through an evolutionary process (Hopper 1987; Bybee, Perkins and Pagliuca 1994; Keller 1994; Croft 2000; Bybee 2009, 2010; MacWhinney 2015, among many others):

- Languages are in a permanent state of flux, as speakers constantly adopt novel constructions, either because they create them as a result of functional pressures, or because they hear them from other speakers.
- Grammatical structure gradually emerges as individual constructions are adopted by more and more speakers over time, leading to those constructions becoming conventionalized in the language and being transmitted across different generations of speakers.

# Functional pressures

Individual constructions may be adopted by speakers because they comply with **functional pressures**, for example

- particular word orders or word order combinations comply with **processing ease**
- the use of zero marking for particular grammatical values and the use of particular alignment patterns in case marking comply with **economy**

Because of these pressures, the same constructions are recurrently adopted in different languages, leading to the emergence of **cross-linguistic patterns** (typological universals: Comrie 1989; Croft 2003, among many others).

# Grammatical evolution and biological evolution

This scenario is often likened to **biological evolution** (McMahon 1994, Haspelmath 1999, Croft 2000, Blevins 2004, MacWhinney 2015, among many others):

'In language change, variants are created from which speakers may choose. Being subject to various constraints on language use, speakers tend to choose those variants that suit them best. These variants then become increasingly frequent and entrenched in speakers' minds, and at some point they may become obligatory parts of grammar [...]

Grammatical constraints are thus the way they are because they arise from user constraints in a diachronic process of adaptation. Diachronic adaptation in language is in many ways analogous to adaptation in biological change.' (Haspelmath 1999)

# Grammatical evolution and biological evolution

- Both grammatical evolution and biological evolution involve **selection**, that is, **differential spread** of individual variants (individual genetic traits, individual grammatical constructions) in a population.
- In both cases, selection is driven by **adaptiveness**:
  - genetic traits spread because of **environmental adaptiveness**, that is, they are beneficial for the organisms carrying them
  - grammatical constructions spread because of **functional adaptiveness**, that is, they are beneficial for the user in functional terms.

# Grammatical evolution and biological evolution

- Both grammatical evolution and biological evolution involve two distinct steps
  - **development**: the emergence of a new variant (a new genetic trait, a new grammatical construction)
  - **propagation**: the transmission of that variant from one individual to another within a population, either vertically (across different generations) or horizontally (from one adult individual to another, though this only takes place in grammatical evolution).

# Grammatical evolution and biological evolution

But there are two important differences between grammatical evolution and biological evolution, concerning

- **the locus of selection**: selection does not take place at the same level in grammatical and biological evolution
- **the factors driving selection**: selection is not driven by the same factors in grammatical and biological evolution

# The locus of selection

In biological evolution, selection takes place at the level of **propagation**:

- The fact that genetic traits are **adaptive** increases the chances of the organisms carrying them surviving and reproducing, thus passing on these traits to their descendants.
- So selection leads to **differential propagation** of individual traits in a population depending on adaptiveness, but this is independent of how those traits arise in the first place.
- Different traits have different **propagation chances** but (to the extent that they arise through random mutation) comparable **developmental chances**.



# The locus of selection

Does this have an equivalent in grammatical evolution?

- In the functional-typological approach (and the literature on language change) functional adaptiveness is not generally assumed to play any role in the **propagation** of grammatical constructions within a speech community.
- Horizontal propagation (from one adult speaker to another) is usually assumed to be driven by extra-linguistic factors pertaining to the dynamics of social interaction between speaker (e.g. the strength of social network relations among speakers, the position of individual speakers within the social networks they are part of ...), not the fact that the resulting constructions are beneficial for the user in functional terms (functional adaptiveness).

# The locus of selection

‘Functional factors – the phonetic and conceptual factors appealed to by functionalist linguists – are responsible only for innovation, and social factors provide a selection mechanism for propagation [...] The empirical evidence indicates that linguistic selection [*in propagation: SC*] is governed largely if not exclusively by social forces that have nothing to do with functional adaptiveness for communication.’ (Croft 2000: 38-9; see also McMahon 1994, Newmeyer 2005)

# The locus of selection

- There also is no generalized evidence that functional adaptiveness plays a role in the **vertical propagation** of grammatical constructions across different generations of speakers
- This hypothesis has been tested through computational simulations and artificial language learning experiments, but for a limited number of constructions (e.g. Kirby 1999, Culbertson 2012, Culbertson and Newport 2017).
- Constructions that do not comply with particular functional pressures are quite stable over time, meaning that these constructions are successfully transmitted across generations (Vincent 1978, Lass 1997, Croft 2000, among many others).

# The locus of selection

This implies that, if functional adaptiveness plays a role in grammatical evolution at all, this must be at the level of innovation, not propagation:

- Different speakers should independently and recurrently create the same constructions due to the functional adaptiveness of those constructions (Keller 1994).
- So functional adaptiveness should lead to the **differential development** of individual constructions in a speech community, while playing no role in the propagation of those constructions once they arise in the community.
- Individual constructions would have different **developmental chances** but comparable **propagation chances**.
- Can one actually speak of selection here?
  - Constructions are selected, but in the sense that speakers create particular constructions rather than others
  - not in the sense that speakers select within a pool of existing variants due to the adaptiveness of those variants.

# The factors driving selection

Does functional adaptiveness really leads speakers to create particular constructions as opposed to others? Some developmental processes provide evidence for this:

- When constructing linear sequences, speakers must select the order of the elements within the sequence.
  - Longer noun phrases occur clause finally rather than clause internally, plausibly because this facilitates constituent recognition (Hawkins 2004).
- (1) (a) *The man waited for his son in the cold but not unpleasant wind.*  
(b) *The man waited in the cold but not unpleasant wind for his son.*

# The factors driving selection

- Similarly, elements that are logically prior tend to be placed in initial position in the sentence (Greenberg 1978, Traugott 1974).
  - This is plausibly both because speakers attend to those elements first when constructing the sequence, and because sequence initial position invites the hearer to pay more attention (Tomlin 1985, Givon 1988, among others).
- (2) (a) *If you are hungry, you must eat.*  
(b) *You must eat if you are hungry.*

# The factors driving selection

But we know that a lot of grammatical structure originates from the reinterpretation of pre-existing constructions (through grammaticalization and other processes of constructional reinterpretation):

- In disciplines that investigate actual instances of such processes (grammaticalization studies, studies of language change in general), they are routinely assumed to be triggered by properties of the source constructions and the contexts in which they are used
- not the fact that the resulting patterns comply with particular functional pressures.

# The factors driving selection

'...our view of grammaticization is much more mechanistic than functional ... grammaticization is not goal-directed ... The push for grammaticization comes from below ... in the tendency to infer as much as possible from the input, and in the necessity of interpreting items in context.' (Bybee, Perkins and Pagliuca 1994: 298-300)

'Lexical items begin on the path towards grammatical elements in the process of conversational inferences carried out by mature speakers.'  
(Slobin 2002: 381)

So can we really say that the development of grammatical structure is adaptive, in the sense of **being driven by properties of the resulting patterns?**



# Accusative alignment in case marking

Accusative alignment in case marking:

- Transitive and intransitive subjects are encoded by the same case form, whereas direct objects are encoded by a different form.
- This is a recurrent pattern cross-linguistically, and one significantly more common than others (transitive subjects, intransitive subjects and direct objects all encoded by a different form; same form for transitive subjects and direct objects, and a different form for intransitive subjects).

# Accusative alignment in case marking

- Why is it that languages recurrently display accusative alignment?
- This is traditionally assumed to be because accusative alignment complies with general functional pressures (DuBois 1985, Comrie 1989, Dixon 1994, Kibrik 1997, Mithun and Chafe 1999, among many others):
  - use the same form for similar meanings: transitive and intransitive subjects are both topical, hence they should be encoded in the same way
  - use distinct forms for meanings more in need of disambiguation: direct objects must be disambiguated from transitive subjects, because they co-occur in transitive clauses, hence they should be encoded differently.

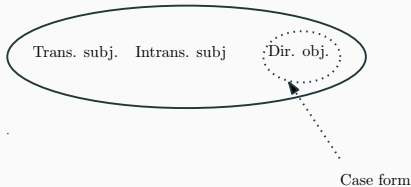
# Accusative alignment in case marking

- In an evolutionary perspective, these principles should play a role in the **development** of accusative alignment, that is, they should lead speakers to recurrently create accusative alignment, both within and across languages.
- Is this really the case, that is, how does accusative alignment arise diachronically in the world's languages?

# Accusative alignment in case marking

**Metonymization** (Bybee, Perkins and Pagliuca 1994, Traugott and Daher 2005):

- Transitive subjects, intransitive subjects and direct objects originally have the same form.
- Some element originally not used to encode grammatical relations is reinterpreted as signaling the role of a co-occurring direct object, whereas transitive and intransitive subjects retain the original form.



## Accusative alignment in case marking

'Take' verb evolve into markers for their direct object ('**take** X (and) VERB (X)' > '**OBJ** X VERB')

(3) Twi (Niger-Congo)

(a) *o-de afoa ce boha-m*  
he-OBJ sword put scabbard-inside

'He put the sword into the scabbard' (Lord 1993: 66)

(b) *ɔkɔm de me*  
hunger take me

'Hunger takes me' (19th century: Lord 1993: 70)

# Accusative alignment in case marking

## (4) Mandarin Chinese

- (a) *Tāmen* **bā** *Zhāng-sān* [...] *jiǎntao* *le* *liǎn xiǎoshi*  
They OBJ Zhang-san scrutinize ASP two hours

'They scrutinized Zhang-san for two hours.' (Modern Mandarin: Li and Thompson 1974: 203)

- (b) *Yù* *qīng* **bā** *tīan* *zhǐ* *rùi-lìng* *yǐ* *zhēn*  
Yu himself take heaven POSS mandate to conquer  
*yǒu* *Miáo*  
PTCL Miao

'Yu himself took the mandate of heaven to conquer Miao.'  
(*Mè-zǐ*, 5th century B.C.: Li and Thompson 1974: 202)

# Accusative alignment in case marking

Topic markers used for topicalized direct objects evolve into direct object markers.

## (5) Spanish

- (a) *Traj-eron*      **a**      *un amigo con ellos*  
bring-PFV.3PL   ACC   a   friend   with   them

'They brought a friend with them'. (Modern Spanish: Melis 2021: 40)

- (b) **A**      *ti*      *arodo*                      *e*      *cred-o*                      *de*  
OBJ   2SG   worship.PRES.1SG   and   believe.PRES.1SG   of  
*toda*   *voluntad*  
all   goodwill

'I worship you and I believe in you with all my heart'. (*Cantar de mio Cid*, early 13th century, 362: Melis 2021: 46)

# Accusative alignment in case marking

## (6) Latin

**Ad** *Dolabellam, ut scribis, ita*  
TOP Dolabella.ACC as write.PRES.2SG in.this.way  
*puto faciendum.*  
do.PRES.1SG do.GER

'As for Dolabella, as you write, I think one should act in this way'.  
(Cicero, *Letters to Atticus* 13.10.2: Pensado 1995: 201)

## (7) Kanuri (Saharan)

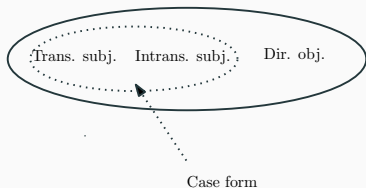
(a) *Músa shí-ga cúro*  
Musa 3SG-OBJ saw  
'Musa saw him' (Cyffer 1998: 52)

(b) *wú-ga*  
1SG-as.for  
'As for me' (Cyffer 1998: 52)



# Accusative alignment in case marking

For pronouns, accusative alignment can emerge as transitive and intransitive pronominal subjects get reduced forms due to their high discourse frequency, whereas pronominal direct objects retain the original unreduced form.



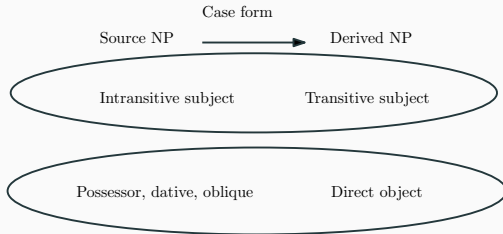
	Trans./ Intrans. Subject	Direct object
1SG	<b><i>mo</i></b>	<i>mwa</i>
2SG	<b><i>to</i></b>	<i>twa</i>

**Table 1:** Pronominal declension in Louisiana Creole (Haspelmath & the APiCS Consortium 2013: 233)

# Accusative alignment in case marking

**Reanalysis of argument structure** (Harris and Campbell 1995, Gildea 1998, Creissels 2008, among many others):

- An intransitive construction is reanalysed as transitive.
- The subject of the intransitive construction becomes the subject of the transitive construction and retains its original form, so that transitive and intransitive subjects are encoded in the same way.
- Indirect objects, possessors or obliques are reanalysed as direct objects and retain their original marking, leading to a distinct form for direct objects.



## Accusative alignment in case marking

Intransitive locative constructions of the type 'X is at the VERBing of Y' are reinterpreted as transitive progressive constructions, 'X is VERBing Y'.

### (8) Wayana (Carib)

*i-pakoro-n*                      *iri-Ø*                      *pək wai*  
1-house-POSS/OBJ    make-NOMLZ    at    1.be

'I'm making my house.' (originally 'I am at the making of my house': Gildea 1998: 201)

- The subject of the intransitive construction is a notional agent, which becomes the subject of the transitive construction and retains its original form.
- A possessor NP in the intransitive construction is a notional patient, which becomes the direct object and retains its original possessor marking.

## Reanalysis of argument structure

Intransitive constructions of the type 'X is VERBing to/at Y' (object demotion, antipassive) are reinterpreted as transitive, 'X is VERBing Y' (antipassive-to-accusative reanalysis: Blake 1977, Dench 1994, Harris and Campbell 1995).

### (9) Modern Georgian (Kartvelian)

*deda*                *p'erang-s*    *recxavs*  
mother.ABS    shirt-DAT    washes

'Mother is washing the shirt'. (originally 'Mother washes to the shirt.': Harris and Campbell 1995: 245).

- The subject of the intransitive construction is a notional agent, which becomes the subject of the transitive construction and retains its original form.
- A dative or oblique NP in the intransitive construction is a notional patient, which is reinterpreted as direct object and retains its dative or oblique marking.

# Accusative alignment in case marking

Metonymization, phonological reduction and reanalysis are standard processes in language change, which are generally assumed to be driven by **inherent or contextual properties of the source construction**:

- **Metonymization** is a process of form-function recombination whereby some element takes on a meaning associated with its context of occurrence: for example, 'take' verbs and topic markers are inferred to encode the role of a direct object that is part of the construction.
- **Phonological reduction** is triggered by specific properties of the elements undergoing reduction: subject pronominal forms undergo reduction because of their high discourse frequency.
- **Reanalysis** results from inferences invited by properties of the source construction: particular NPs encode notional agents or patients, so they can be inferred to be transitive subjects or direct objects.

# Accusative alignment in case marking

These factors are independent of the fact that the accusative patterns resulting from individual processes comply with particular functional pressures

- encode transitive and intransitive subjects in the same way because of their similarity
- disambiguate transitive subjects and direct objects

So speakers cannot be assumed to create ('select') the relevant constructions because of these pressures.

# Accusative alignment in case marking

The development of accusative alignment is not random. The various developmental processes are triggered by factors that are plausibly relevant to different speakers in different languages:

- the fact that the source construction invites particular types of inferences leading to metonymization or reanalysis
- the fact that the discourse frequency of particular forms leads to automatization and consequent phonological reduction of those forms

## The factors driving selection (again)

But to the extent that grammatical constructions originate through the reinterpretation of pre-existing ones, there is no real equivalent of adaptiveness in their evolution:

- There is no generalized evidence that constructions propagate within a speech community (either horizontally or vertically) because they are adaptive.
- The fact that individual constructions are adaptive plays no role in the development of those constructions either.



# The factors driving selection (again)

- It is plausible that the various developmental processes involve mechanisms that are ultimately beneficial for users, leading to these processes recurrently taking place within and across languages:
  - only pay attention to the most important part of a message, so that it becomes the main meaning of the relevant construction whereas other meaning components are bleached
  - simplify articulatory gestures when possible, so that frequently occurring expressions are automatized and ultimately reduced
- But these mechanisms pertain to the way speakers interpret existing constructions, not **properties of the resulting constructions**

A proper comparison between biological evolution and grammatical evolution requires further understanding of a number of aspects about the latter, including the developmental vs. the propagation rate of different constructions, and the specific factors involved in individual developmental and propagation processes.

# Abbreviations

DEP.FUT	dependent future
IMPF	impefect
NOMLZ	nominalizer
POSS	possessor
PTCL	particle



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