The evolution of morphosyntactic categorization: Typology and implications for comparative reconstruction

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The problem

- Comparative reconstruction and phylogenetic language family trees rely strongly on phono-lexical cognacy, which establishes genetic relationships through regular sound correspondences in related lexical items → the **Comparative Method (CM)**
- Morphological and morphosyntactic information is not systematically taken into account because of:

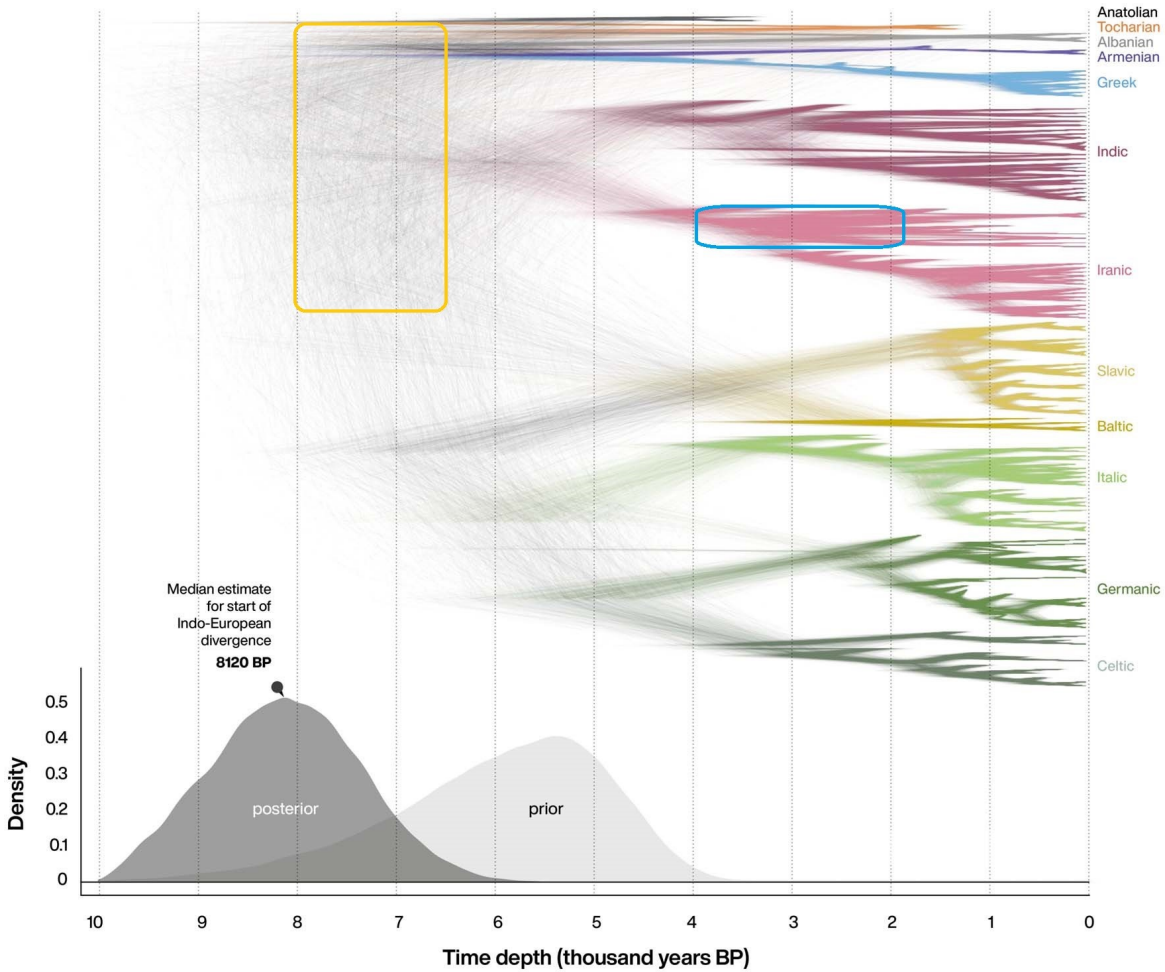
1. a lack of consensus as to how "regular correspondences" in the domain of morphology/morphosyntax (e.g., derivational morphemes, case markers, etc.) are to be defined
2. uncertainty as to whether morphological/morphosyntactic change is (uni)directional
   - for phonological change, cp. e.g., θ > f, f ⊁ θ (Honeybone 2016)
   - for syntactic change, cp. syntactic cycles, economy principles, etc. (e.g., van Gelderen 2011; Breitbarth 2017; Roberts & Roussou 2003; Roberts 2021; 2019; Biberauer & Roberts 2017)

The problem

- With respect to the relative chronology of morphosyntactic innovations, morphological change is therefore usually viewed from the perspective of phonology.
  - e.g., the Ancient Greek sigmatic aorist is characterized by a quasi-theme vowel *-a-* which resulted from the vocalization of syllabic nasals in 1sg. **-s-m̥* > *-sa* and 3pl. **-s-n̥t* > *-san* whence it spread by levelling through the whole paradigm.
  - This morphophonological innovation sets it apart from the *s*-aorist in other branches of Indo-European (IE) such as Indo-Iranian.
- This lack of knowledge has direct implications for our understanding of subgrouping/language phylogeny: we know a lot about the morphology of the older IE languages, but we cannot use that knowledge *systematically* when we build our language family trees.
  - Same is true for other language families, *mutatis mutandis*
- This has also been recognized as a problem in large-scale quantitative/computational approaches to language phylogeny (e.g., Piwowarczyk 2022)

Implications for subgrouping & language phylogeny

(1) Subgrouping of the IE language family, Heggarty et al. (2023)



The Indo-Europeanist's perspective

We know a lot about Proto-Indo-European inflectional and derivational/stem-forming morphology ....

- Nominal:
  - *-*(o/e)s*- (adj. abstracts)
  - *-*ti*- (verbal abstracts)
  - *-*te/or*- (agent nouns)
  - etc.
- Verbal:
  - *-*éi̯e/o*- (iterative, causative)
  - *-*s*- (perfective/aorist)
  - *-*(h_1)s*- (desiderative)
  - etc.
- Adjectival:
  - *-*u*-, *-*ro*-, *-*nt*-, *-*ko*-, etc.

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  - etc.
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... but we haven't figured out how to systematically derive subbranching information from this knowledge → mostly due to problem 1 (cognacy).

The typologist's/language change perspective

- Some "grammaticalization paths" are extremely well-studied cross-linguistically
  - Cf. Hopper & Traugott (2003); Kuteva et al. (2019)

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- ... but the focus tends to be on the development of new functions/abstract meaning, rather than on generalizations concerning the origin of the *markers* that express this meaning.
- Categorizing/word-forming material less well studied than "higher" functional/inflectional categories (tense, mood, aspect; definiteness, number, etc.)
- Difficult to extract generalizations from the data due to problem 2 (directionality)

The theoretical linguist's perspective

- Is categorization a "morpho-lexical" primitive or are there morphosyntactic/morphosemantic correlations that determine the choice of (sub)categorizer?
- How many "primary" categorizers are there? Just *n*, *v*, or also *a*, prep (more?) Universal or language-specific?
- Can they be decomposed, e.g., into (bundles of) formal features?
  - E.g., Mitrović & Panagiotidis (2020); Fábregas (2020) on *a*
- Are there different "flavors" of *v*, *n* ...? And how many? (Folli & Harley 2004; Acquaviva 2009, 2019)
- Are there zero categorizers, and what are the constraints on their meaning/distribution?

Addressing the problem

→ "The evolution of morphosyntactic categorization: Formal typology, diachrony, and comparative reconstruction of the mental lexicon"

(EVOCAT)

ERC CoG 2024

Today's goals

In order to address these problems, I will

- outline how we can leverage the morphosyntactic information we have collected for (P)IE to construct more accurate subbranching relationships
- propose a typology of morphosyntactic reanalysis that can capture the different types of changes that we see in **categorizing morphology** diachronically, based on **Distributed Morphology (DM)**
- introduce & motivate:
  - the hypothesis that morphosyntactic change in the categorizer domain is **regular** and **directional**, like sound change (Grestenberger 2022a, 2023a)
  - a novel formalization of morphosyntactic cognacy that takes variants (allomorphs) of different morphemes and their context into account, again using DM (Grestenberger & Fellner 2025)
- present a case study from the IE participial system to show how the directionality assumption combined with the cognacy definition allows us to draw conclusions with respect to the relative chronology of the different participial morphemes, and how "morphosyntactic subbranching trees" follow from that.

Background:
Categorizers in Distributed Morphology

What are categorizers?

First pass:

- Elements that formally mark (inflectional) *stems*
- Mediate between root/lexical meaning and higher functional/inflectional categories (Voice, Aspect, Mood, Tense; Definiteness, Number, Case ...)
- Provide specific morphosemantic function(s) (?)
  - Verbal domain: Argument structure/Aktionsart/Voice (*genus verbi*)?
  - Nominal domain: Gender, animacy, mass/count?

Why categorizers?

- Across frameworks, there is agreement that morphosyntactic categorization corresponds *to some extent* to ontological category (≈ "notional" definitions)
  - Reference/"thing" = N
  - Predication/event = V
- But there are many exceptions; no 1:1 correspondence
- Moreover, categorization is not a requirement imposed by the meaning/interpretative component of grammar:

  "In a language where the grammatical properties and behaviour of morphosyntactic words is completely predictable on the basis of the ontological category of their denotata, their is no need for an additional (grammatical) level of lexical categories."
  (Himmelmann 2005: 86)

Categorizers in DM

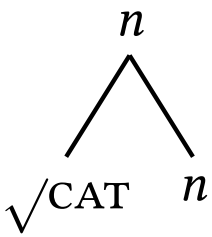
- In generative approaches, it's been argued that categorization is not strictly a *syntactic* requirement, either, but some sort of "interface condition" (e.g., Embick & Marantz 2008, Chung 2012)

In **Distributed Morphology (DM)** (Halle & Marantz 1993; Harley & Noyer 1999; Embick 2010, 2015; Bobaljik 2017, etc.):

- complex word forms are generated in the syntax from abstract "terminal nodes" (syntactic heads) which are linearized (concatenated) post-syntactically and morphophonologically realized through a process of **Vocabulary Insertion**.
- **word-formation is syntactic**: categorially unspecified **roots** combine with (overt/covert) categorizing heads "in the syntax"/via Merge:

(2)

a.



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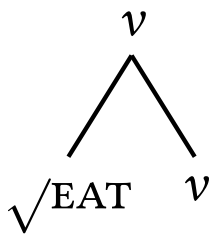

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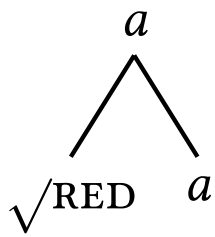
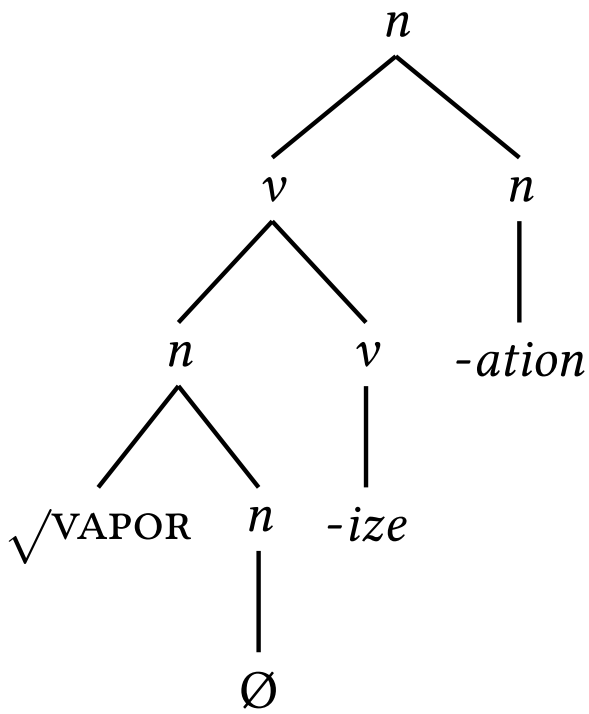


Categorizers in DM

(3) Root-adjacent categorizers ("inner affixes") vs. derivational morphemes ("outer affixes")



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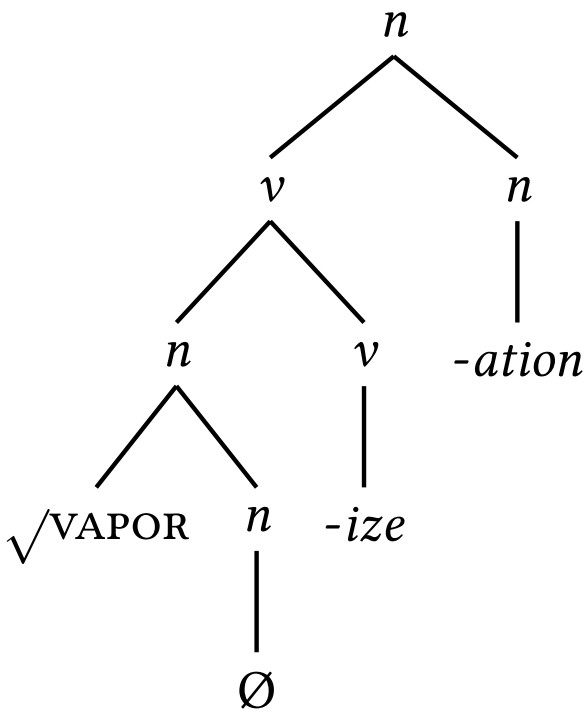


→ In the following, "categorizer" can refer both to inner (root-selecting) and to outer (category-changing or category-modifying) morphology

Summary: categorizers in DM

In DM, categorizers

- select roots or stems and turn them into a categorially specified element that can be manipulated by the syntax
  - Categorization as an "interface condition" (e.g., Embick & Marantz 2008, Chung 2012)
- can be phonologically null/"zero"
- have different features or "flavors"; e.g., "flavors" of the verbalizer v (Folli & Harley 2004, 2007; Harley 2005, 2009, 2013; Alexiadou & Lohndal 2017; Panagiotidis et al. 2017, etc.):
  - v_{CAUSE}: causatives
  - v_{BECOME}: anticausatives/inchoatives
  - $v_{\text{BE/STATE}}$: states
  - v_{DO} or v_{ACT}: unergative activity verbs
- morphosemantically mediate between the root and higher functional projections (**FP**s, e.g., voice, temporal/spatial anchoring, agreement, etc.)

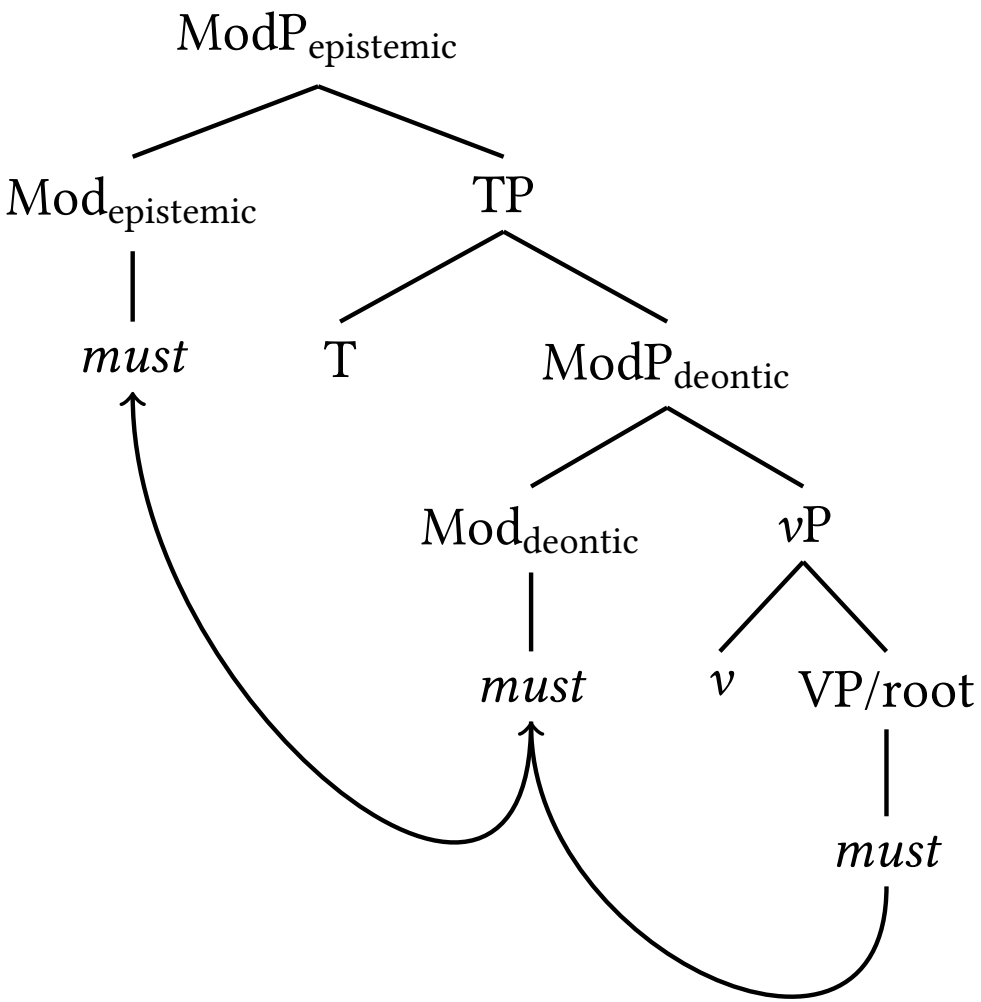
Where do categorizers come from?

Core claim:

- New categorizers arise through **reanalysis** of root-adjacent morphological material
  - Reanalysis as "(...) a process whereby the hearer assigns a parse to the input that does not match the structure assigned by the speaker." (Walkden 2014: 39; cf. Hale 1998; Walkden 2021; Bar-Asher Siegal 2024)
- **Directionality**: Reanalysis is *directional* - structurally upwards, linearly rightwards
- **Upwards Reanalysis (UR)**, cf. (4):
  lexical → "lower" functional material → "higher" functional material
  - e.g., Roberts & Roussou 2003, Cournane 2014, Alexiadou 2021, Grestenberger 2023a
  - "semantic bleaching" (= loss of formal features) can seemingly counteract this directionality, leading to new "primary" (root-selecting) categorizers

Directionality: the modal cycle

(4) UR in the modal cycle



UR & directionality in morphological change

Core hypotheses:

- Changes in categorizing morphology are unidirectional, parallel to syntactic changes.
- This directionality follows from the same underlying principles as in syntactic change
  - Morphology mirrors syntax, e.g., DM, Nanosyntax...
- Morphosemantic/"syn-sem" change should systematically correlate with changes in/reanalysis of categorizing morphology
- These changes should follow specific patterns and directions, parallel to "cycles" in syntactic change

UR & morphology

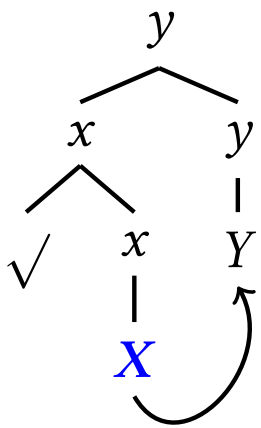
(5) **Upwards Reanalysis (UR)** in complex word forms (Grestenberger 2023a):

(a) phonological/morphosyntactic feature(s) associated with a terminal node x are reanalyzed as belonging to a structurally higher (linearly adjacent) head y

Morphosyntactic reanalysis of root-adjacent morphology: a typology

Typology of reanalysis in complex word forms

1) Category change, no loss of meaning (meaning = formal features/ functional heads)



Example: category change, no loss of meaning

Ancient Greek (AG) verbs in *-éu-ō* were originally derived from (animate "agentive") nouns in *-éu-* with the verbalizer **-(j)e/o-*, (6).

(6) AG verbs in *-éu-ō*

*basil-**eú**-ō*	'am king; rule'	*basil-**eú**-s*	'king'
*khalk-**eú**-ō*	'am a coppersmith'	*khalk-**eú**-s*	'coppersmith'

Nominal *-eu-* was reanalyzed as a productive verbalizer on the way to Modern Greek (MG).

- Ralli 2005; Efthymiou 2011; Efthymiou et al. 2012; Holton et al. 2012; Spyropoulos et al. 2015; Panagiotidis et al. 2017; Koutsoukos 2021, etc.

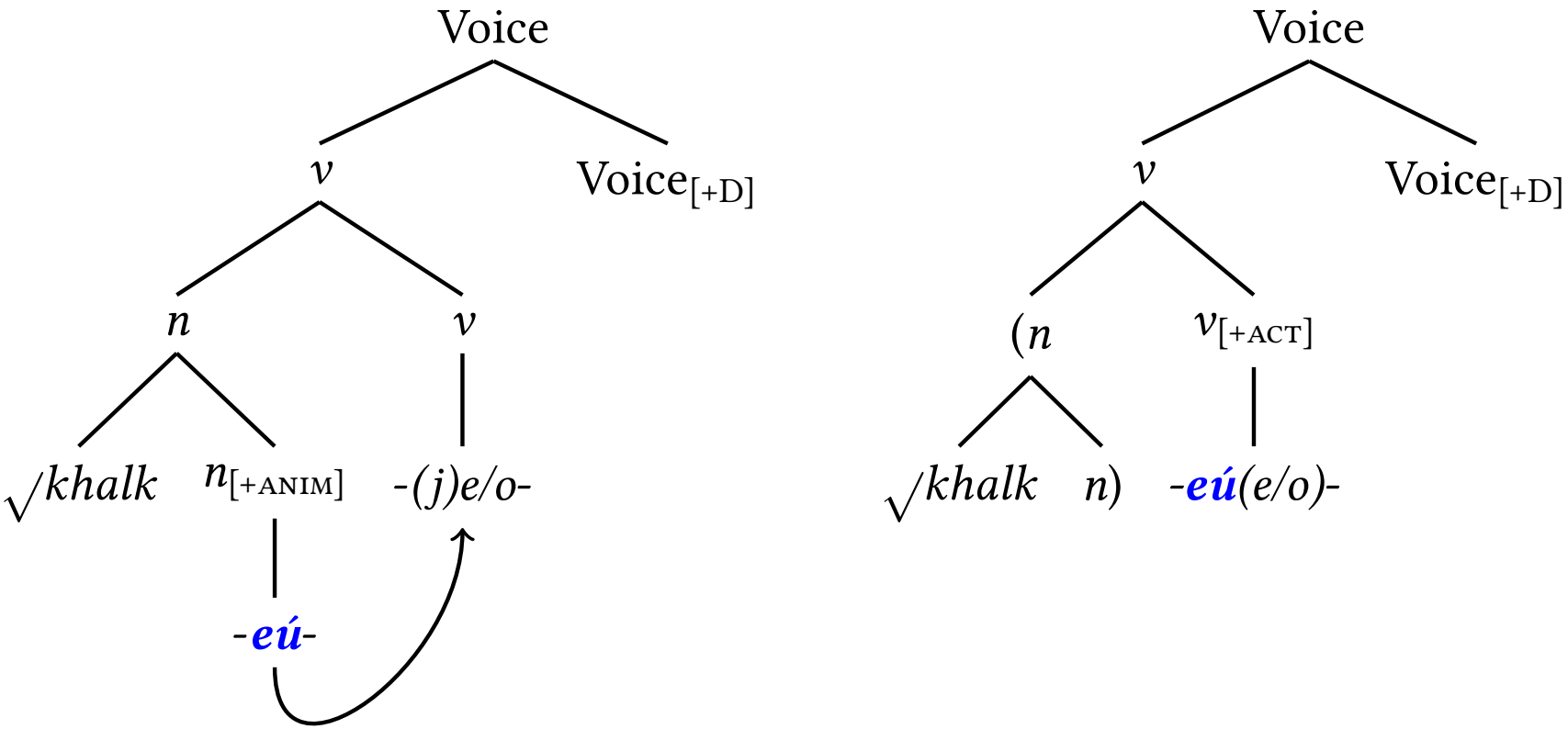
(7) Modern Greek verbs in *-ev-* (ex. from Panagiotidis et al. 2017)

MG *-ev-o*		base	
*stox-**év**-o*	'I aim at'	*stóx-os*	'target'
*kont-**év**-o*	'I approach'	*kontá*	'near'
*xak-**év**-o*	'I hack'	Engl. *hack*	

Example: category change, no loss of meaning

(8) Reanalysis of Ancient Greek nominal *-eú-* in Davidsonian/Stage Level verbs

a. → **b.**

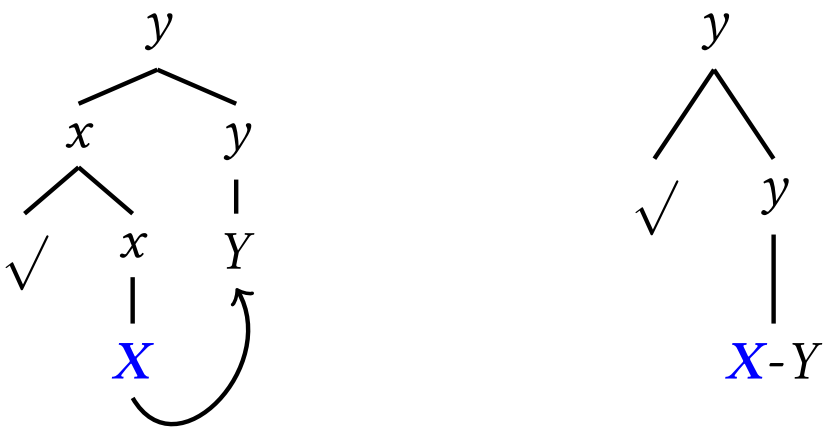


(Marescotti & Grestenberger 2024)

Typology of reanalysis in complex word forms

2) Category change + loss of meaning (= loss of functional projections/ formal features)

a. → **b.**



Example: category change + loss of meaning

UR + change of base: historical development of the MG action noun-forming suffix *-ismos* from earlier *-is-* (aorist verb stem) + noun-forming *-mós* (Schwyzer 1939: 493; Manolessou & Ralli 2015).

(9) Ancient Greek deverbal nouns in *-mós*

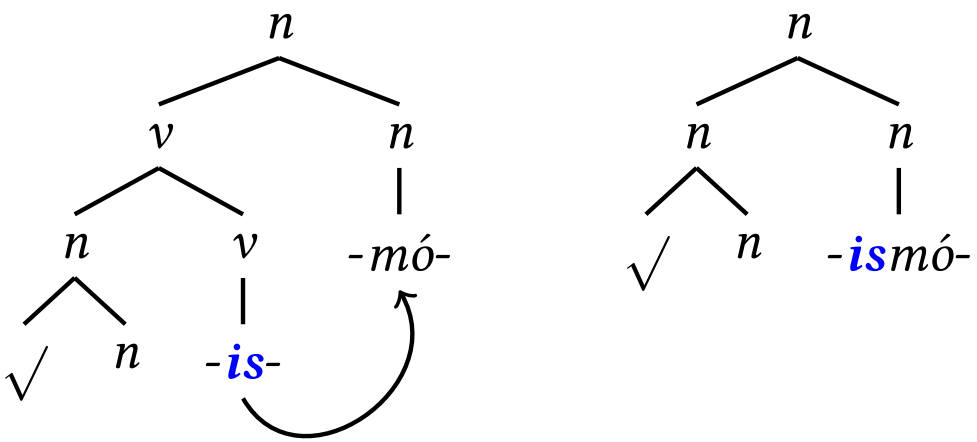
Present	Aorist	Deverbal noun
oik-íz-ō	*oík-**is**-a*	*oik-**is**-**mó**-s* 'foundation of a colony'
house-PRES-1SG	house-AOR-1SG	house-AOR-NMLZ-NOM
dane-íz-ō	*dane-**is**-a*	*dane-**is**-**mó**-s* 'money-lending'
loan-PRES-1SG	loan-AOR-1SG	loan-AOR-NMLZ-NOM

Hellenistic to MG: *-ismos* = productive denominal suffix (*dogmat-**ísmos***, *ergat-**ísmos*** 'workerism', *varoufak-**ísmos*** 'Varoufakism', ...)

Example: category change + loss of meaning

(10) UR of AG *-is(-)mós*

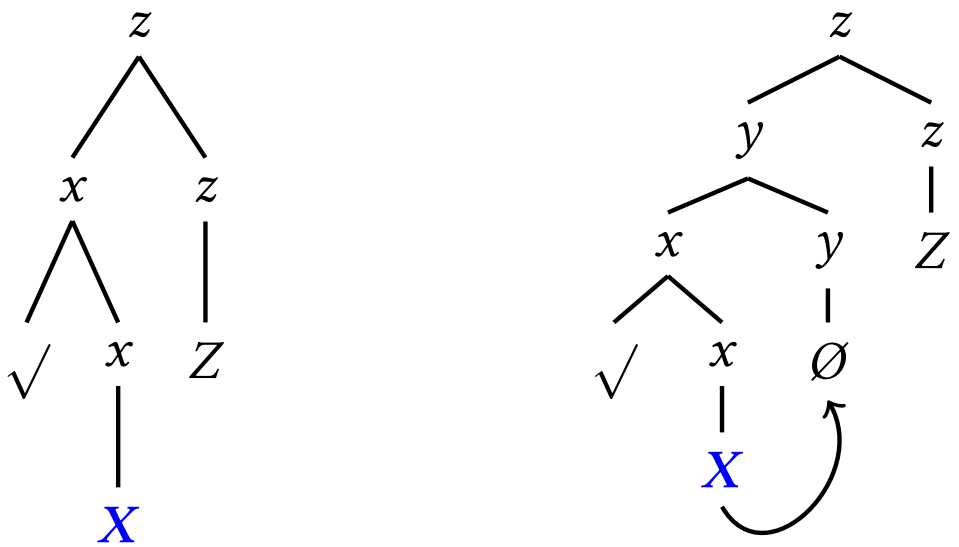
a. → b.



Typology of reanalysis in complex word forms

3) Category change + addition of meaning (= functional head(s)/syn-sem features)

a. → **b.**



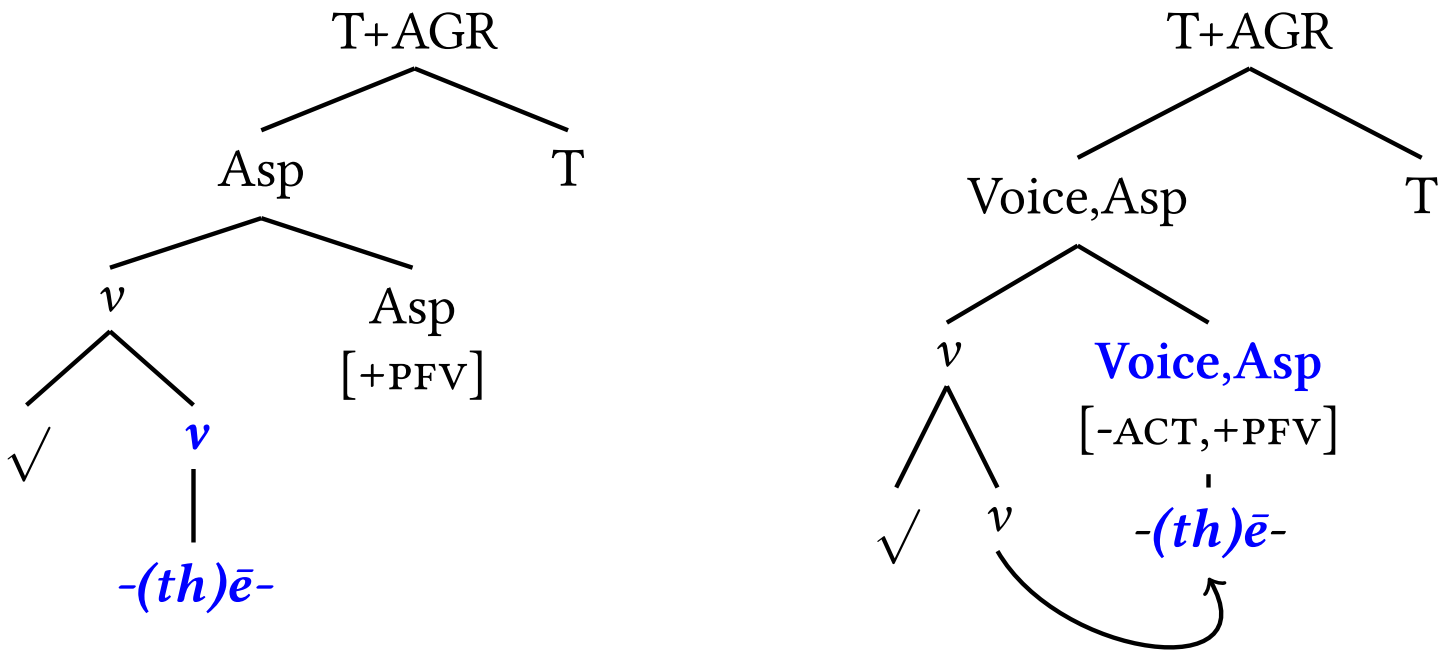
Example: category change + addition of meaning/FP

The AG inchoative/"passive" suffix *-(th)ē-* turned from a root-selecting suffix, (11a), to a *v*-selecting one, realizing a fused [Voice,Asp] head in MG, (11b).

- Christopoulos & Petrosino 2018, Alexiadou 2021, Grestenberger 2021b

(11) UR of Ancient Greek *-thē-*

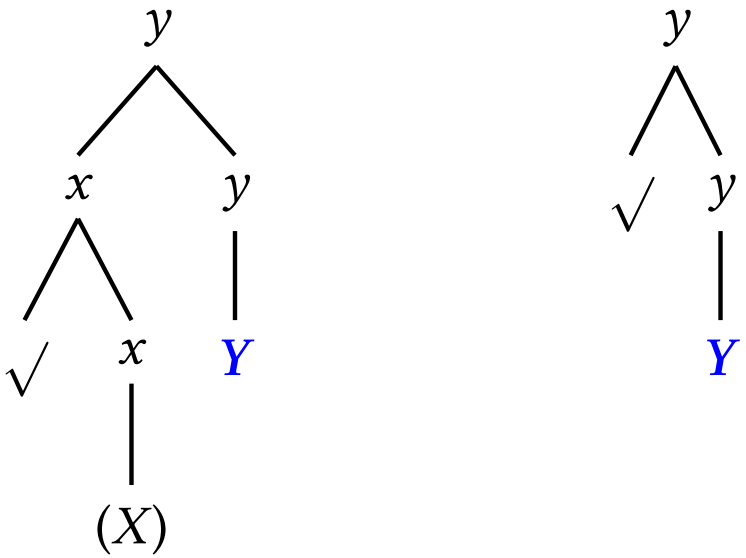
a. → **b.**



Typology of reanalysis in complex word forms

4) No category change; loss of meaning (= of functional projections)

a. → **b.**



Example: No category change; loss of meaning/FP

Ancient Greek middle participle suffix *-menos* vs. Modern Greek passive *-menos* (Grestenberger 2020):

- Ancient Greek *-menos*
  - can be formed to any verb stem that inflects as nonactive/"middle" in the finite forms, independent of its argument structure/valency → "**middle**" participle.
  - can be *transitive*

(12) AG *-menos* and finite verbs

	active	middle	***-menos***
alternating	*phér-ō*	*phéro-mai*	***pheró-menos***
	'carry'	'carry for myself'	'carrying for myself'
middle only	—	*keĩ-mai*	***keí-menos***
		'lie'	'lying'
active only	*ei-mí*	—	—
	'am'		

Example: No category change; loss of meaning/FP

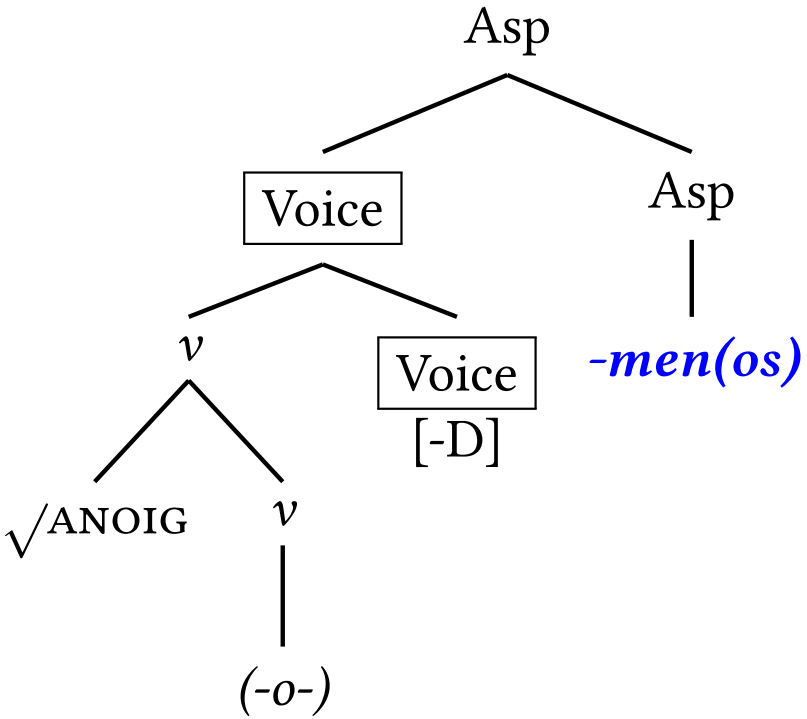
- Modern Greek *-menos*
  - only combines with the perfective stem ≈ "perfect passive participle'.
  - forms exclusively *passive* participles from *transitive*/resultative verbs, independent of whether they are active or nonactive-marked

(13) MG *-menos* and its base verbs (present stem)

	verb	meaning	participle	meaning
active	*agapo*	'love'	*agapi-**ménos***	'loved'
	deno	'tie'	*de-**ménos***	'tied'
nonactive	*metahirizome*	'use'	*metahiris-**ménos***	'used'
	varieme	'am bored'	*variesti-**ménos***	'bored'

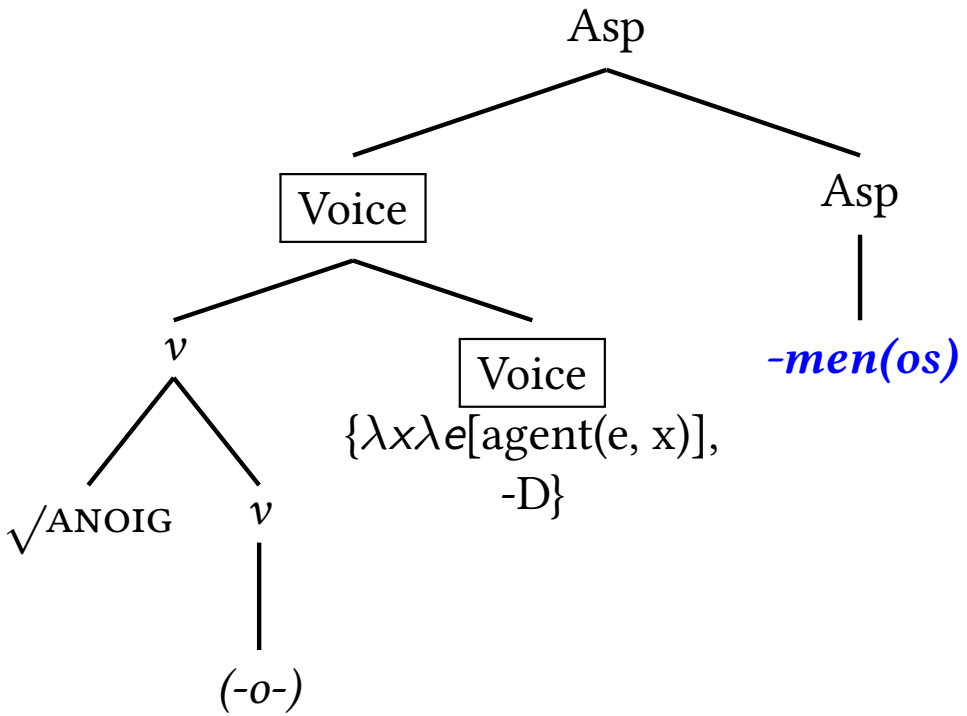
Example: No category change; loss of meaning/FP

(14) **a.**

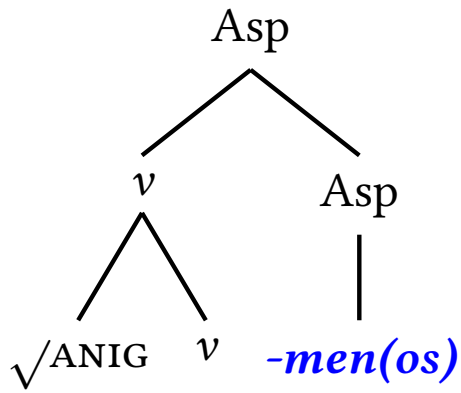


Example: No category change; loss of meaning/FP

b.



→ **c.**



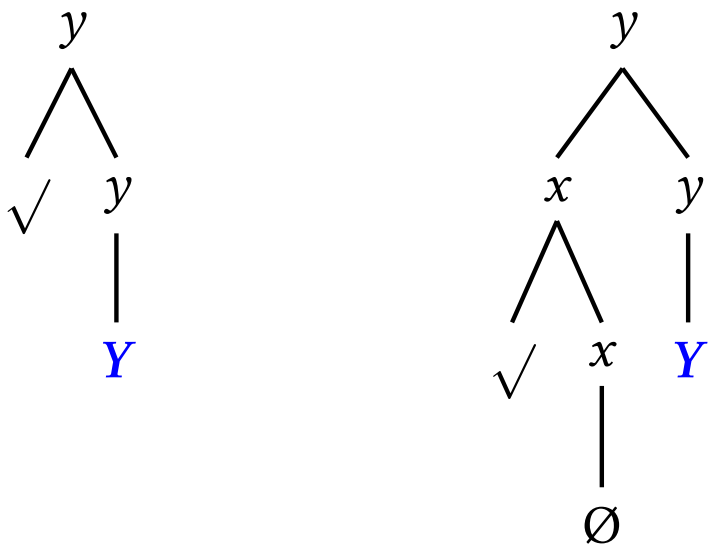
a. AG "middle" *menos*-ptcp. (selects Voice)
b. AG/postclassical perf. pass. ptcp./ MG resultant state ptcp. (selects Voice)
c. MG target state ptcp. (selects *v*)

cf. Anagnostopoulou 2003, Alexiadou & Anagnostopoulou 2008, Alexiadou et al. 2015

Typology of reanalysis in complex word forms

5) No category change, addition of meaning (= of functional projections)

a. → **b.**



Example: no category change; addition of meaning/FP

Vedic Sanskrit (VS) *-ín-*:

- denominal possessive adjective-forming suffix, (15a), →
- adjectives that are ambiguous between a denominal and a deverbal (state-denoting) interpretation, (15b), →
- (de)verbal (participial) suffix to morphologically characterized verbal stems (including preverbs, DO, etc.), (15c).

(15) Vedic denominal/deverbal adjectives in *-ín-*

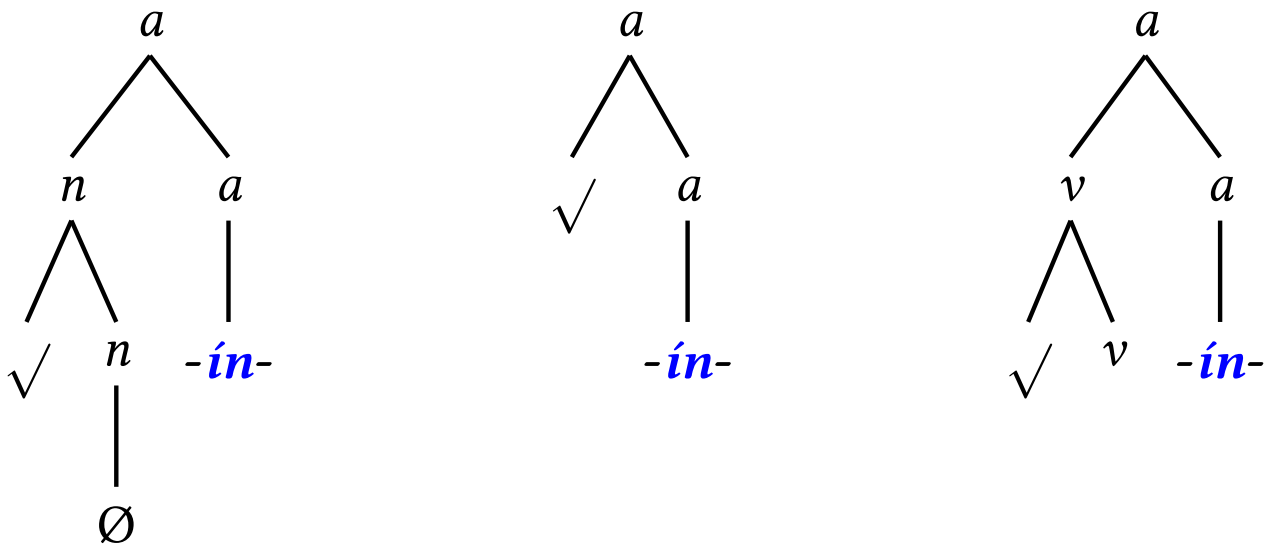
a.	*dhána-* 'prize'	*dhan-**ín**-* 'possessing prizes'
	parṇá- 'wing, feather'	*parṇ-**ín**-* 'winged, feathered'
b.	*kārá-* 'praise song'/*kar* 'praise'	*kār-**ín**-* 'praising'
	vi-rapśá- 'abundance'/ *vi rapś* 'abound'	*vi-rapś-**ín**-* 'having abundance'
c.	*ví*$_{\text{PRVB}}$ *car* 'wander off'	*vi-cār-**ín**-* 'wandering off'
	prá$_{\text{PRVB}}$ *sak-ṣ* 'conquer'	*pra-sak-ṣ-**ín**-* 'conquering'

(Lowe 2017; Grestenberger 2021a)

Example: no category change; addition of meaning/FP

(16) Reanalysis of Vedic adjectives in *-ín-*

a. → **b.** → **c.**



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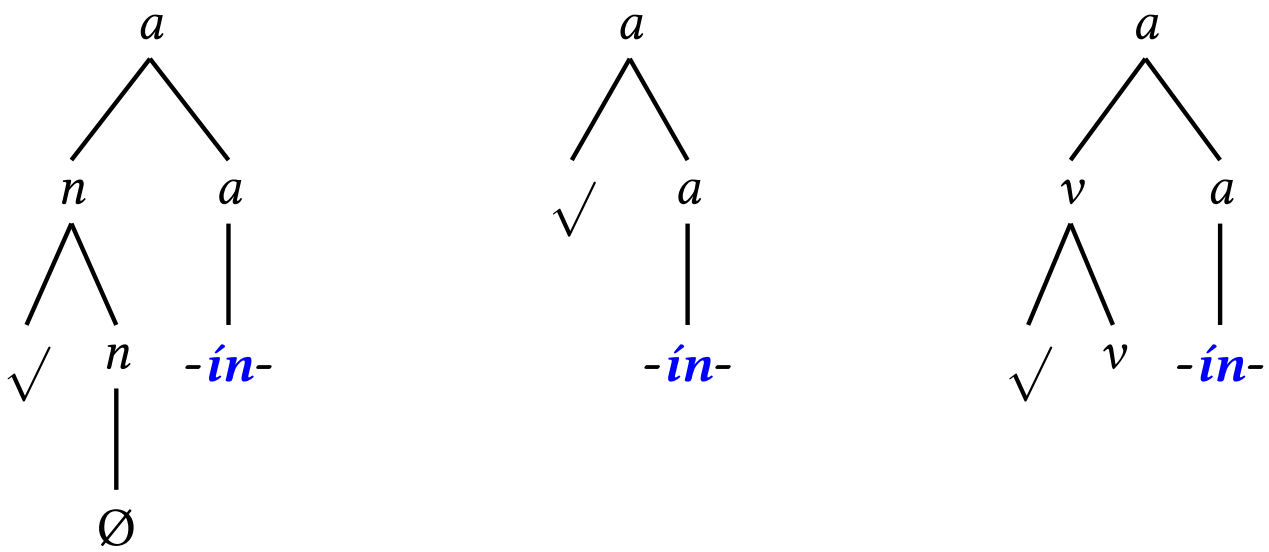
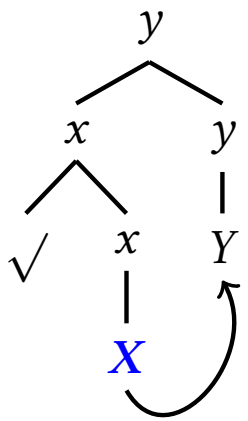
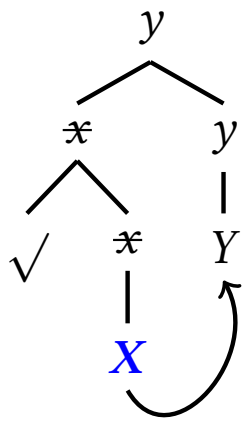
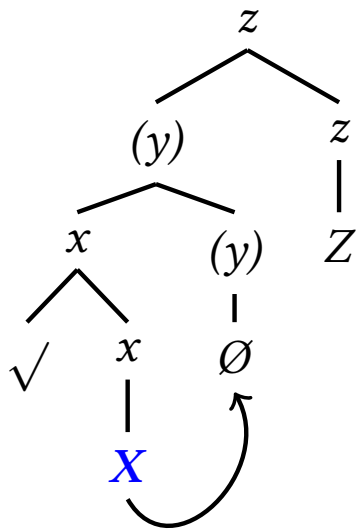
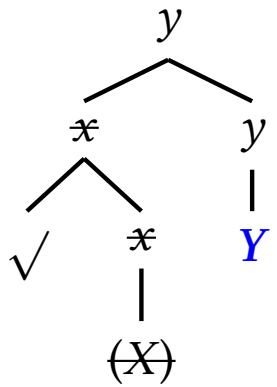
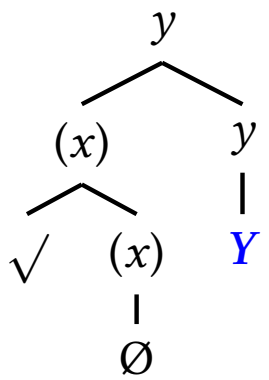


- "semantic enrichment", addition of event-introducing projection based on root-derived structures from inherently eventive roots ("*break*-type", e.g., Beavers & Koontz-Garboden 2020; Beavers et al. 2021 — Ora Matushansky, p.c.)

Summary

	no change in selection	FP lost	FP added
category change of reanalyzed affix	**1)** 	**2)** 	**3)** 
no category change of reanalyzed affix	(= no change)	**4)** 	**5)** 

Summary of examples

	no change in selection	FP lost	FP added
category change of reanalyzed affix	**1)** AG *-euō* → MG *-evo*[a]; Gmc. **-ar-* (*a*) → PDG *-er-* (*v*)[b]; conglutination, secretion[c];	**2)** AG deverb. *-is-mos* → MG denom. *-ismos*[d]; "telescoping"[e]; Old Hung. frequ. *v* → middle voice[f]	**3)** AG *v -(th)ē-* → MG [Voice,Asp] *-thi-*[g]; Proto-Algonquian independent order[h]
no category change of reanalyzed affix	(= no change)	**4)** AG mid. *-menos* → MG pass. *-menos*[i]; PIIr. dim. **-ka-* → Middle Ir. nmlz. *-k(a)-*[j]	**5)** Ved. denom. adj. *-ín-* → VA/ptcp.[k]; PIE denom./poss. adj. **-nt-* → act. ptcp.[l]; Gmc. verb. adj. (**-to-*/**-no-*) → pass. ptcp.[m]

[a]Marescotti & Grestenberger 2024; [b]Grestenberger et al. 2025; [c,d,e]Haspelmath 1995; [f]Halm 2020; [g]García Ramón 2014, Christopoulos & Petrosino 2018, Alexiadou 2021; [h]Goddard 1974, Proulx 1982, Oxford 2014; [i]Grestenberger 2020; [j]Edgerton 1911, Jamison 2009; [k]Grestenberger 2021a; [l]Lowe 2015, Grestenberger 2020; [m]Wegner 2019, Hallman 2021.

Summary

- Reanalysis of categorizing morphology can be grouped into specific subclasses depending on whether
  1) the formal features/function(s) of the categorizer change and
  2) its selectional properties change
- Specifically, **cross-categorial derivation** seems to be a crucial context that diachronically gives rise to new (reanalyzed) categorizers

  (cf. Grestenberger & Kastner 2022)
- These should then systematically inherit specific abstract properties/ features from their diachronic sources (except in cases of bleaching/loss of features)
  - In the verbal system: Grestenberger 2023a, Marescotti & Grestenberger 2024

Categorizers in diachrony

Origins of categorizers in the context of cross-categorial derivation:

- ***v*** < *n*: MG *-ev-* (*-en-*, *-iz-*, *-ar-*, etc.)[a]; Lat. 1st conj.[b];
  Pre-Proto-Alginquian verbal nouns → stative verbs[c];
  deverbal nouns → itr./antipassive verbs, Japhug Rgyalrong[d]
  - < *v*: AG CoS *-thē-* → pass.aor. [Voice,Asp][e]; AG iterative *-ske/o-*$_v$ → *-ske/o-*$_{\text{Asp}}$[f];
  - < *a*: Gmc. adj. (*)*-r(a)-* → OHG iter.-int. verbalizer *-ar-*[g];
    Gk. factitive/inchoative *-ūne/o-* & Anat. factitive *-nu-*[h]
- ***n*** < *n*: OIran. nominal dim. *-ka-* > Mid. Ir. nominalizer *-(V)k(a)-*[i]
  - < *v*: Gk. verbal nouns → denominal nouns in *-is(-)mos*[j] (cf. above)
  - < *a*: PIE/PIIr. denom. adj. → substantival **-ko-/-ka-*[k]
- ***a*** < *n*: Russ. “deagentive” *-tel’n(yj)*[l]
  - < *v*: Ved. verbal adj. *-y(-)u-*[m]
  - < *a*: denom. **-(o)nt-* → verbal adj./pctp. *-(V)nt-* (Gk., Skt. ...)[n];
    Ved. denom. *-ín-* → verbal adj. *-ín-*[o]; denom. **-to-* → VA/PPP (Gk., IIr., Lat.)[p]

[a]Marescotti & Grestenberger 2024; [b]Bertocci 2017, Calabrese 2023, Calabrese & Petrosino 2023; [c]Goddard 1974, Proulx 1982; [d]Jacques 2014, 2021; [e]Christopoulos & Petrosino 2018, Alexiadou 2021; Grestenberger 2021b; [f]Ringe & Eska 2013, Grestenberger 2022b; [g]Grestenberger et al. 2024; [h]Koch 1978, 1980, Tucker 1981, 1990, Villanueva Svensson 2024; [i]Gershevitch 1954, Gholami 2009; Grestenberger 2023b; [j]Manolessou & Ralli 2015; [k]Grestenberger 2023b; [l]Haspelmath 1995, Matushansky 2024; [m]AiG II,2; [n]Lowe 2014, 2015, Grestenberger 2020; [o]Grestenberger 2021a; [p]Grestenberger 2022b

$v < a$

- Proto-Gmc. adjectival *-*r(a)*- → Proto-NW-Gmc. "iterative" verbalizer *-*(a)r*- (Grestenberger et al. 2024)

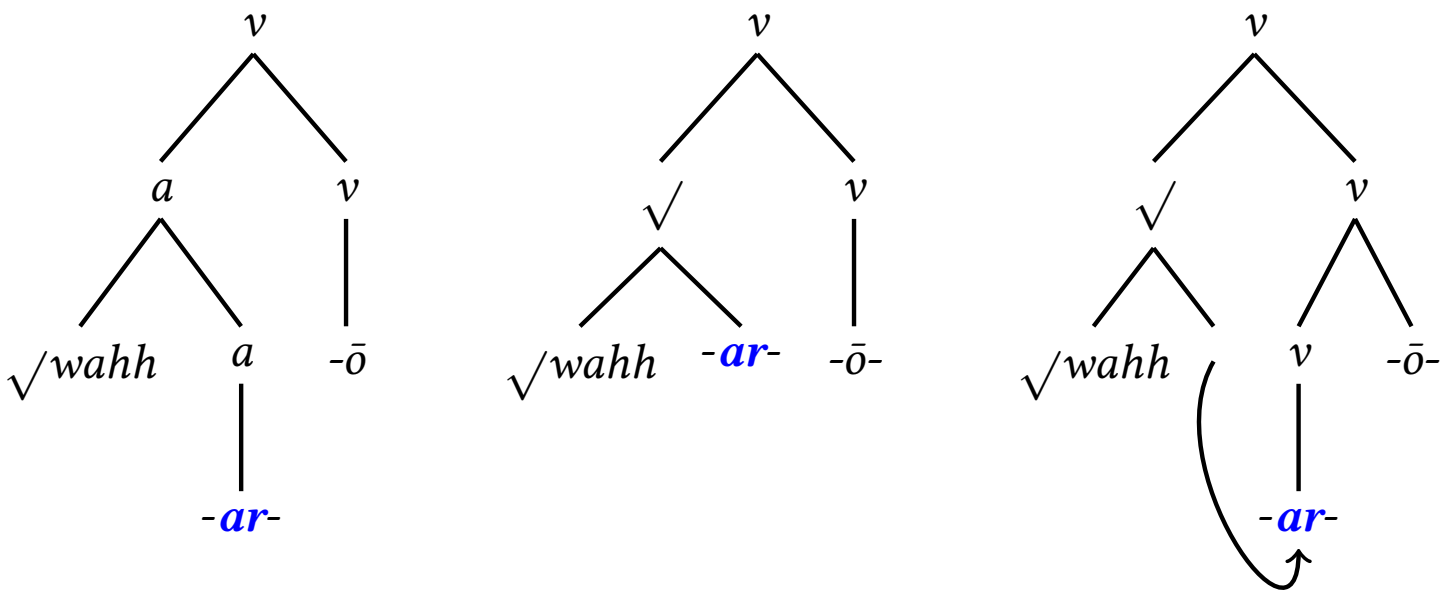
(17) OHG "deverbal" iteratives (base a;v)

***r*-iter.**		***r*-adj.**		**primary (strong) verb**	
*wahh-**ar**-ōn*	'be alert'	*wahh-**ar**, wach-**ar***	'alert, awake'	*wach-ēn*	'be awake, vigilant'
*weig-**ar**-ōn*	'refuse, be obstinate'	*weig-**ar***	'obstinate'	*wīg-an*	'oppose, fight'
*flog-**ar**-ōn, flag-**ar**-ōn*	'flutter, flicker'	**flak-**ra***-, OE *flac**or***	'flickering'	**flakk/g-ōn*, ME *flakk-en*	'flutter, flicker'
*-lung-**ar**-ōn*	'wander around'	*lung-**ar***	'capable'	*gi-lingan*	'succeed'

$v < a$

(18) Reanalysis of -*(a)r*- as a $\sqrt{}$-modifier > *v* head

a. → **b.** → **c.**



n < *n*

- Proto-Indo-Iranian nominal diminutive *-*ka*- > East Iranian/Middle Iranian nominalizer/nominal stem formant -*(V)k*

(19) Young Avestan (Old East Iranian) substantives in -*ka*- from animate concrete substantives (m./f.)

Derivative	Meaning	Base	Meaning
*kaini-**kā***- f.	'girl'	*kainiiā*-, *kainī*- f.	'young girl'
*jahi-**kā***- f.	'bad woman'	*jahī*- f.	'bad woman'
*maṣiiā-**ka***- m.	'human'	*maṣiia*- m.	'mortal; human'
*zəma-**ka***- m.	'winter storm'	*ziiam*- m.	'winter'

(20) Examples "pleonastic" -*ka*- in Middle East Iranian

a. Sogdian:
pāδ 'foot' & *pāδ-**ē*** 'foot' < **pāda-**ka***-

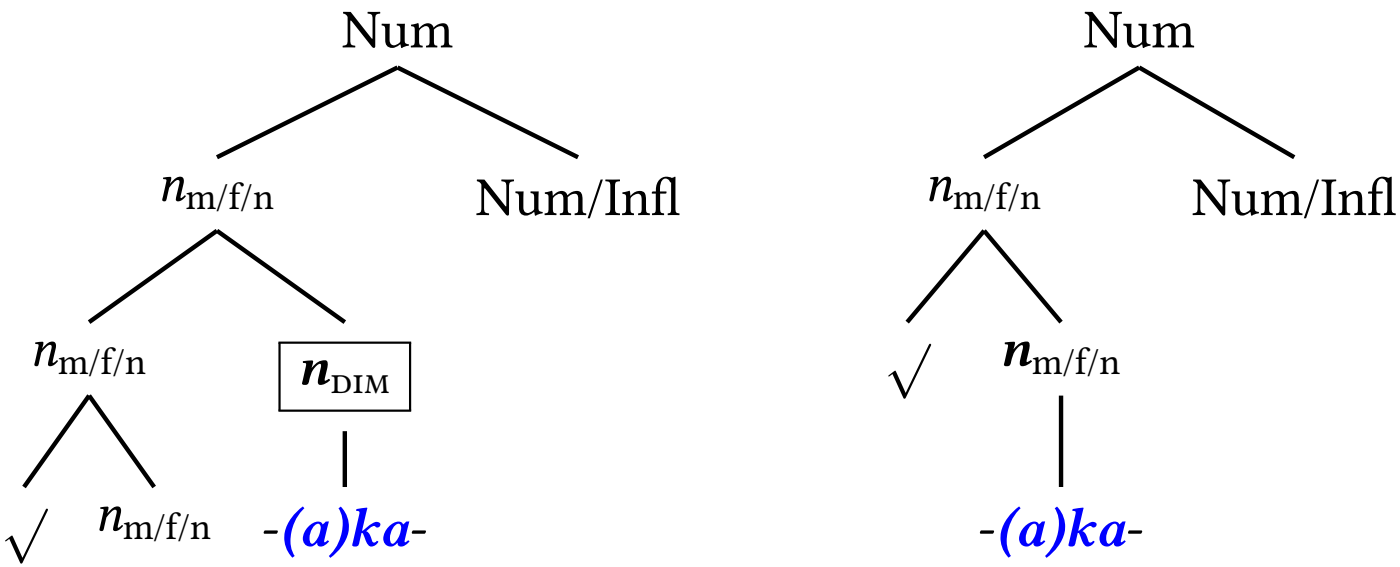
b. Bactrian:
αγγαρ**γο** 'possessions' < **ham-kāra-**ka***-
βαρ**γο** 'riding animal' < **bāra-**ka***-

$n < n$

Analysis: Modifier of/adjunct to functional head → functional head (Grestenberger 2023b)

- (DIM)-affixes as heads vs. modifiers: Wiltschko & Steriopolo 2007; Fábregas 2013; Gouskova & Bobaljik 2022

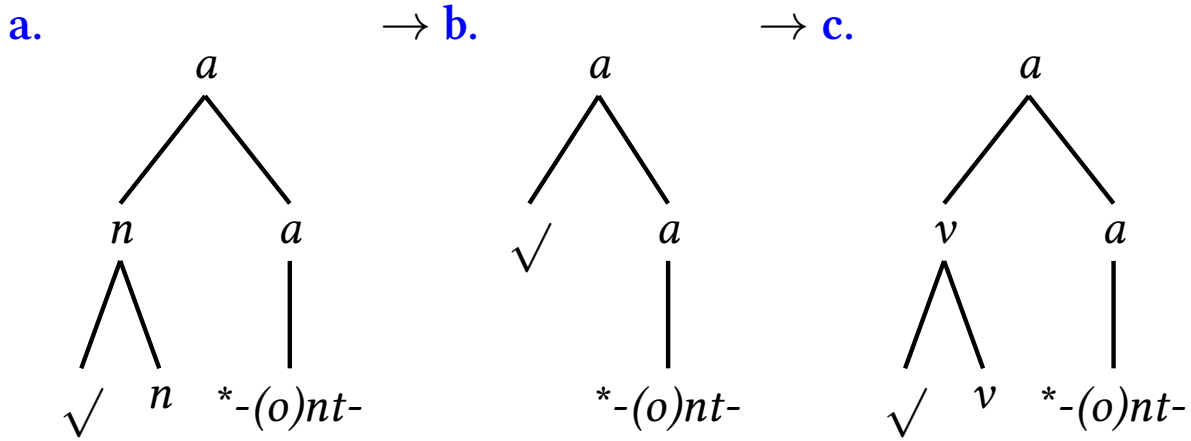
(21) a. → b.



$a < a$

- (Relational/"secondary") adjectival morphology is a common diachronic source of participial morphology (Haspelmath 1994)
- E.g., PIE *-*(o)nt*- (denominal possessive adj.) → (late) IE active participle suffix (Lowe 2014, 2015; Grestenberger 2020), via intermediate stage in which it was ambiguous between root- and (nominal) stem-derived adjective ("verbal adjective").

(22) Reanalysis of *-*(o)nt*-



Discussion

Diachronic generalizations:

- The source usually "conflates with" (Hale & Keyser 2002, 2005) the target category both phonologically and semantically
  - Though both phonological and semantic content can also be lost (sound change/semantic bleaching) — **zero categorizers**
- The target category usually reflects the morphosemantic properties of the source category (at least at the initial stage) → **reanalysis is local & directional** (Early Semantic Stability Hypothesis, Bar-Asher Siegal 2024)
  - E.g., "agentive" -*eu*-verbs from animate nouns of profession/"agentive" nouns
- New categorizers are never "across the board" ("just *n*" or "just *v*"), but associated with particular types ("flavors") of *n*, *v*

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Next step: connect these generalizations to different **cognacy relationships** at the morpheme level, using DM-style Vocabulary Items.

A typology of morphosyntactic cognacy

The double cognacy condition

One reason why it is difficult to establish cognacy in morphosyntax is that the Double Cognacy Condition does not hold.

(23) **Double Cognacy Condition** (Walkden 2014: 50)
In order to form a correspondence set, the contexts in which postulated cognate sounds occur must themselves be cognate

= the lexical items in which the sounds occur must themselves be cognate in order to establish sound correspondences.

(24) English word-initial /t/ = High German word-initial /t^{s}/ ⟨z⟩/

a. Engl. ***t**en* : Gm. ***z**ehn*
b. Engl. ***t**ooth* : Gm. ***Z**ahn*
c. Engl. ***t**ell* : Gm. ***z**ählen*

There is no consensus as to what the morphosyntactic equivalent of "word-initial" etc. is.

Background: The lexicon in DM

- In DM, word-fomation is "syntactico-centric": terminal nodes are linearized (concatenated) post-syntactically and morphophonologically realized through **Vocabulary Insertion**.
- Vocabulary Insertion matches exponents to terminal nodes in accordance with the Subset Principle and contextual locality conditions → **Vocabulary Items**

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(25) Vocabulary Items for T[+past] in English (Embick 2015: 169)

a. T[+past] ↔ *-t* / $\{\sqrt{\text{BEND}}, \sqrt{\text{LEAVE}},\ldots\}^\frown\_$
b. T[+past] ↔ *-Ø* / $\{\sqrt{\text{HIT}}, \sqrt{\text{QUIT}},\ldots\}^\frown\_$
c. T[+past] ↔ *-ed*

(26) **M(eaning) ↔ F(orm) / C(ontext)**

- All three variables (M, F, C) can change over time
- (26) holds for "inflectional" and "derivational" material alike.

A typology of morphosyntactic cognacy

Grestenberger & Fellner 2025 (cf. Meelen et al. 2022 for phono-lexical cognacy):

- **Strong morphosyntactic cognacy** (symbol: =): F, M, and C correspond
- **Moderate morphosyntactic cognacy** (symbol: $\widehat{=}$)
  - **Moderate form-meaning cognates**: F and M correspond, C differs
  - **Moderate form-context cognates**: F and C correspond, M differs
  - **Moderate meaning-context cognates**: M and C corresponds, F differs (not by regular sound change)
- **Medium morphosyntactic cognacy** (symbol: $\approx$)
  - **Medium meaning cognates**: M corresponds, but F and C have changed (F not by regular sound change)
  - **Medium context cognates**: C corresponds, but F and M have changed (F not by regular sound change)
- **Weak morphosyntactic cognacy** (symbol: $\sim$)
  - **Weak formal cognates**: F corresponds, but M and C have changed.
  - **Weak non-formal cognates**: F has undergone some non-regular (analogical, etc.) changes, M and C have also changed
- **Feeble morphosyntactic cognacy** (symbol: $\cong$): no correspondence of F, but M and C correspond.

A typology of morphosyntactic cognacy

Example: **Strong morphosyntactic cognacy** (symbol: =, equal): phonological form (*modulo* regular sound change), meaning and context correspond exactly.

- Equivalent to an exact **word equation**:
  - Hittite 3sg.pres.act *kuen-zi* 'slays'
  - Vedic 3sg.pres.act. *hán-ti* 'slays'
  - < PIE *g^{wh}*én-ti*
- PIE 3sg.act. 'primary' (non-past) ending **-ti*

(27) Strong cognates of PIE 3sg. **-ti*

Hitt.	Agr[3,−PL]	↔	*-zi*	/	T[−PST]⁀_	=
Ved.	Agr[3,−PL]	↔	*-ti*	/	T[−PST]⁀_	=
PIE	Agr[3,−PL]	↔	*-ti*	/	T[−PST]⁀_	

A typology of morphosyntactic cognacy

Example: **Moderate form-meaning cognates**

(28) Singular active forms of the *s*-aorist/preterit in Greek, Latin, Vedic, Tocharian, and Hittite

	Gk.	Lat.	Ved.	Toch. B	Hitt.
1	*(é-)deik-**s**-a*	*vēx-ī* /-k-**s**-/	*á-vāk-ṣ-am* /-k-**s**-/	*prek-wa*	*dā-ḫḫun*
2	*(é-)deik-**s**-as*	*vēx-istī* /-k-**s**-/	*á-vāṭ* /-k-**s**-/	*prek-asta*	*dā-tta*
3	*(é-)deik-**s**-e*	*vēx-it* /-k-**s**-/	*á-vāṭ* /-k-**s**-/	*prek-**sa***	*dā-**š***

- Marker *-s-* throughout the paradigm in Indo-Iranian, Greek and Latin, but only in the 3sg.act. in Tocharian and Hittite
- Form & meaning correspond, context has changed.

(29) *s*-aorist

a. v/Asp[+PFV] $\leftrightarrow$ *-s-* /_$\frown$T/Agr[3,−PL] $\widehat{=}$ (PIE; Hitt.; Toch.)

b. v/Asp[+PFV] $\leftrightarrow$ *-s-* (Greek, Indo-Iranian, Latin)

A typology of morphosyntactic cognacy

Example: **Moderate form-context cognates**

- Greek inherited both the original PIE athematic dative singular ending *-*ei̯* (Myc. <-e>) and the original athematic locative singular ending *-*i* (Myc. <-i>)
- Towards the end of the 2nd millenium BCE, the distinction between the inherited dative, instrumental, and locative cases collapsed and the original locative marker became a (syncretic) dative case marker

A typology of morphosyntactic cognacy

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(30) Dative & locative singular in Vedic and Greek

a. Vedic:
   (i) [+DAT,−PL] ↔ -*e* /ai/ (< *-*e̯i̯*)
   (ii) [+LOC,−PL] ↔ -*i* ≙
b. Greek: [+DAT,−PL] ↔ -*i*

Form (-*i*) and context (athematic/underspecified) correspond, but meaning differs (dat. vs. loc).

A typology of morphosyntactic cognacy

Example: **Moderate meaning-context cognates**

- The sigmatic aorist has developed several allomorphs in Old Indic, among which is the productive variant -*iṣ*-, which arose due to regular sound change among *s*–aorists to *seṭ*-roots, but was subsequently also formed to *aniṭ* roots (Narten 1964)
- The new form is due to a reanalysis of the context for insertion based on a resegmentation

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(31) -*iṣ*-aorist

a. v/Asp[+PFV] ↔ -*s*- $\widehat{=}$ (Greek, Avestan, Latin)

b. v/Asp[+PFV] ↔ -*iṣ*- (Vedic)

Meaning (aorist) and context (all person/number combinations) correspond, form differs due to analogy (NOT regular sound change).

A typology of morphosyntactic cognacy

Example: **Medium context cognacy**

- Unlike the Vedic athematic loc.sg., the Vedic locative *plural* only stands in a medium cognacy relationship to the *dative plural* in Greek because this ending has undergone an analogical change, (32), namely the adoption of the vowel of the locative singular (*-*su* $\rightarrow$ *-*si*).

A typology of morphosyntactic cognacy

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(32) Dative & locative plural in Vedic and Greek

a. Vedic

(i) [+DAT, +PL] ↔ -*bhyas*

(ii) [+LOC, +PL] ↔ -*su* ≈

b. Greek [+DAT, +PL] ↔ -*si*

Meaning has changed, form has undergone non-phonological change, context (athematic/underspecified) corresponds.

A typology of morphosyntactic cognacy

Example: **Weak formal cognacy**: Form corresponds exactly, meaning and context differ.

(33) Partial paradigm of Vedic *vṛkī-* "she-wolf" (*vṛ́ka-* 'wolf') < *-*iH*-

	Sg	Pl
Nom	*vṛkī-s*	*vṛkᵢ́y-as*
Acc	*vṛkᵢ́y-am*	*vṛkᵢ́y-as*
Instr	*vṛkᵢ́y-ā*	*vṛkī-bhis*
Dat	*vṛkᵢ́y-e*	*vṛkī-bhyas*
Gen	*vṛkᵢ́y-as*	*vṛkī-nām*

(34) Italo-Celtic genitive singular *-ī*:

a. Lat. *virus* : *virī*
b. OIr. *fer* : *fir*^{L}

(35) Weak formal cognacy of the *-ī-morpheme

a. [+FEM] ↔ -ī- / $n^{TV}\frown n_{[\_]}$ ∼ (Vedic)
b. [+GEN,−PL] ↔ -ī / $n^{TV}\frown \text{Infl}_{[\_]}$ (Latin)

Summary: Typology of morphosyntactic cognacy

	F	M	C	Ex.
strong	✔	✔	✔	Hitt. *-zi* = Ved. *-ti* = Gk. *-si/ti*, etc.
moderate (f-m)	✔	✔	✗	Toch., Hitt. 3sg.pret. *-s* $\widehat{=}$ inner IE *s*-aor.
moderate (f-c)	✔	✗	✔	Ved. loc.sg. *-i* $\widehat{=}$ Gk. dat.sg. *-i*
moderate (m-c)	•	✔	✔	Ved. aor. *-iṣ* $\widehat{=}$ inner IE aor. *-s-*
medium (m)	•	✔	✗	Ved. 3sg.mid. *-e* $\approx$ Gk. 3sg.mid. *-toi*, *-tai*
medium (c)	•	✗	✔	Ved. loc.pl. *-su* $\approx$ Gk. dat.sg. *si*
weak (f)	✔	✗	✗	Lat. gen.sg. *-ī* $\sim$ Skt. *vṛkī*-infl.
weak (f')	•	✗	✗	Ved. instr.sg. *-ā* $\sim$ Gk. pass. aor. *-thē-*
feeble (m-c)	✗	✔	✔	IE mid. endings $\cong$ Old Nordic mid. *-sk*

Case study: The IE participial system

Reconstruction of participial morphemes in IE

(36) Participial morphemes reconstructable for the "inner" IE languages

Morpheme	Voice orientation	Morphophonology	Morphosyntax
-(o)nt*-	active	ablauting	like finite forms
*-*mh$_1$no*-	middle	non-ablauting	like finite forms
*-*u̯os*-/-*us*-	perfect active	ablauting	like finite forms
*-*tó*-	theme-oriented	non-ablauting	resultative verbal adj.

Reconstruction of participial morphemes in IE

(37) Continuation of participial morphemes

	*-(o)nt-	*-mh_1no-	*-u̯os-/-us-	*-tó-
Hittite	✔	✗	✗	✗
Vedic	✔	✔	✔	✔
Avestan	✔	✔	✔	✔
Greek	✔	✔	✔	✔
Baltic	✔	✔	✔	✔
Slavic	✔	✔	✔	✔
Tocharian	✔	✔	✔	✗
Italic	✔	remnants	✗	✔
Celtic	remnants	remnants	✗	✔
Germanic	✔	✗	remnants	✔
Armenian	remnants	remnants	✗	remnants
Albanian	✗	?	✗	✔

Reflexes of *-(o)nt-

(38) Post-Anatolian IE: ***active*** (*)*nt*-participles

	transitive	intransitive
Ved.	*bhárant-* 'carrying', *ghnánt-* 'striking'	*róhant-* 'growing', *yánt-* 'going'
Av.	*xšāiiaṇt-* 'ruling', *ɣnaṇt-* 'striking'	*snaēžiṅt* 'snowing', *(a)iiaṇt-* 'going'
Gk.	*phérōn* 'carrying', *doús* 'giving'	*rhéōn* 'flowing', *iṓn* 'going'
Lat.	*ferēns* 'bringing', *amāns* 'loving'	*nivēns* 'snowing', *iēns* 'going'
Toch. B	*preñca* 'bringing', *täṅwaññeñca* 'loving'	*mäskeñca* 'being', *yneñca* 'going'

Reflexes of *-(o)nt-

Anatolian: “patient-oriented”/“passive” participles, e.g.:

(39) Hitt. *ant*-participles:

a. **stative-intransitive verb : stative-intransitive participle**
   (i) *ai-*^{ari} ‘to be hot’ : *ānt-* ‘(being) hot’
   (ii) *ar-*$^{tta(ri)}$ ‘to stand’ : *arant-* ‘standing’

b. **telic change-of-state/motion verb : resultative participle**
   (i) *āk-*^{i}*/akk-* ‘to die’ : *akkant-* ‘(being) deceased, dead’
   (ii) *ār-*^{i}*/ar-* ‘to come, arrive at’ : *arānt-* ‘(having) arrived’

c. **transitive verb : resultative/“passive” participle**
   (i) *ēp-*^{zi}*/app-* ‘to take, seize’ : *appānt-* ‘taken, seized’
   (ii) *kuen-*^{zi}*/kun-* ‘to kill, slay’ : *kunant-* ‘killed, slain’

Reflexes of *-mh_1no-

Essentially only in Indo-Iranian, Greek, Tocharian, Balto-Slavic.

- Not in Anatolian
- Remnants in Italo-Celtic, Armenian, (maybe) Albanian

(40) Post-Anatolian middle *-mh_1no-participles

Ved.	*bháramāṇa-* 'taking for oneself', *smáyamāna-* 'smiling'
Av.	*barəmna-* 'taking for oneself'
Gk.	*pherómenos* 'taking, winning', *agómenos* 'being led; leading'
Toch. B	*premane* 'taking for oneself', *akemane* 'being led', *smimane* 'smiling'
OCS	*nesomŭ* '(what is) carried', *znajemŭ* '(what is) known'

→ tends to develop into a purely passive (rather than middle) participle.

Reconstruction of *-(o)nt- & *-mh_1no-: Function

- Participial morphology marks a type of ***state*** (resultative, etc.), hence aspect (**Asp**)
  - Grestenberger 2018, 2020; Fellner & Grestenberger 2018; Grestenberger & Fellner 2025; following, e.g., Embick 2000; Alexiadou & Anagnostopoulou 2008; Alexiadou et al. 2015; Anagnostopoulou & Samioti 2014.
- *-mh_1no- was specified for the context "middle Voice", (42a)
- Conflicting evidence for *-*nt*- (passive/object-oriented vs. active/subject-oriented) → originally a **root-derived verbal adjective**:

(41) Asp ↔ *-(o)nt- / $\sqrt{}\frown$ _

From (41), the different functions of *-*nt*- in inner IE, (42b), vs. Anatolian, (42c), developed.

(42) Vocabulary Items for *-(o)nt- & *-mh_1no-

a. Asp ↔ *-mh_1no- / Voice$_{[-D]}\frown$ _ (IIr., Gk., Toch.)
b. Asp ↔ (*)-(o)nt- $\widehat{=}$ (mod. f-m; IIr., Gk., Toch. ...)
c. Asp ↔ -(a)nt-/ $v\frown$ _ (Anatolian)

Reflexes of *-u̯os-/-us-

- Restricted to the *perfect* stem (in Toch.: preterit stem), unlike *-*o*)*nt*- and *-*mh*$_1$*no*-
- Indo-Iranian, Greek, Tocharian, B.-Sl.
  - Not in Anatolian
  - Possible remnants in other branches? (Malzahn 2014: no)
- Perfect *active* in Indo-Iranian and Greek, but seems to be unspecified for Voice in Tocharian: both active and passive use possible, (43).

(43) a. *añcalī ṣarne* ***yāmu*** *araṇemi* *weṣṣäṃ*
añcali hand.ACC.DU made.NOM.SG.M Araṇemi.NOM.SG speak.PRS.3SG
"**Having made** both hands (into) 'añjali' (the 'añjali' gesture), Araṇemi speaks." (TB CEToM THT 92 a5)

b. … *śaiṣṣe* *kärsaucaisa* *apākärtse* ***yāmusa***
world.ACC.SG knowing.PERL.SG visible made.NOM.SG.F
"(This path as the best one …) (which **was**) **made visible** by the one who knows the world." (TB CETom THT 30 a4)

Reflexes of *-u̯os-/-us-

- Some evidence that suggests that *u̯os-/-us-* was originally root-derived and (even earlier) formed to unreduplicated (= non-perfect) *u(s)*-adjectives (Rau 1998, 2017; Malzahn 2014)
- which would also explain the compatibility with both active and passive syntactic contexts in Tocharian (cf. *-*(o)nt-* in Anatolian vs. post-Anatolian IE)

(44) Vocabulary items for *-u̯os-/-us-

a. $\text{Asp}_{([\text{PF}])} \leftrightarrow$ *-u̯os-* / $\{v, \sqrt{}\}\frown\_\,\widehat{=}$ ((late) PIE)

b. $\text{Asp}_{[\text{PF}]} \leftrightarrow \{(^*)$*-u̯ot-*, *-u̯os-*, *-us-* $\}$ / $\{v, \text{Voice}_{[+\text{D}]}\}\frown\_$ (IIr., Gk.)

c. $\text{Asp}_{[\text{PFV}]} \leftrightarrow$ *-u-* / $\text{Voice}\frown\_$ (Toch.)

Reflexes of *-*tó*-

- All branches except for Anatolian and Tocharian have evidence for root-derived *-*tó*- ("verbal adjective")
- E.g., Ved. *kṛ-tá-* 'done', *ga-tá-* 'gone'; Gk. *do-tós* 'given', *sta-tós* 'standing'; Lat. *dic-tus* 'said', *fac-tus* 'done', etc.
- In Latin (> Romance), Germanic, and Modern Greek these develop into verbal passive participles
  - They can be derived from verb stems rather than the bare root for some classes of verbs
  - They can be transitive in Latin (to deponent verbs) → underspecified for Voice, like Tocharian *-u*-participles.

(45) Vocabulary items for *-*tó*-

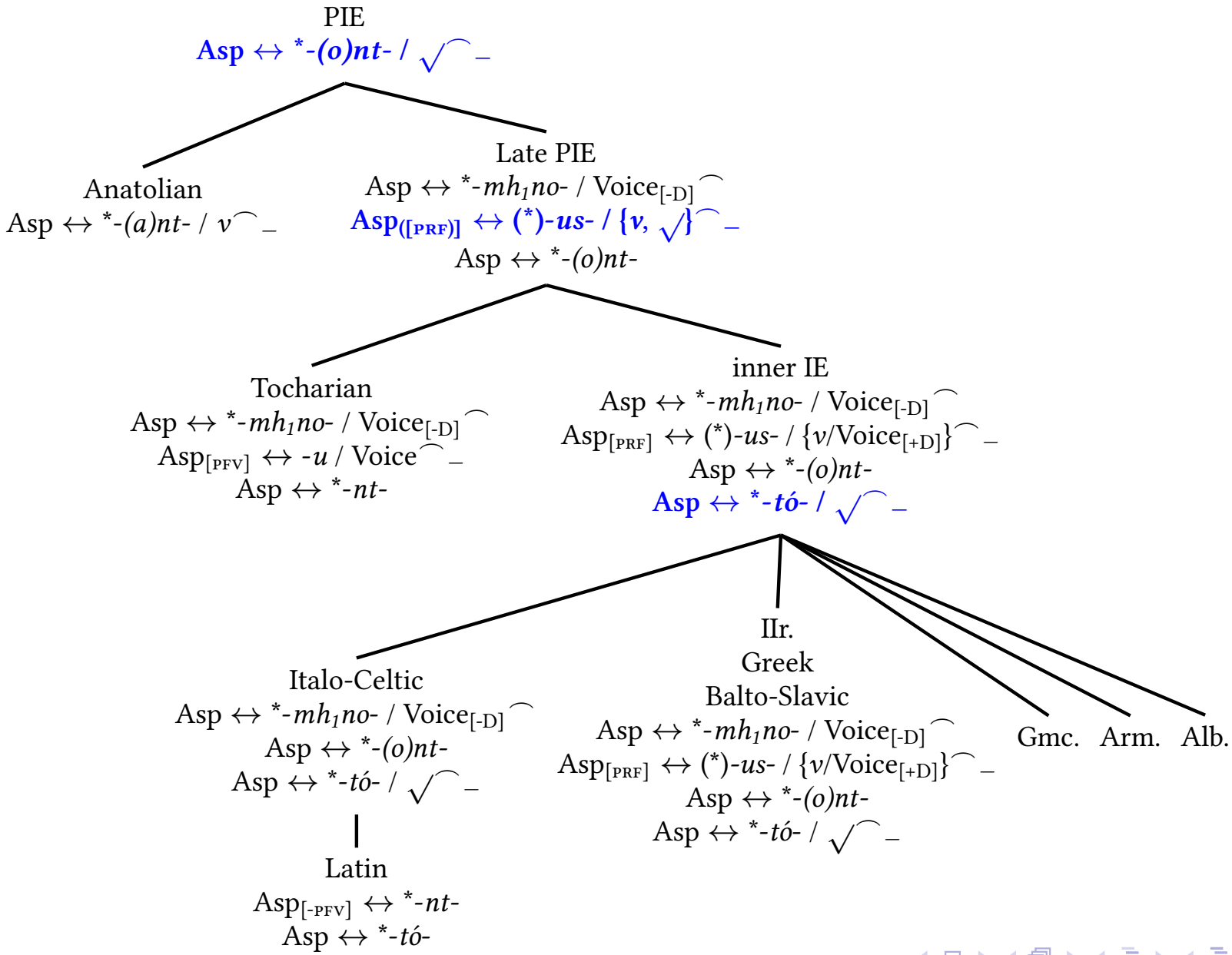
a. Asp ↔ (*)-*tó*- / $\sqrt{}\frown\_$ (PIE, Vedic, Avestan, AG)

b. $\text{Asp}_{[\text{RES}]}$ ↔ (*)-*tó*- / $v\frown\_\approx$ (Sanskrit caus., MG, ...)

c. $\text{Asp}_{[(\text{PF}(\text{V}))]}$ ↔ *-t(us)-*, *-tós* / Voice[–D] $\frown\_\approx$ (Romance, Gmc., MG ...)

d. Asp ↔ *-t(us)-* (Latin)

Relative chronology of participial morphemes in IE



Relative chronology of participial morphemes in IE

- The relative order of *-*(o)nt*-, *-*u̯os*-/-*us*-, and *-*tó*- is crucial.
- All three suffixes had similar functions at one point, namely the formation of (root- or *v*-derived) **resultant states**/verbal adjectives.
- Since they don't seem to have been root-specific (or otherwise contextual) allomorphs of one another (unlike, e.g., *-*tó*- and *-*nó*-), they must be in a relationship of relative chronology to one another *in this particular function*, (46).

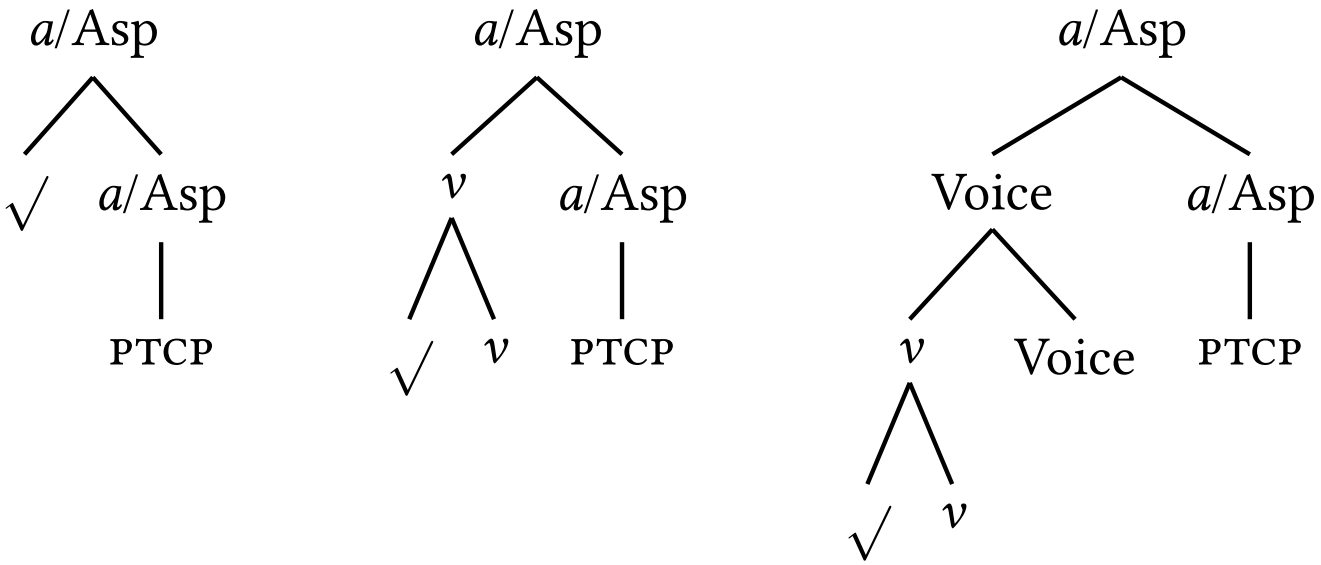
(46) $\text{Asp} \leftrightarrow \{ \text{*-}(o)nt\text{-} > \text{*-}us\text{-} > \text{*-}tó\text{-} \} / \sqrt{\frown}\_$

- each innovation (introduction of new morpheme with this function) corresponds to a node in the family tree

Participial morphology & reanalysis

(47) Development of participial morphemes in IE

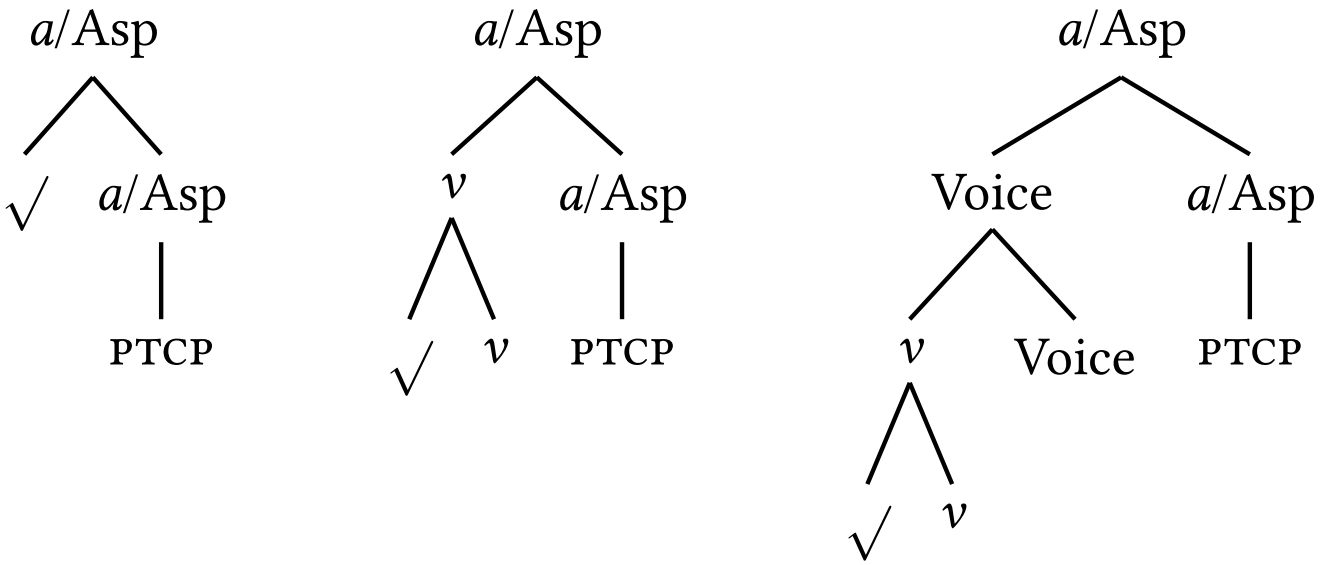
a. → **b.** → **c.**



Participial morphology & reanalysis

(47) Development of participial morphemes in IE

a. → **b.** → **c.**



- UR = change of the C(ontext) variable of the respective Vocabulary Items
- "flavors" of Asp (RES, PFV ...) = change of the M(eaning) variable

Summary

- Once we adopt a framework in which morphology mirrors syntax, directionality of morpheme reanalysis in complex word forms falls out from general assumptions about UG, L1 acquisition, and third factor principles
- Using DM to formalize and generalize across abstract morphosyntactic entities ("morphemes") makes it easier to compare their form and function across different branches & to gain insights into the relative sequencing of morphosyntactic change.
- We can leverage this to build a typology of categorizer change in complex word forms, which in turn can give us an idea of what kinds of formal features get reanalyzed and how that affects the compositional meaning of complex words — synchronically and diachronically
- From a theoretical point of view, this could also help us understand which "syn-sem" features are universally available

Conclusion

- If we adapt the Neogrammarian hypothesis to morphological change, we can use these generalizations to predict possible and impossible types of categorizer change, which in turn allows us to systematically integrate morphosyntactic information into comparative reconstruction
- This approach thus makes it possible to extend the "traditional" comparative method to morphosyntax and has the potential to contribute to establishing phylogenetic subgrouping by shedding light on non-trivial morphosyntactic innovations.
- To test the usefulness of this approach for establishing phylogenetic relationships, many more in-depth studies need to be added to generate and compare more morphosyntactic subbranching trees like the one for participial morphemes — eventually extending it to non-IE languages with a similar morphological profile (in terms of word formation)

Thank you!

ÖAW AUSTRIAN ACADEMY OF SCIENCES

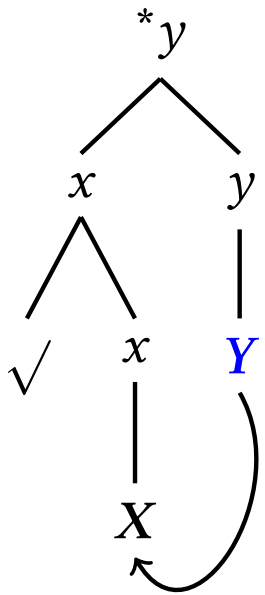
FWF Der Wissenschaftsfonds.

FWF V850-G “The diachrony of verbal categories and categorizers”
(`https://lauragrestenberger.com/categorizers-in-diachrony`)

Appendix: Counterdirectionality

- Q: Are there counterexamples to the (uni)directionality of reanalysis hypothesis? Is the typology in principle falsifiable?
- A: (48) is excluded and so far I haven't found any examples of it — if you can think of one, let me know!
  - One possible case is discussed by Dali & Mathieu (2021), but there may be an alternative explanation.

(48) An example of counterdirectionality (excluded)



Appendix: Zero categorizers

- in DM, categorizers can be covert/"zero" (Ø)
  - conceptual & empirical arguments in favor of zero categorizers: E.g., Pesetsky 1995; Dahl & Fábregas 2018; Calabrese 2019; Iordăchioaia 2020; Iordăchioaia & Melloni 2023b; Grestenberger & Kastner 2022
  - Criticism: Borer 2013, 2014; cf. also the surveys in Dahl & Fábregas 2018; Iordăchioaia & Melloni 2023a)

> *"Making zero morphemes unavailable within a theory is remarkably difficult: if a theory adopts some form of the arbitrariness of the sign, it is conceivable that a morpheme has content but a null phonological representation."* (Dahl & Fábregas 2018: 23)

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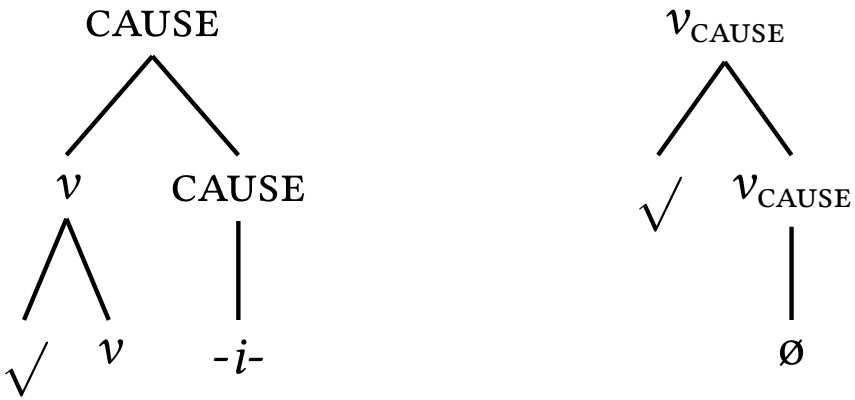
Importantly, there is an obvious diachronic pathway to zero affixation: **loss of overt category-defining morphology** via sound change

- E.g., rise of the $n \leftrightarrow v$ conversion pattern(s) in English; labile verbs of the causative alternation through loss of causativizing morpheme, etc.

Appendix: Zero categorizers

(49) Diachronic pathway of labile verbs in English (van Gelderen 2018; cf. Grestenberger & Kastner 2022: 49)

a. → **b.**



(50) Old English causative alternation verbs

anticausative		causative	
sittan	'sit'	*settan*	'set'
liċġan	'lie'	*leċġan*	'lay'
meltan	'melt, burn up'	*mieltan*	'melt/purge'
nesan	'escape from/be saved'	*nerian*	'save/protect'

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