A COGNITIVE APPROACH TO SUFFIX ORDERING: TWO-SUFFIX CONSTRUCTIONS IN ENGLISH AND SLAVIC

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Acknowledgements

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  The support is gratefully acknowledged.

Structure of the talk

- What is affix ordering?
- Preliminaries
  - Goals
  - Data
  - Affixes and meaning
- Approaches to affix order
- Analysis
- Additional evidence for the results obtained
  - Linguistic
  - Psycholinguistic
  - From neuroscience
- Conclusions

What is affix ordering?

real →

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real → *real* + *-ize*

What is affix ordering?

real → *real* + *-ize* →

→ *real* + *-iz* + *-ation*

What is affix ordering?

real → *real* + *-ize* →

→ *real* + *-iz* + *-ation* →

→ *real* + *-iz* + *-ation* + *-al*

What is affix ordering?

real → *real* + *-ize* →

→ *real* + *-iz* + *-ation* →

→ *real* + *-iz* + *-ation* + *-al*

- An alternative ordering of the suffixes is not possible, i.e. **real-iz-al-ation*, **real-al-ation-ize*, etc. do not exist.

Goals

- to understand the mechanisms behind affix ordering
- to contribute to the typology of the phenomenon of affix order
- to contribute to the better understanding of the nature of morphological constructions

Languages investigated

- Slavic
  - Bulgarian
  - Russian
  - Polish

Languages investigated

- Slavic
  - Bulgarian
  - Russian
  - Polish
- Germanic
  - English

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- Slavic
  - Bulgarian
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- Romance
  - Italian

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Sources of data: existing studies, grammars, dictionaries, corpora, native speaker intuition, Internet

Data

- Usage-based approach, i.e. data are particularly important
- Large sets of derivational suffixes and their combinations in Bulgarian, Russian and Polish (120 derivational suffixes from each language)
- Reanalysis of the combinability of 43 English suffixes according to our approach
- We have also analyzed the combinability of 36 Italian derivational suffixes (collaboration with L. Talamo)

Usually a study on affix ordering analyses about 30 suffixes.

Affixes and meaning 1

- The traditional view

Morphemes are the smallest pieces of linguistic structure that relate form and meaning (or grammatical function). (Affixes are morphemes.)

- Split morphology (Beard 1987, 1995), Realizational morphology (Anderson 1992; Aronoff 1994, Stump 2001) & Construction morphology (Booij 2010)

Affixes are units of structure without semantics, i.e. they receive semantic interpretation in words / constructions.

Affixes and meaning 2

- Distributed morphology (Halle and Marantz 1993): affixes receive semantic interpretation at an abstract level, i.e. both *-s* in *book**s*** and *-en* in ox*en* are the same suffix that marks 'plural', cf. ***feature geometry***.
- Some of the approaches to affix order are based on the traditional understanding of a morpheme, while others combine affixes without reference to semantics.

Approaches to affix order

- Overviews in Muysken (1986), Manova & Aronoff (2010), Rice (2011), Manova (submitted)

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- According to the type of information used in affix ordering Manova & Aronoff (2010) differentiate eight different approaches to affix order:
    1) phonological
    2) morphological
    3) syntactic
    4) semantic
    5) statistical
    6) psycholinguistic
    7) cognitive
    8) templatic

Phonological ordering

- Depends on phonological information.
- This type of affix ordering is rare.

Tiene (Hyman 2006)

- bases in a vowel

(a)

lE	‘eat’	lees-E	‘feed’

- bases in a coronal consonant (alveolar or palatal)

(b)

mat-a	‘go away’	maas-a	‘cause to go away’
kal-a	‘be’	kaas-a	‘cause to be, become’

- bases in a non-coronal consonant (labial or velar)

(c)

lab-a	‘walk’	lasab-a	‘cause to walk’
lók-a	‘vomit’	lósek-E	‘cause to vomit’

Syntactic ordering 1

- *The Mirror Principle*
  - "Morphological derivations must directly reflect syntactic derivation (and vice versa)." (Baker 1985:375)

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    - Koyukon (koy; Athabaskan; Jetté and Jones 2000)

object – aspect – (participant) subject

a) dee-**n**-'oyh

'you sg. will handle object'

b) **ne**-henee-¬-'aanh

'they are looking at you sg.'

Syntactic ordering 2

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    V+subject
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    V+object
- Some linguists (Rice 2000) assume that semantic derivation directly maps syntactic derivation since both syntax and semantics mean compositionality.

Semantic ordering

- Depends on semantic information
- Semantic scope

Yup'ik (Mithun 1999: 43)

yug-**pag-cuar**	yug-**cuar-pag**
person-**big-little**	person**-little-big**
'little giant'	'big midget'

- Affix ordering in well-described languages is rarely described in terms of semantic scope.

Morphological ordering

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Morphological ordering

- Depends on morphological information
  - Level ordering or stratal approach
  - Selectional restrictions
  - Monosuffix constraint

Level-ordering or stratal approach 1

- Lexical phonology

  Siegel (1974), Allen (1978), Selkirk (1982), Kiparsky (1982), Mohanan (1986), Giegerich (1999)

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Class I suffixes: *+ion, +ity, +y, +al, +ic, + ate, +ous, +ive*

Class II suffixes: *#ness, #less, #hood, #full, #ly, #y, #like*

Class I prefixes: *re+, con+, de+, sub+, pre+, in+, en+, be+*

Class II prefixes: *re#, sub#, un#, non#, de#, semi#, anti#*

From Spencer (1991: 79)

Level ordering or stratal approach 2

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- Class I affixes are less productive and less semantically transparent than class II affixes.
- Class I affixes do not occur outside class II affixes.

Selectional restrictions 1

- The fact that in English, of all possible combinations of suffixes allowed by level-ordering only a few exist, makes Fabb (1988) claim that it is not the relation of a suffix with a particular stratum but selectional restrictions of individual suffixes that are responsible for the combinatorial properties of suffixes.

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  - Group 2: suffixes that attach outside one other suffix
  - Group 3: suffixes that attach freely
  - Group 4: problematic suffixes

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Problem: Plag (1996, 1999) established numerous counterexamples to Fabb's model.

Selectional restrictions 2

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! Affix-driven versus base-driven morphology

- Fabb's approach is affix-driven, i.e. it is the affix that selects the base = affix-to-base direction of rules.
- Plag's analysis is base-driven, i.e. the base selects the suffix = base-to-affix direction rules.

Monosuffix constraint

- Affixes do not have semantics and affix combinations should be described as depending on non-semantic facts.
- Diachronic information such as Latinate versus Germanic bases (suffixes) determines suffix order.

According to the monosuffix constraint, in English "suffixes that select Germanic bases select unsuffixed bases" (Aronoff and Fuhrhop 2002: 473), i.e. the Germanic part of the English derivational morphology allows only one derivational suffix, therefore the label 'monosuffix constraint'

Problem: How do speakers know which suffix is Latinate and which Germanic?

Templatic ordering 1

- Some linguists consider this type of ordering morphological
- Arbitrary assignment of affixes to slots, position class morphology or slot and filler morphology
- "Morphological systems in which morphemes or morpheme classes are organized into a total linear ordering that has no apparent connection to syntactic, semantic, or even phonological organization." Inkelas (1993: 56)

- Simpson and Withgott (1986): the first outline of the properties of template morphology
- Templatic ordering is incompatible with the Mirror principle.

Templatic ordering 2

- Northern Iroquoian verb template

prepronominal prefixes + pronominal prefix + reflexive prefix + noun stem + verb root + derivational suffixes + aspect suffixes + final suffixes

(Mithun 1999: 42)

Psycholinguistic ordering

- Parsability hypothesis
- Complexity-based ordering

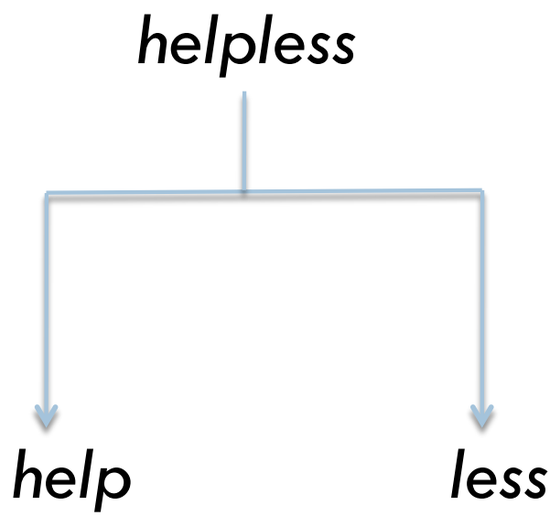
Parsability hypothesis 1

- Hay (2000, 2003 and later work)
- ***psycholinguistic*** by nature - acknowledges the crucial role of processing constraints in affix ordering
- a ***dual-route access*** model of morphological processing, i.e. we access derived words either as whole words or as decomposable units.
- ***relative frequency***

Dual-route access

- **whole word route**

decomposition route



Relative frequency

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- The **decomposition route** is likely if the relative frequency is low, e.g. as in *blue* vs. *blueness*.

Parsability hypothesis 2

- Parsability depends on different factors, such as productivity, semantic transparency and phonotactics across the morpheme boundary, and occurs by gradations, which allows affixes to be ordered hierarchically according to their ability to parse.

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- Affixes order in such a way that *more parsable affixes do not occur within less parsable affixes*, since the attachment of a less separable affix to a more separable one is difficult to process.

Parsability hypothesis 3

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Problem: Parsability cannot explain all combinations of English suffixes, selectional restrictions can override parsability. (Hay and Plag 2004)

Complexity-based ordering

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Problem: If a suffix never combines with all other suffixes in a language, why do we need to relate it to all suffixes in terms of a hierarchy?

Intermediate assessment

- Some of the approaches suggest a linguistic explanation of affix ordering and rely on information to which the speaker does not have access, since the speaker is not a linguist. For example, the prototypical speaker does not necessarily know what syntactic subject and syntactic object are but produces correct words, which implies that information such as syntactic subject and syntactic object is most probably not used in affix ordering. To illustrate, we can define -er in teach-er as corresponding to the subject of the verb to teach (syntactic approach) but also as deriving a noun or a person (cognitive approach).

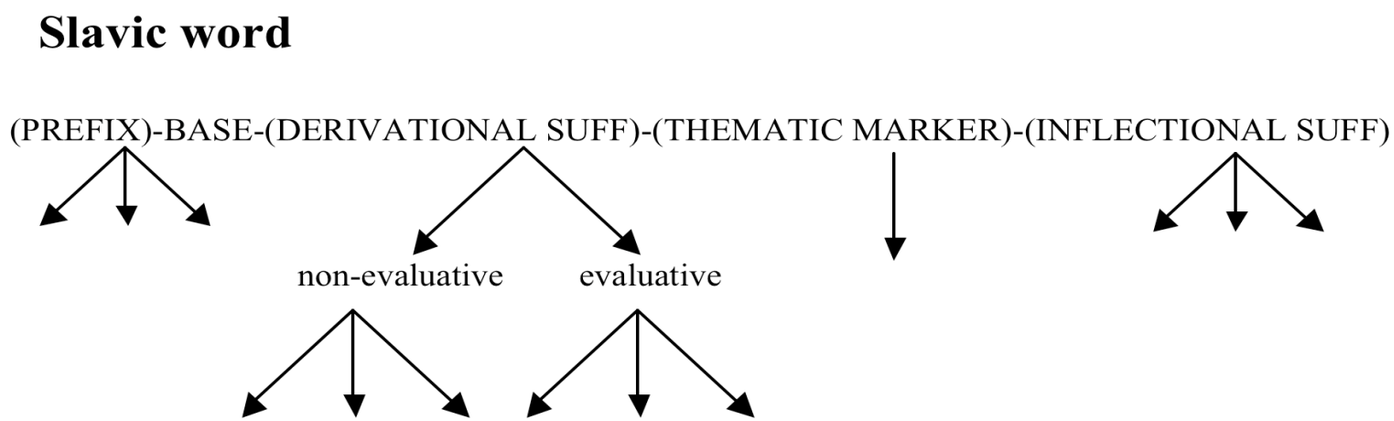
Cognitive ordering

- This type of affix ordering is based on general cognitive principles and do not require any specific knowledge.
- **Entrenchment:** a unit does not need to be assembled from its parts on each occasion of its use, nor the language users need to refer to its parts in order to understand it. (WF in Cognitive Grammar, Taylor 2002, recall the dual-route model)
- Two-suffix constructions are instances of entrenchment. (Construction Morphology belongs to the cognitive paradigm.)

Domain-specific affix ordering (Manova 2011c)

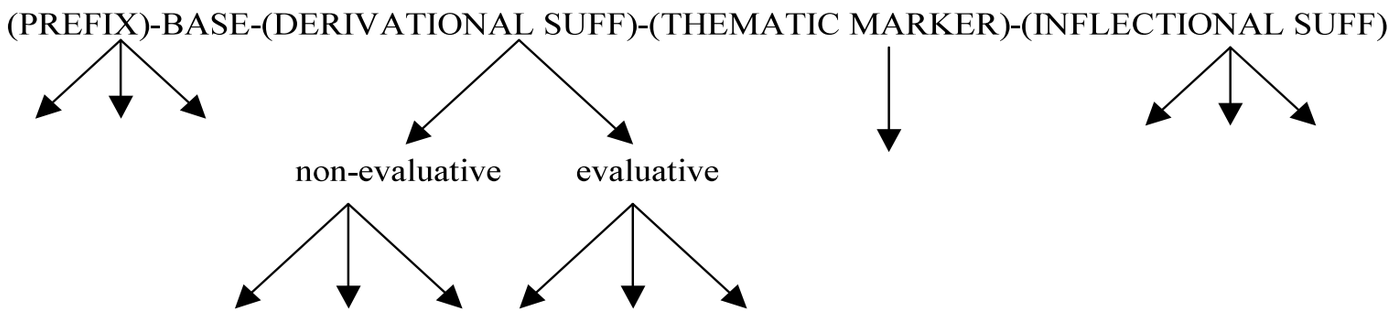
- The whole word is not derived on the same principle
- The word consists of domains
- Each domain has affix ordering principles of its own

Word-domains

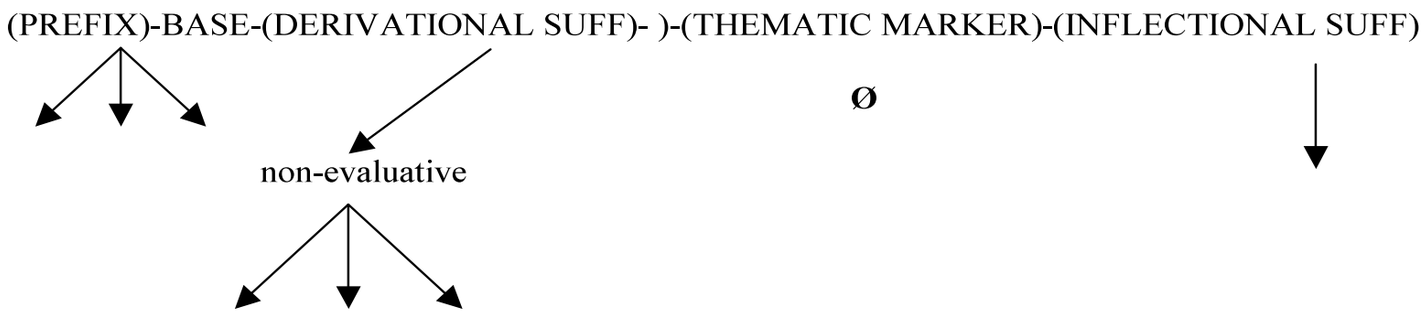


Slavic word versus English word: Towards a typology

Slavic word



English word



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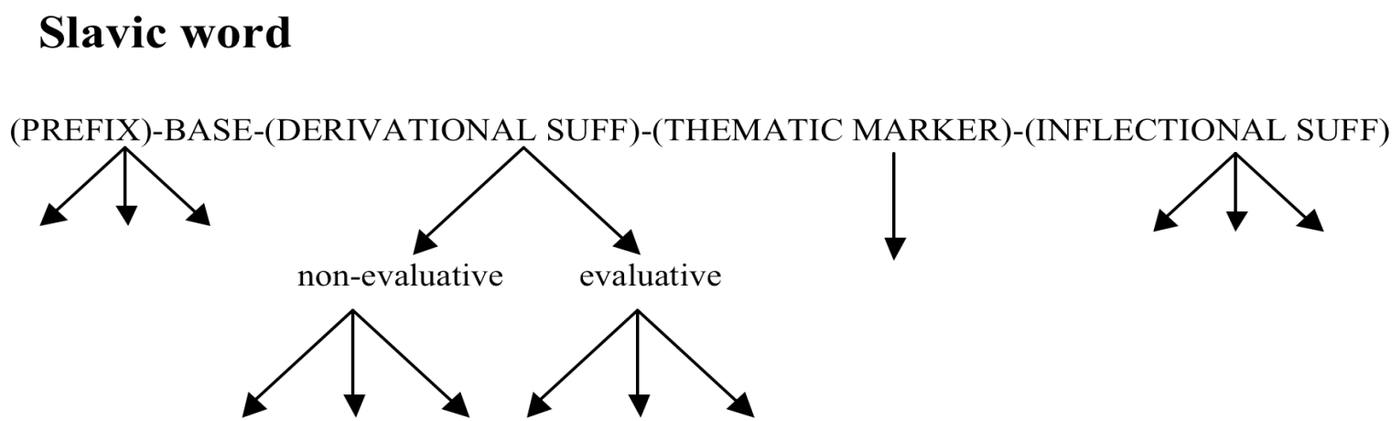

Motivation of a domain-specific account

- Different ordering principles in the different domains
- Each domain has closing suffixes of its own

Evaluative domain: Bulgarian diminutives

Nouns in	DIM1 suffixes	DIM2 suffixes	DIM3 suffixes
in *-C*	*-ec* (unproductive)		
	-le (unproductive) *-če*	*-ence*	*-ence*
	-čica (unproductive)		
in *-a*	*-ica*	*-ka*	
	-ka	*-ica*	*-ica*
	-ička (unproductive)		
in *-o*	*-ce*	*-ence*	*-ence*
in *-e*	*-ence* *-ice* (unproductive)		

Evaluative domain: Polish diminutives

	DIM1 suffixes	DIM2 suffixes	
Nouns in		Productive (attach by additon)	Unproductive (attach by substitution of a DIM1 suffix, i.e. do not combine with DIM1 suffixes)
-C	*-ek* *-ik / -yk* *-uszek* (unproductive)	*-ek*	*-uszek, -aszek*
	-iszek /-yszek (unproductive) *-aszek* (unproductive) *-ulek* (unproductive) *-ka* (unproductive, selects feminine nouns)		
-a	*-ka*	*-ka*	
	-uszka (unproductive) *-iczka /-yczka* (unproductive)		
-o / -e	*-ko*	*-ko*	
	-uszko (unproductive)		

Inflectional domain

BASE–GEND/NUM–DEF

krasiv-ø-ø ‘beautiful’ (masculine)

krasiv-ø-ijat ‘beautiful-DEF’

krasiv-a-ø ‘beautiful-FEM/SG’

krasiv-a-ta ‘beautiful-FEM/SG-DEF’

krasiv-o-ø ‘beautiful-NEUT/SG’

krasiv-o-to ‘beautiful-NEUT/SG-DEF’

krasiv-i-ø ‘beautiful-PL’

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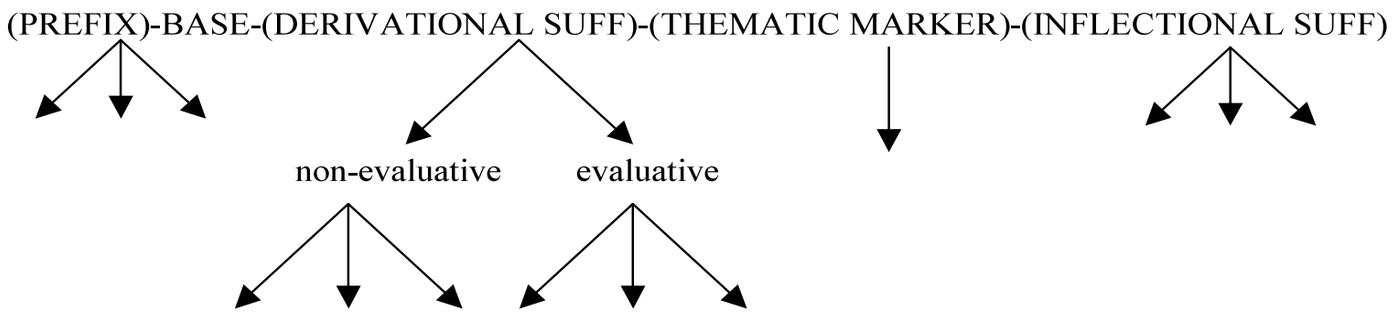
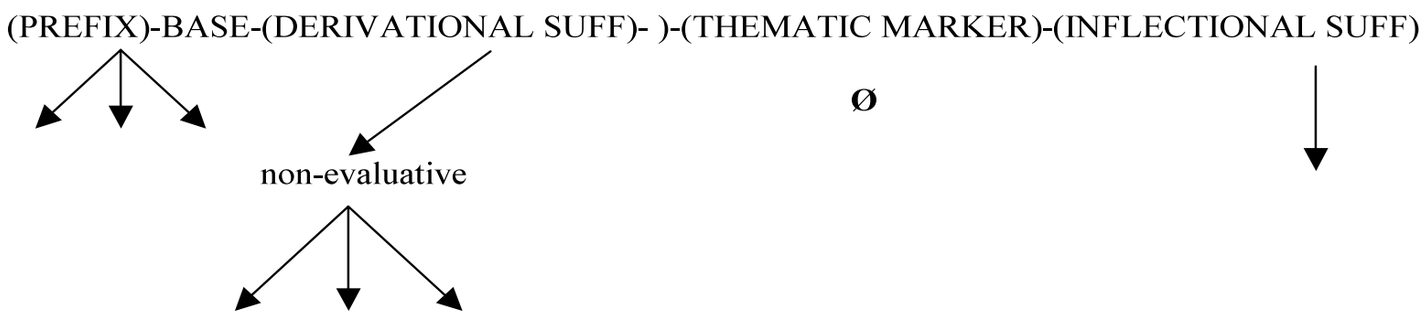


English word



Traditional analyses versus my approach 1

SUFF1 + all SUFF2 that follow it (a single rule is expected to account for all combinations)

Strategies borrowed from the literature:

- Analysis in terms of binary combinations of suffixes
- Suffixes are combined without relation to a lexical base

Traditional analyses versus my approach 2

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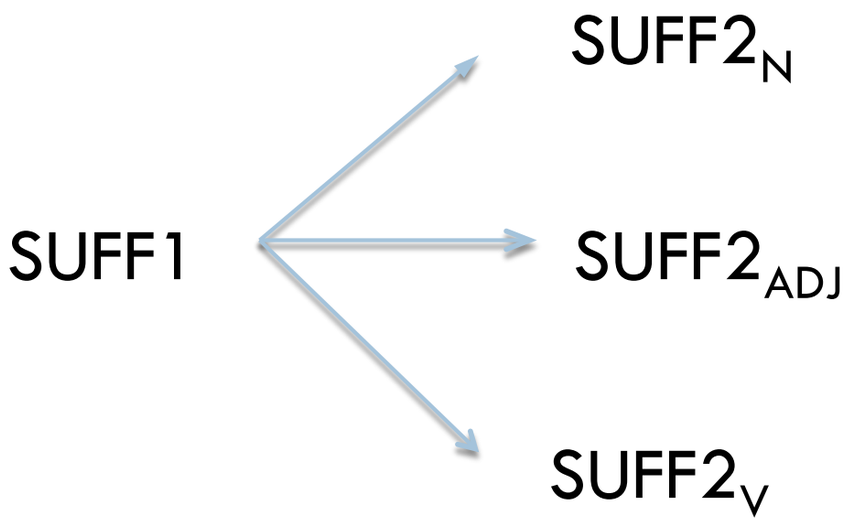
versus



Note on terminology

- Syntactic category
- Lexical category
- Word class
- Part of speech

Major categories

Noun – N

Adjective – ADJ

Verb - V

-ist: A traditional analysis

SUFF1	Word class of SUFF1	Followed by SUFF2
-ist	N	*-dom, -ic, -y, -ize*

Aronoff & Fuhrhop (2002), based on OED, CD 1994

-ist: A cognitive analysis

SUFF1	Syntactic category of SUFF1	SUFF2	SUFF2 suffixes with the same word-class in numbers
-ist	N	N: *-dom* (2) ADJ: ***-ic* (631)**, *-y* (5) V: *-ize* (3)	N: **1** ***ADJ: 2*** V: **1**

Aronoff & Fuhrhop (2002), based on OED, CD 1994

Looking up for data (English)

- The British National Corpus (BNC)

http://www.natcorp.ox.ac.uk/

- Corpus of Contemporary American English (COCA), http://corpus.byu.edu/coca/
- Oxford English Dictionary (OED)

http://www.oed.com/

- Specialized internet sites, e.g. OneLook, http://www.onelook.com
- Google

Parts of speech 1

- The lexical-category specification of a suffix can be N, V and ADJ, and it is seen as cognitively defined in terms of semantic concepts
- Langacker's (1987) - conceptual analysis of parts of speech
- Croft (2001) – universal-typological theory of parts of speech

Parts of speech 2

- Langacker (1987), based on ***relationality*** (i.e. +/- relational) and ***way of scanning*** (whether summarily scanned, i.e. conceived statistically and holistically, or sequentially scanned, i.e. mentally scanned through time), recognizes ***things*** (N), ***processes*** (V) and ***modifiers*** (ADJ).

Parts of speech 3

- Croft (2001) defines objects, properties and actions in terms of four semantic properties: ***relationality, stativity, transitoriness*** and ***gradability***. Thus prototypically, nouns name things or objects, verbs denote processes or actions, and adjectives are modifiers and express properties.

The role of semantics

- Semantic rules for selection of SUFF2 can be illustrated with the suffixes *-ful*$_{ADJ}$ and *-less*$_{ADJ.}$ If the suffix *-ful*$_{ADJ}$ attaches to a derived noun in English (e.g. *mean-ing*$_{N}$*-ful*$_{ADJ}$) usually also the suffix *-less*$_{ADJ}$ attaches to that noun (*mean-ing*$_{N}$*-less*$_{ADJ}$). Thus, we have two SUFF2$_{ADJ}$ that combine with the same SUFF1 (*-ing*$_{N}$). However, the two SUFF2 $_{ADJ}$ are semantically opposite and are thus semantically assigned, based on intensional semantics (i.e. what the speaker intends to say).

The role of semantics: Blocking

- We speak of blocking if the existence of one lexeme prevents the derivation of another lexeme with the same or similar semantics (Aronoff 1976, and many others).
- The existence of *glory* in English blocks the derivation of **glorious**ity* (Aronoff 1976: 44) and thus also the suffix combination *-ous* + *-ity* in this particular case.

Types of SUFF1-SUFF2 combination

- ***Fixed (unique)***
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- ***Predictable***
  - SUFF2 applies by default – the majority of words (types) are derived by this suffix
  - SUFF2 is semantically determined (based on intentional semantics)
- ***Unpredictable***
  - very few combinations are of this type

More data

No	SUFF1	Syntactic category of SUFF1	SUFF2 (default instances in bold type)	Number of SUFF2 suffixes with the same word-class
1.	*-(i)an*	ADJ	N: -ship (1), **-ism** (485), -ist (2), ness (1) V: -ize	***N: 4*** V: **1**
2.	*-able*	ADJ	N: -ity (810), -ness	N: 2
3.	*-acy*	N	V: substitutes -ate	
4.	*-age*	N	N: -er (1), -ist (1) ADJ: -ous (2)	***N: 2*** V: **1**
5.	*-an*	N	N: -ism (485), -ist (131), -ity (57) ADJ: -ic (201) V: -ize (218)	N: 3 ADJ: **1** V: **1**
6.	*-ance*	N	ADJ: -ful (1), -less (2)	***ADJ: 2***
7.	*-ant*	N	ADJ: -ed (1) V: -ize (24)	ADJ: **1** V: **1**
8.	*-ant*	ADJ	N: -ness V: -ize	N: **1** V: **1**
9.	*-ary*	ADJ	N: -ity (3), **-an**, -ness (1)	***N: 3***
10.	*-ate*	V	N: -ion (-ation, 5570), -or (1025); -ee (8); -er (3) ADJ: -ive (991), -ory (745)	N: 4 ADJ: 2
11.	*-ation*	N	ADJ: -al (257) V: -ize (6)	ADJ: **1** V: **1**
12.	*-dom*	N	ADJ: -ful (2); -less (3)	***ADJ: 2***
13.	*-ed*	ADJ	N: -hood (1), -ness ADJ: -ful (2)	*N:* ***2*** ADJ: **1**
14.	*-ee*	N	N: -dom (3), -ship (1), -ism (1)	***N: 3***
15.	*-en*	V	N: -er (32), -ment (5)	***N: 2***

Word-class change

ADJ *real* → V *real* + *-ize* →

→ N *real* + *-iz* + *-ation* →

→ ADJ *real* + *-iz* + *-ation* + *-al*

Word-class change

ADJ *real* → V *real* + *-ize* →

→ N *real* + *-iz* + *-ation* →

→ ADJ *real* + *-iz* + *-ation* + *-al*

ADJ → V → N → ADJ

Suffix combinations in English and Bulgarian

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- Similar results for Russian, Polish and Italian.

Manova (2011c)

Examples from Russian

No	SUFF1	Syntactic category and semantics of SUFF1	SUFF2	Examples	Translation
1.	**-an**	N person	N: -in (5)[1] N: -ín (3) N: -stvo (2) ADJ: -skij (3)	katorž-án-in gražd-an-ín **gražd-an-stvo** **gražd-an-skij**	convict citizen citizen's citizenship
2.	**-(V)tel'**	N person	ADJ: -skij N: -stvo N: -iščina (1)	**pisa-tel'-skij** **uči-tel'-stvo** ljubi-tel-'ščina	writer's being a teacher / teachers (collect.) dilettantism
3.	**-ar'**	N person	ADJ: -skij N: -stvo N: -nik N: -nja	**aptek-ar-skij** **aptek-ar-stvo** svin-ar-nik (=svinarnja) pek-ar-nja	chemist's being a chemist/ chemists (collect.) pigsty bakery
4.	**-(j)ak**	N person	ADJ: -eskij ADJ: -ovyj (1) N: -estvo N: -ina (1)	**zeml-jač-eskij** odinákovyj **zemljačestvo** duračina (=durak)	countryman's equal countrymen (collect.) fool

Examples from Russian

5.	**-ec**	N person	ADJ: -kij	strel-ec-kij	rifleman's Sagittarius
6.	**-(n)ik**	N person	N: -an (2) N: -aška (1) ADJ: -ov-skij (1) ADJ: -eskij N: -estvo	star-ik-an (=starik fam.) star-ik-aška (starik pej.) star-ik-ovskij **uč-enič-eskij** **uč-enič-estvo**	old man old man old man's pupil's being a pupil / pupils (collect.)
7.	**-ač**	N person	ADJ: -eskij N: -estvo	**trub-ač-eskij** **trub-ač-estvo**	trumpeter being a trumpeter / trumpeters (collect.)
8.	**-ščik** **-čik** **-ovščik** **-l'ščik**	N person	ADJ: -kij ADJ: -ovyj N: -estvo	**zagovor-ščic-kij (= zagovor-ščič-eskij)** zakaz-čik-ovyj **zagovor-ščič-estvo**	conspirator's charterer's conspiracy
9.	**-un**	N person	ADJ: -skij N: -ec N: - stvo	**opek-un-skij** brex-un-ec (= brex-un) **opek-un-stvo**	guardian's boaster being a guardian / guardianship

Examples from Italian

No	Suff 1	Suff 1 (Lexical and Sem class)	Suff 2 (according to lexical class)	In Numbers	Examples of Suff1-Suff2
1	-tore(pers)	N pers	N -ismo (1) A -ico (1), -ale (>10) V	N 1 *A 2* V 0	conservatorismo pittorico, dittatoriale
2	-iere(pers.)	N pers	N -ismo (8) A -istico (1) V	N 1 A 1 V 0	giustizierismo infermieristico
3	-izzare	V caus	N -mento (8), -zione (>1000), -tore (>150) A -bile (>100), -torio (8) V	*N 3* *A 2* V 0	volgarizzamento americanizzazione potabilizzatore utilizzabile, privatizzatorio
4	-mento	N abstr 'action noun'	N -ista (>10), -ismo (3), -ario(loc) (1) A -ale (>10), -oso (5) V	*N 3* *A 2* V 0	comportamentista, combattimentismo, armamentario fondamentale, filamentoso
5	-(z)ione	N abstr 'action noun'	N -ista (>10), -ismo (>10) A -ario(adj)(4), -ale (>10) V	*N 2* *A 2* V 0	nutrizionista, divisionismo, rivoluzionario, decisionale

Suffix particular semantics (Bulgarian)
(research in progress)

1) person – possessive/relational adjective

- *-tel-ski*

Examples: *pisa-tel-ski* 'writer's', *rodi-tel-ski* 'parent's'

- *-ar-ski*

Examples: *drug-ar-ski* 'friend's, *aptek-ar-ski* 'chemist's'

2) object – qualitative adjective

- *-tel-en*

Examples: *săedini-tel-en* 'connecting', *ukaza-tel-en* 'pointing'

Additional evidence for the results obtained

- Internal (linguistic) evidence
- Psycholinguistic evidence
- Evidence from neuroscience

Internal (linguistic) evidence

- Nouns, adjectives and verbs usually have different morphology, which means that speakers distinguish between them in some way, because in order to attach the right nominal / adjectival / verbal inflection to a word a speaker must identify the lexical category of that word. Verb inflection cannot be attached to nouns and adjectives, etc.
- N, ADJ, V also have different syntactic combinability.

Evidence from psycholinguistics

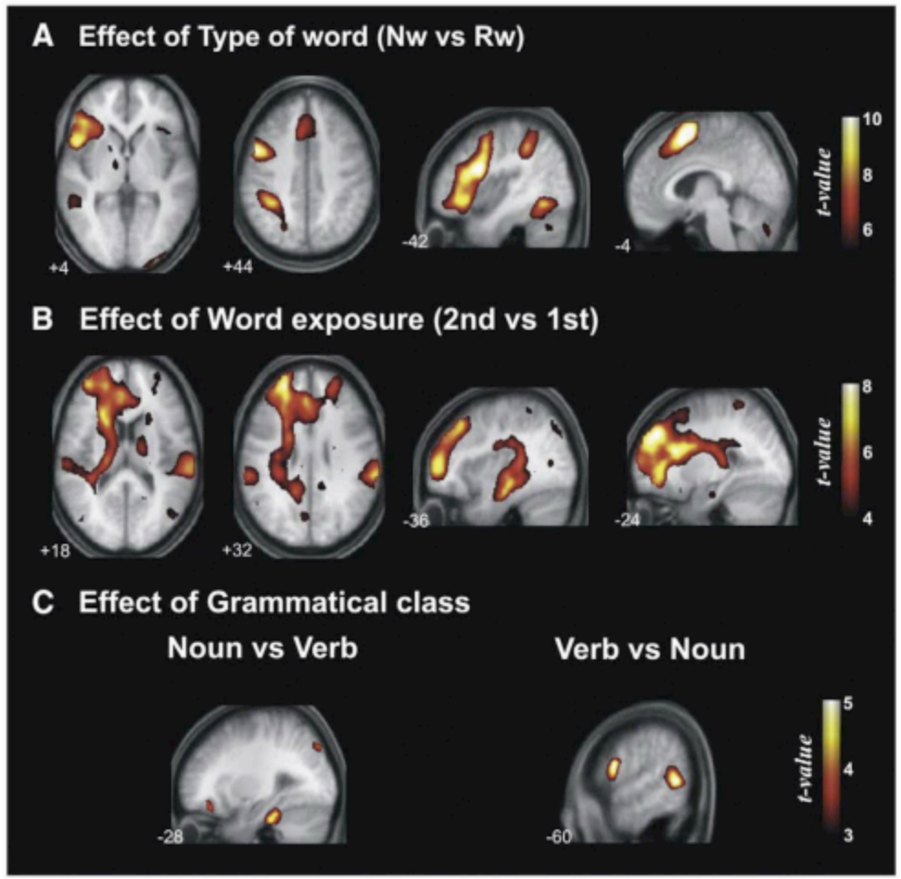
- Children acquire nouns and verbs differently: nouns are acquired faster.

- Research on child language done in Vienna (Dressler's lab), see their publications in the Walter de Gruyter series Studies on Language Acquisition (SOLA): Bittner, Dressler & Kilani-Schoch (2003) and Stephany, U. & M.D. Voeikova (2009).

Evidence from neuroscience

- Nouns and verbs activate different parts of the brain.
  - Mestres-Missé,Anna; Antoni Rodriguez-Fornells & Thomas F. Münte (2010)
  - Yang, Jing, Li Hai Tan b, Ping Li (2011) for Chinese-English bilinguals

Nouns and verbs in the brain



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- The regions in the brain responsible for face recognition differ from the regions responsible for recognition of objects, locations, etc.

(see Kandel et al. 2012 and reference therein)

Conclusions 1

- Suffixes are at least minimally specified in the lexicon in terms of lexical and semantic (cognitive) categories (Lieber 2005).
- The proper assessment of the combinability of a suffix requires not only information about the suffixes that can follow that suffix but also information about the number of types derived (suffixation by default).
- Most SUFF1-SUFF2 combinations are fixed and predictable, i.e. the speakers most probably use them as non-compositional pieces of structure (entrenchment, double-route access).

Conclusion 2

- SUFF1-SUFF2 combinations can be described without reference to a lexical base.
- SUFF1-SUFF2 combinations are purely morphological units of structure that are between morpheme and word, i.e. they cannot be derived syntactically and are instances of morphological constructions.
- Suffix ordering based on cognitive categories such as lexical-category specification and suffix semantics allows us to compare and see similarities between languages that belong to different families genealogically (Slavic, Germanic and Romance).

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