

# WORD-FORMATION AND COGNITION: THE ROLE OF SYNTAX AND SEMANTICS

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# Structure of the talk



- About my research: Affix ordering
- Preliminaries
  - ▣ Theoretical issues (terminology, cognitive grammar, etc.)
  - ▣ History of research
  - ▣ Current approaches
- Affix ordering in English and Slavic: A cognitive analysis
- Evidence supporting the analysis
  - ▣ Linguistic
  - ▣ Psycholinguistic
  - ▣ From neuroscience
- Conclusions & Relevance of the research to other fields

# Languages investigated



- Slavic
  - Bulgarian
  - Russian
  - Polish
- Germanic
  - English
- Romance
  - Italian

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

# Research topic



- We investigate word-formation in terms of affix ordering.
- We have analyzed large sets of suffixes (120 suffixes) and their combinations in Bulgarian, Russian and Polish and compared the results with research on affix ordering in English and Italian.
- There is much research on the topic for English and Italian and almost no research on Slavic languages.

# Word-formation



- In linguistics, word-formation is part of morphology and deals with how new words are formed, e.g.:

*uč-a, uč-i* '(I) teach' → *uč-i-tel* 'teacher'

# Morphemes

- Morphemes are the basic units in morphology.
- Morphemes are the smallest pieces of linguistic structure that relate form and meaning (or grammatical function).
- The word *na-pis-v-a-m* consists of five morphemes.

*-pis-* is a **root**.

*na-* is a **prefix** and *-v-*, *-a-* and *-m* are **suffixes**.

Prefixes and suffixes are also called **affixes**.

# Affixes and meaning



- Split morphology (Beard 1987, 1995; Anderson 1992)
- Construction morphology (Booij 2010)

Affixes do not have semantics, i.e. they are listed in the mental lexicon only as phonological forms and receive semantic interpretation in words / constructions.



# Levels of structure in linguistics



sounds (phonology), e.g. [ž], [e], [n], [a]

morphemes (morphology), *žen-a* 'woman'

words (morphology), *žena* 'woman'

phrases (syntax), e.g. *krasiva žena* 'a beautiful woman'

sentences (syntax), e.g. *Krasivata žena pristigna.* 'The beautiful woman arrive.'

# Affixation

- Affixation is the most frequent word-formation strategy in the languages of the world.
- Addition of form mirrors addition of meaning.

*real* → *real* + *-ize* →

→ *real* + *-iz* + *-ation* →

→ *real* + *-iz* + *-ation* + *-al*

# Affix ordering

*real* → *real* + *-ize* →

→ *real* + *-iz* + *-ation* →

→ *real* + *-iz* + *-ation* + *-al*

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

# The term 'cognitive' in linguistics



As regards the understanding of the term 'cognitive' in linguistics, there are two major research paradigms which follow contrary assumptions:

- Chomskyan Linguistics (generative grammar)
- Cognitive Linguistics (cognitive grammar)

Cognitive Linguistics has developed as a reaction against the Chomskyan Linguistics.

# Language Module?



## GENERATIVE GRAMMAR

- Language is a module of its own in the brain and follows its own logic.

## COGNITIVE GRAMMAR

- There is no language module and logic that is operative in other branches of science is also operative in language.

# Morphology



## GENERATIVE GRAMMAR

- There is no morphology, but only phonology and syntax
- Distributed morphology, i.e. it is distributed between phonology and syntax

## COGNITIVE GRAMMAR

- Recognizes the existence of morphological component

# Cognitive grammar (Taylor, in press)

- A language is a means for relating of sound and meaning, i.e. a language enables speakers to represent their thoughts and intentions by making available an inventory of symbolic associations between units of form (phonological structures) and units of meaning (semantic structures)
- A minimalist approach to form-meaning relation
- There are only three objects of study
  - ▣ 1) language in its perceptible form
  - ▣ 2) symbolized content
  - ▣ 3) symbolic associations between phonological and semantic structures.

# Cognitive grammar



- Inventory of units (phonological, semantic, or symbolic structure) that has been established, or entrenched, in the speaker's mind through frequency of previous use:
- Usage-based (bottom-up)
  - ▣ The whole-part relation
  - ▣ The schema-instance relation
  - ▣ The similarity/identity relation



# Word-formation in cognitive grammar

- Analyzability, e.g. writ-**er**.
- Entrenchment – a unit does not need to be assembled (compositionally) from its parts on each occasion of its use, nor the language users need to refer to its parts in order to understand it
- Autonomy & dependence – affixes are dependent.
- Schematic & contentful – affixes are schematic, bases are contentful.
- Valence – the specification of a unit often requires reference to the kinds of items with which it can combine (subcategorization)
- Selection – selectional restrictions.
- Profile determinant – affixes are profile determinants of their bases.
- Coercion – an unit may influence the phonological shape of a neighboring unit, e.g. **photográph-ic** with a stress change in comparison to *photógraph*.

# Affix ordering



*real* → *real* + *-ize* →

→ *real* + *-iz* + *-ation* →

→ *real* + *-iz* + *-ation* + *-al*

# Affix ordering: History of research



- Level-ordering (Stratal approach)
- Selectional restrictions
- Monosuffix constraint
- Parsability hypothesis
- Complexity-based ordering
- Other approaches

# Level-ordering or stratal approach

- Lexical phonology

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

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



- Class I affixes frequently attach to bound roots and tend to be phonologically less transparent than class II affixes and cause stress shifts, resyllabification, and other morphonological alternations, whereas class II affixes do not.
- 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

- 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.

Group 1: suffixes that do not attach to already suffixed words

Group 2: suffixes that attach outside one other suffix

Group 3: suffixes that attach freely

Group 4: problematic suffixes

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

# Selectional restrictions



- **Plag's solution:** for any given affix, its phonological, morphological, semantic and syntactic properties together are responsible for the possible and impossible combinations of the respective affix with stems and with other affixes.

**Problem:** This approach is too complicated.

# Selectional restrictions

- **Plag's solution:** for any given affix, its phonological, morphological, semantic and syntactic properties together are responsible for the possible and impossible combinations of the respective affix with stems and with other affixes.

**Problem:** This approach is too complicated.

- ! 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?

# Parsability hypothesis



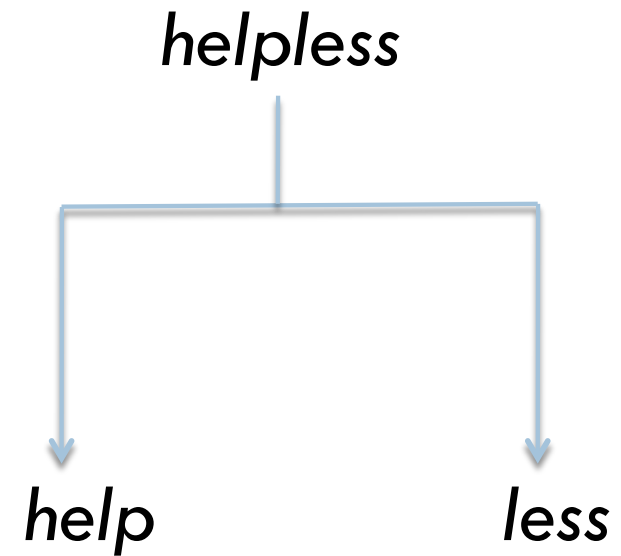
- Hay (2000, 2003 and later work)
- ***psycholinguistic*** by nature - acknowledges the crucial role of processing constraints in affix ordering
- a ***dual-route access*** model of morphological processing, i.e. we access derived words either as whole words or as decomposable units.
- ***relative frequency***

# Dual-route access

□ **whole word route**



**decomposition route**



# Parsability hypothesis



- Parsability depends on different factors and occurs by gradations, which allows affixes to be ordered hierarchically according to their ability to parse.
- 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.

**Problem:** Parsability cannot explain all combinations of English suffixes, selectional restrictions can override parsability.

# Complexity-based ordering

- English suffixes can be ordered in a *hierarchy of juncture strength* (Hay 2002 and Hay and Plag 2004)
- If the affixes **A, B, C, D** and **E** form a hierarchy, affixes that follow, let us say, **C** on the hierarchy can be added to words already affixed by **C**, whereas affixes preceding **C** on the hierarchy cannot be attached to words containing **C**, i.e. **\*CAD** should be an impossible combination.

**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?

# Approaches to affix order



According to the type of information used 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

# No approach is perfect

- 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 means that information such as syntactic subject and syntactic object is 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 person** (cognitive approach).

# Syntactic & semantic ordering



- Syntactic ordering
  - Depends on syntactic information
  - Syntactic category specification
  - Full compositionality
  
- Semantic ordering
  - Depends on the semantic meaning of a morphological unit
  - Suffix-particular semantics



# Note on terminology



- Syntactic category
- Word class
- Part of speech

## **Major categories**

Noun – N

Adjective – ADJ

Verb - V

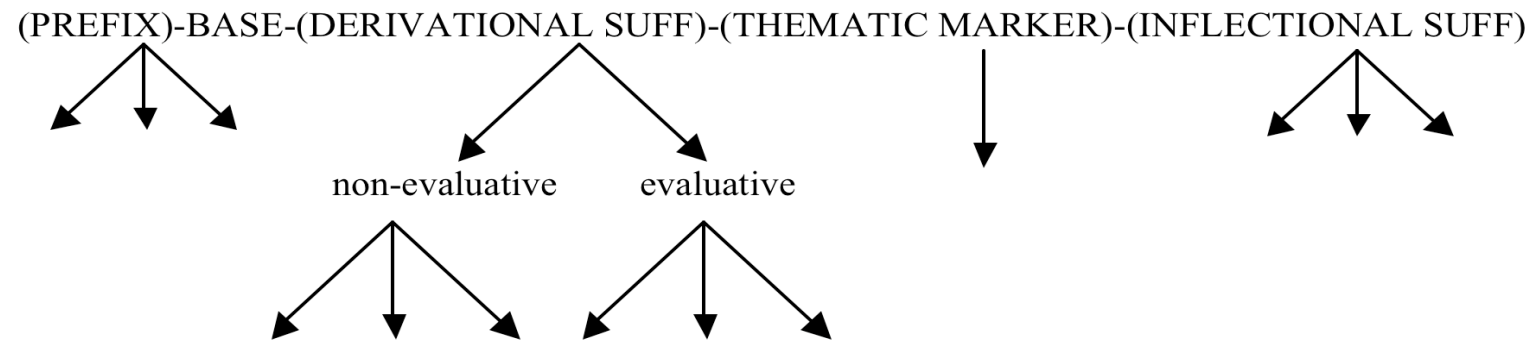
# Domain-specific ordering



- 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



# 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

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

*krasiv-i-te* ‘beautiful-PL-DEF’

# Inflectional domain

BASE–GEND/NUM–DEF

*krasiv-∅-∅* ‘beautiful’ (masculine)

*krasiv-∅-ijat* ‘beautiful-DEF’

*krasiv-a-∅* ‘beautiful-FEM/SG’

*krasiv-a-ta* ‘beautiful-FEM/SG-DEF’

*krasiv-o-∅* ‘beautiful-NEUT/SG’

*krasiv-o-to* ‘beautiful-NEUT/SG-DEF’

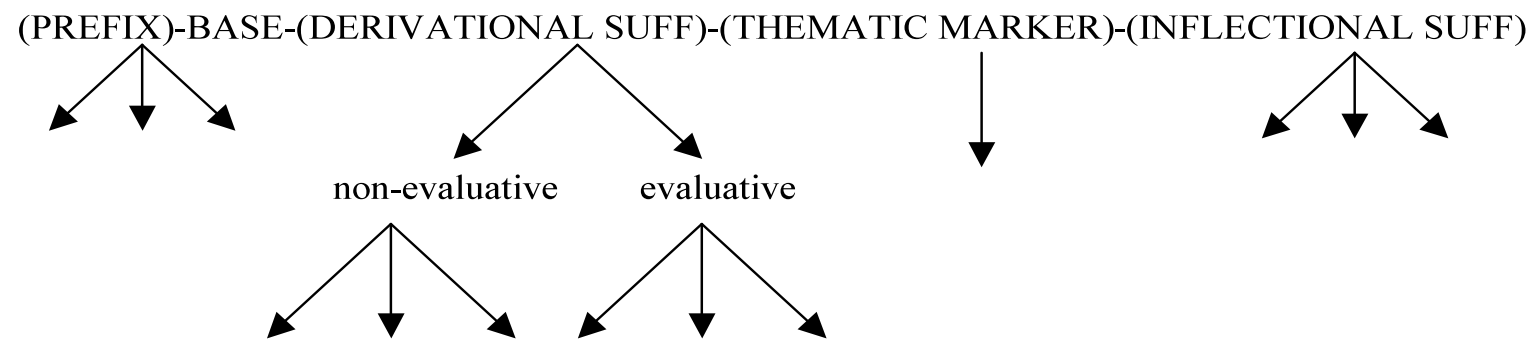
*krasiv-i-∅* ‘beautiful-PL’

*krasiv-i-te* ‘beautiful-PL-DEF’

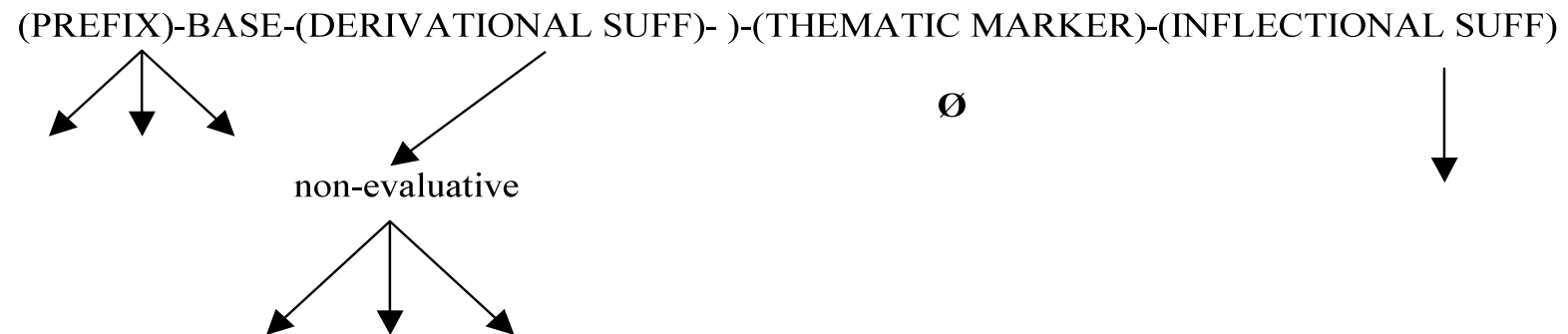


# Slavic word versus English word

## Slavic word



## English word



## Traditional analyses versus a cognitive approach



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

- Binary combinations of suffixes
- Suffixes are combined without relation to a lexical base

# -ist: A traditional analysis



SUFF1	Word class of SUFF1	Followed by SUFF2
<i>-ist</i>	N	<i>-dom, -ic, -y, -ize</i>

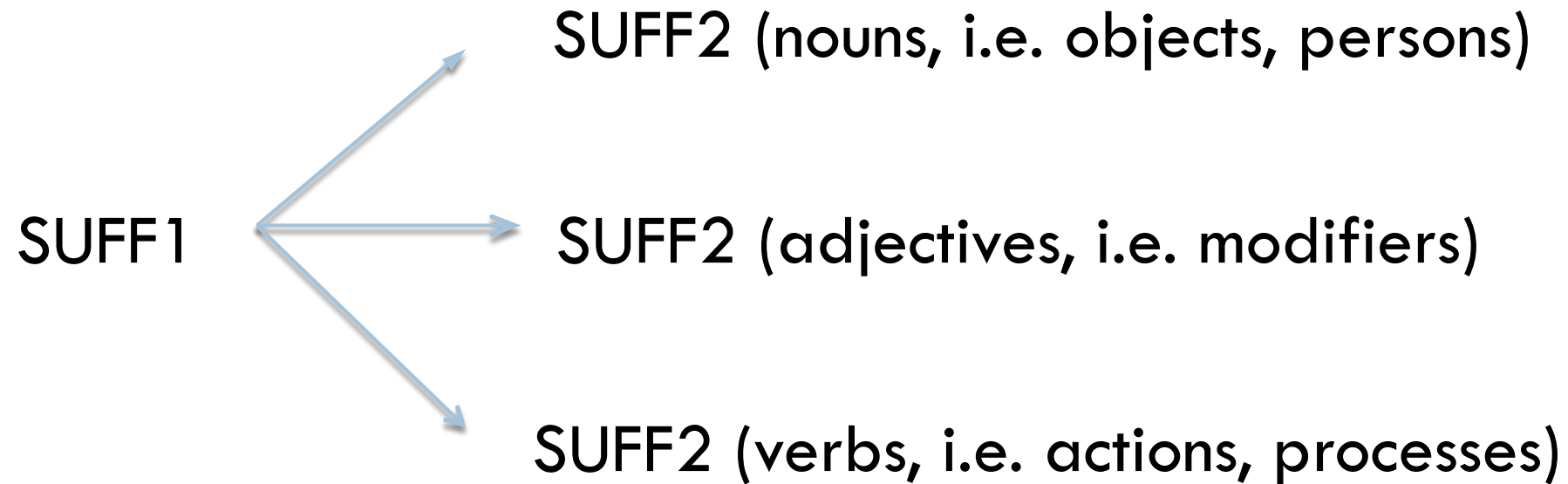
Aronoff & Fuhrhop (2002), based on OED, CD 1994

# Traditional analyses versus a cognitive approach



SUFF1 + all SUFF2 that follow it

versus



## Syntactic categories / Parts of speech / Word classes



- The syntactic 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

## Syntactic categories / Parts of speech / Word classes



- 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).

- 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.

# -ist: A cognitive analysis

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

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



# The role of semantics

- Semantic rules for selection of SUFF2 can be illustrated with the suffixes *-ful*<sub>ADJ</sub> and *-less*<sub>ADJ</sub>. If the suffix *-ful*<sub>ADJ</sub> attaches to a derived noun in English (e.g. *mean-ing*<sub>N</sub>-*ful*<sub>ADJ</sub>) usually also the suffix *-less*<sub>ADJ</sub> attaches to that noun (*mean-ing*<sub>N</sub>-*less*<sub>ADJ</sub>). Thus, we have two SUFF2<sub>ADJ</sub> that combine with the same SUFF1 (*-ing*<sub>N</sub>). However, the two SUFF2<sub>ADJ</sub> 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 \**gloriousity* (Aronoff 1976: 44) and thus also the suffix combination *-ous* + *-ity* in this particular case.

# Types of SUFF1-SUFF2 combination



- ***Fixed (unique)***

- SUFF1 combines with only one particular SUFF2 of a major syntactic category

- ***Predictable***

- SUFF2 applies by default
- SUFF2 is semantically determined

- ***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>-(i)an</i>	ADJ	N: -ship (1), <b>-ism</b> (485), -ist (2), ness (1) V: -ize	<b>N: 4</b> V: 1
2.	<i>-able</i>	ADJ	N: -ity (810), -ness	N: 2
3.	<i>-acy</i>	N	V: substitutes -ate	
4.	<i>-age</i>	N	N: -er (1), -ist (1) ADJ: -ous (2)	<b>N: 2</b> V: 1
5.	<i>-an</i>	N	N: -ism (485), -ist (131), -ity (57) ADJ: -ic (201) V: -ize (218)	N: 3 ADJ: 1 V: 1
6.	<i>-ance</i>	N	ADJ: -ful (1), -less (2)	<b>ADJ: 2</b>
7.	<i>-ant</i>	N	ADJ: -ed (1) V: -ize (24)	ADJ: 1 V: 1
8.	<i>-ant</i>	ADJ	N: -ness V: -ize	N: 1 V: 1
9.	<i>-ary</i>	ADJ	N: -ity (3), <b>-an</b> , -ness (1)	<b>N: 3</b>
10.	<i>-ate</i>	V	N: -ion (-ation, 5570), -or (1025); -ee (8); -er (3) ADJ: -ive (991), -ory (745)	N: 4 ADJ: 2
11.	<i>-ation</i>	N	ADJ: -al (257) V: -ize (6)	ADJ: 1 V: 1
12.	<i>-dom</i>	N	ADJ: -ful (2); -less (3)	<b>ADJ: 2</b>
13.	<i>-ed</i>	ADJ	N: -hood (1), -ness ADJ: -ful (2)	N: 2 ADJ: 1
14.	<i>-ee</i>	N	N: -dom (3), -ship (1), -ism (1)	<b>N: 3</b>
15.	<i>-en</i>	V	N: -er (32), -ment (5)	<b>N: 2</b>

# Uniqueness

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

# 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

- In English and Bulgarian, up to 85% of the suffix combinations reported in different studies involve fixed suffix combinations, i.e. a SUFF1 combines with only one SUFF2 of a particular word class, N, ADJ or V.
- Up to 83% of the suffix combinations are word-class changing, i.e. there is a complementary relationship between the word-classes of the SUFF1 and SUFF2.
- Similar results for Russian, Polish and Italian.

Manova (2011c)

# Examples from Russian

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



# Examples from Russian

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

# Suffix particular semantics (Bulgarian)

(research in progress)

1) person – possessive/relational adjective

□ *-tel-ski*

Examples: *pisa-tel-ski*, *rodi-tel-ski*, etc.

□ *-ar-ski*

Examples: *drug-ar-ski*, *strug-ar-ski*, *aptek-ar-ski*, etc.

2) object – qualitative adjective

□ *-tel-en*

Examples: *săedini-tel-en*, *ukaza-tel-en*, etc.

# Evidence for the research 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 syntactic 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).

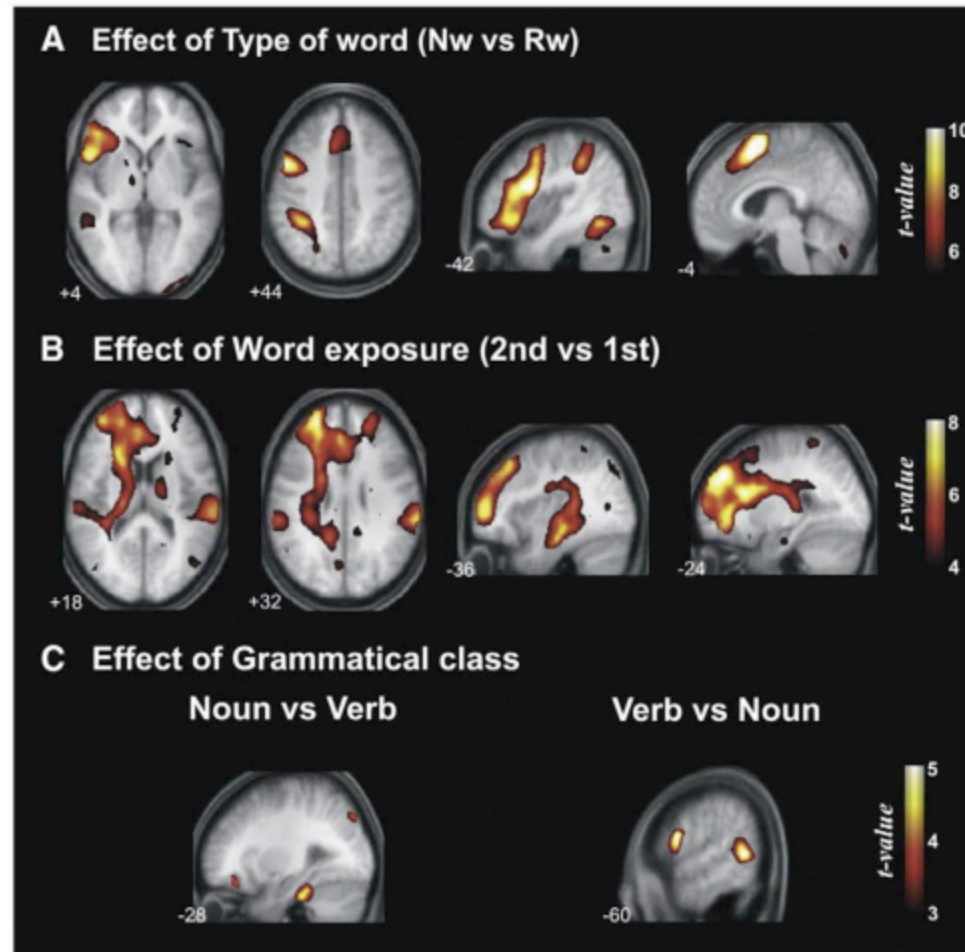
# Evidence from neuroscience



- Nouns and verbs activate different parts of the brain, see the next slide.

Mestres-Missé, Anna; Antoni Rodríguez-Fornells & Thomas F. Münte (2010)

# Nouns and verbs in the brain



# Evidence from neuroscience



- Nouns and verbs activate different parts of the brain.

(Mestres-Missé, Anna; Antoni Rodríguez-Fornells & Thomas F. Münte 2010, and many others).

- 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 & Relevance to other fields



- Our research shows that most SUFF1-SUFF2 combinations are fixed and predictable, i.e. the speakers use them as non-compositional pieces of structure that are between morpheme and word.

# Conclusions & Relevance to other fields



- Our research shows that most SUFF1-SUFF2 combinations are fixed and predictable, i.e. the speakers use them as non-compositional pieces of structure that are between morpheme and word.
- Our results can find practical implementation in:
  - ▣ Speech recognition
  - ▣ Machine translation
  - ▣ Automatic annotation of electronic corpora at a morpheme level

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**Thank you!**

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