

Natural language without semiosis

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Introduction

At the center of much of the discussion of language in the first half of the 20th century —

the SIGN

ENG: /'tej.bl/

SPA: /'me.sa/

HEB: /ʃul.'xan/



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SPA: /'me.sa/

HEB: /ʃul.'xan/



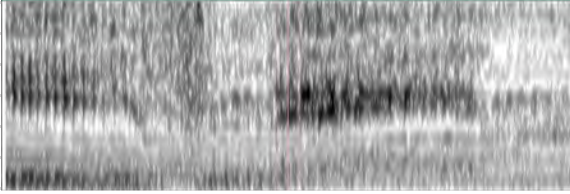
Much was made about the often **arbitrary** nature of the relation between the meaning of a SIGN and its form (Saussure 1916, Hjelmslev 1943).

As contrasted with, e.g., "onomatopoeia", "iconicity", etc.

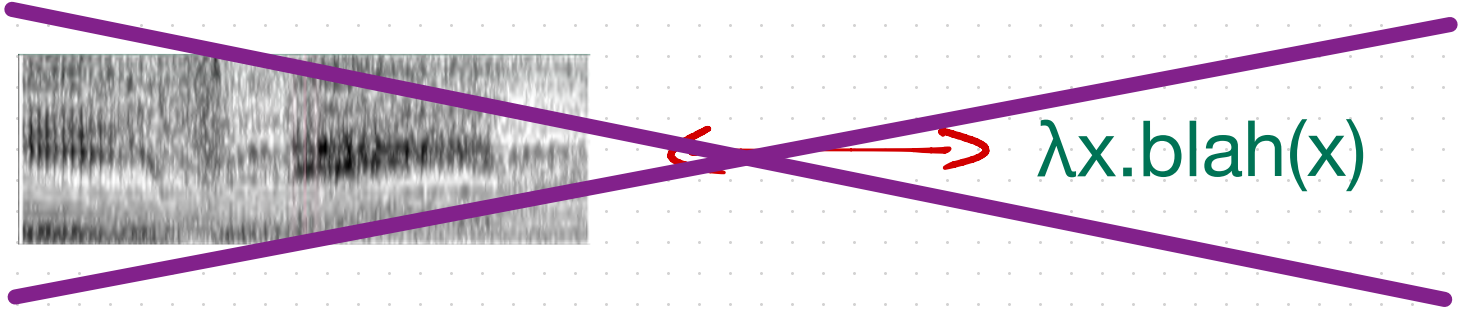
Of course, anyone who has thought about this carefully has noted that this is wrong — at least for human language.

Cf. Seyfarth & Cheney (1980), and subsequent work, on vervet monkey alarm calls.





$\lambda x.blah(x)$



$/bla:/$ \longleftrightarrow $\lambda x.blah(x)$

considerably
more
abstract!

(1) This book is old and crumbling, but will captivate you like no other.

(2) This window is double-glazed and has a magnificent view.

cf.: (3) # This bug can record 3 hours of conversation and its bite will cause a rash.

/bla:/'



$\lambda x.blah(x)$

considerably
more
abstract!

also
very
abstract!

cf. "book",
"window", etc.

CENTRAL QUESTION:

Can adequately abstract notions of "FORM" and of "MEANING" salvage a semiotic view of linguistic atoms as <FORM, (SYNTAX,) MEANING> mappings?

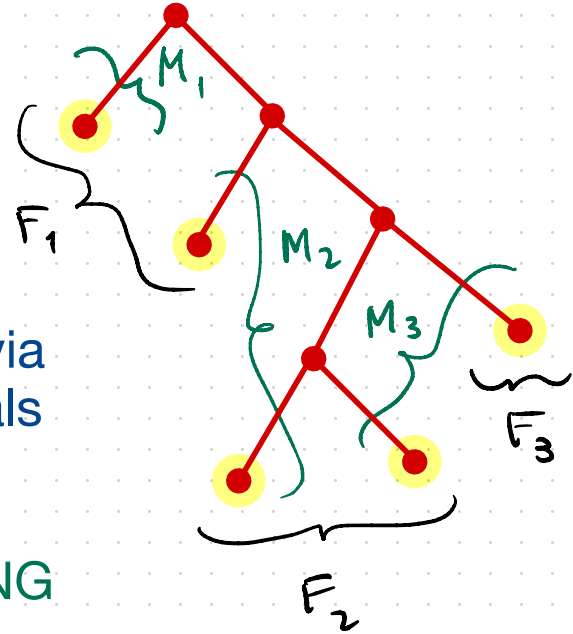
CLAIM:

The answer is no.

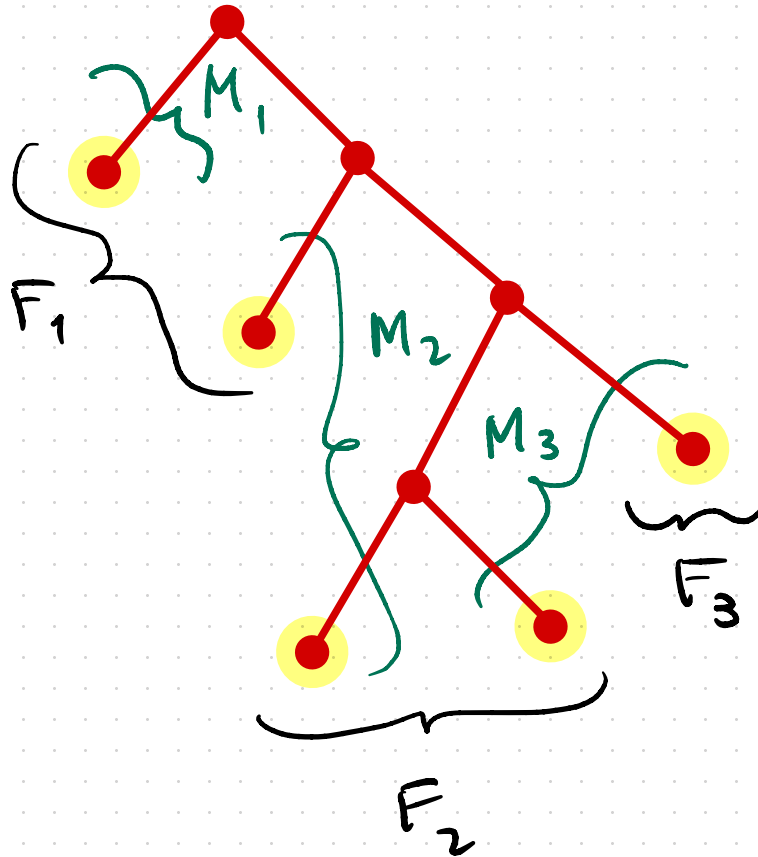
WHAT I WILL ARGUE FOR:

- syntactic **terminals** don't "have forms" and they don't "have meanings"
- they are, instead, fully abstract
- they come to be associated with **FORM** via many-to-one rules from syntactic terminals to exponents
- they come to be associated with **MEANING** via many-to-one rules from syntactic terminals to listed meanings

(see also Pesetsky 1985)



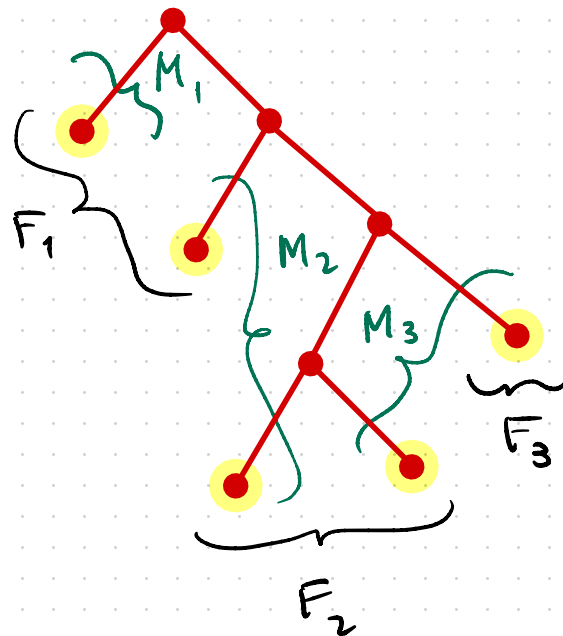
NB:
contiguity



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contiguity

In other words, the proposed architecture of *listed* (a.k.a. "lexical") knowledge:

- (A) fully abstract syntactic atoms (e.g. **DOG**, **PAST**, **RUN**, **IN**, etc.)
- (B) many-to-one rules from sets of nodes in (A) to units of FORM
- (C) many-to-one rules from sets of nodes in (A) to units of **MEANING**



NB:
contiguity

**IF THIS PROVES TO BE CORRECT,
THEN:**

“What does the word/morpheme *w* mean?”

“How do speakers (of this language)
pronounce the meaning *m*?”



**NOT, STRICTLY SPEAKING, COHERENT
QUESTIONS!**

E.g.: suppose, hypothetically, that we found that sentences with "again" in them are interpreted in two different ways, depending on their syntactic structure.

⇒ Conventional responses:

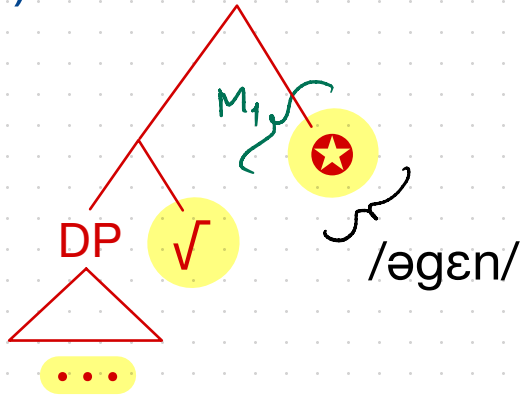
- (1) Posit two, homophonous "again"s (cf. *bug-bug*), each with a restricted syntactic distribution. } typically treated as "uninteresting"...
- (2) Try to find a single, "flexible" semantics for "again", which will give the right reading in each syntactic environment.

E.g.: suppose, hypothetically, that we found that sentences with "again" in them are interpreted in two different ways, depending on their syntactic structure.

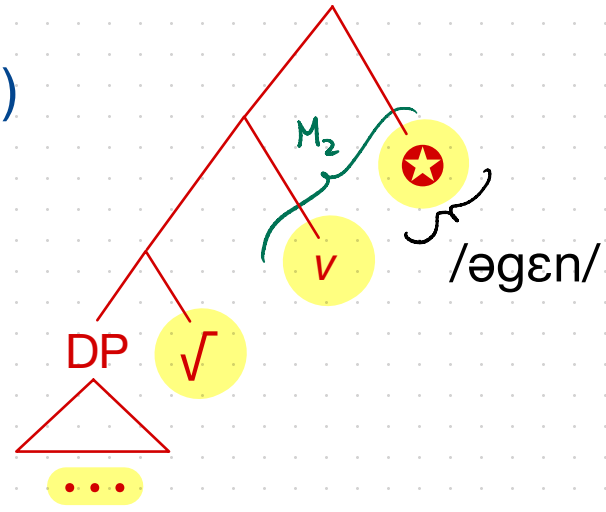
But these responses both assume that there is a bona fide linguistic object "again", which is submitted to interpretation.

If the arguments I will present today hold, this is a false assumption.

(1)



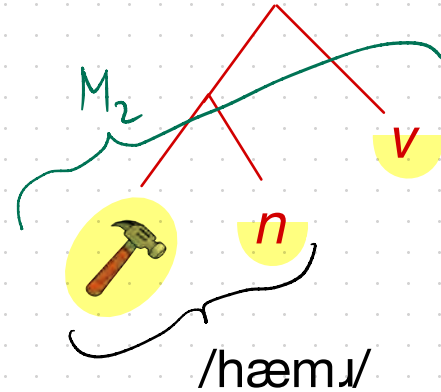
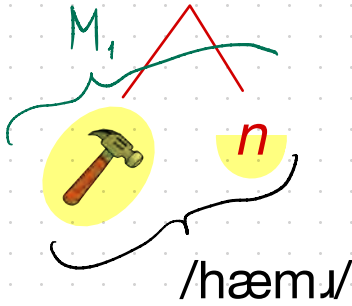
(2)



Notice that there is NO APPEAL TO "HOMOPHONY" here – any more than there's an appeal to "homophony" in:

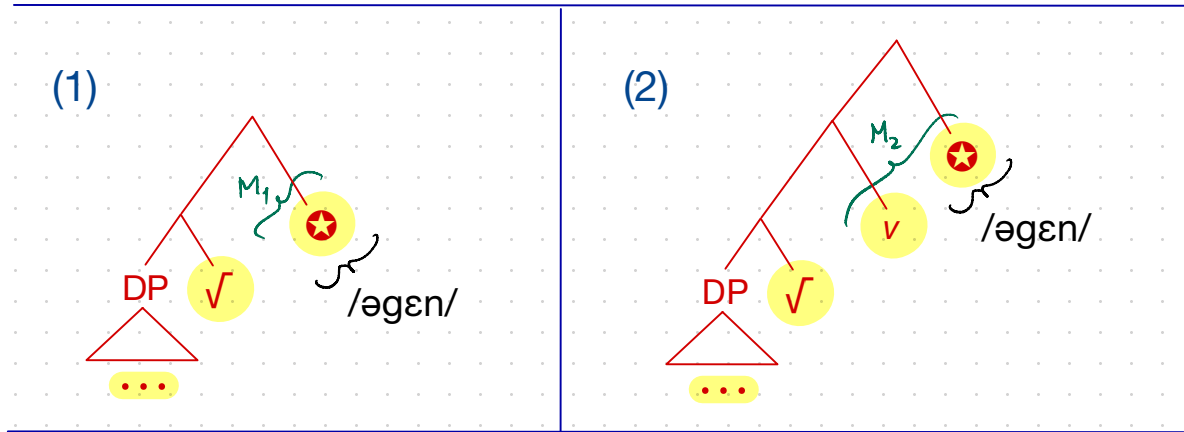
(3) Kim picked up the hammer and hammered the metal into a blade.

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(importantly, the verb
"hammer" is indeed
non-compositional)

Q: Okay, but is this mode of explanation "interesting"?



A: That's the wrong question to ask. We're in the business of neither mathematics nor aesthetics, but of **cognitive science**.

If these kinds of representations are available to the child, those who would claim that she doesn't use them are on the hook to explain why.

A Methodological Note:

The discussion of MEANING in this talk will mostly center on open-class items.

Whereas most formal semantics these days is about closed-class items.

⇒ *Problem...?*

No.

The focus on closed-class items in formal semantics is merely a *heuristic* choice.

CENTRAL IDEA:

Open-class items (dog, beauty) will involve the same principles & mechanisms as closed-class items (every, the). But we have a better guess for what the latter mean...

⇒ Thus, by parity of reasoning:

If we're able to learn something about interpretation & meaning from open-class items —

It should be taken to be general, as well, and apply to closed-class items too.

PRELIMINARIES:

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There's (probably) such a thing
as "phonological words" —

but phonological words can correspond
to composed meanings:

[ðə.'dɒg]
“the dog”

they need not even be constituents:

[ðeɪd.bi:hi:]
“They'd be here.”

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✓ (a) "phonological word" is not suited to serve as the relevant notion of "word"

(b) and neither is "orthographic word"

There are (sometimes) such things as
orthographic words...

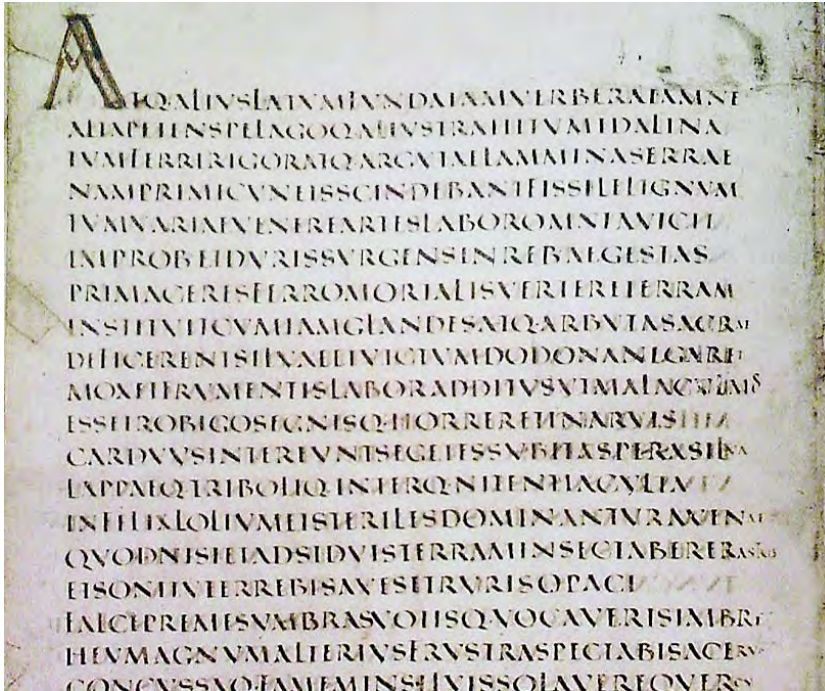
BUT:



- speaks English
- doesn't know how to read/write

⇒ doesn't know "words"?

⇒ doesn't know units of
FORM-MEANING
correspondence?



Many writing systems
(incl. early Latin & Greek)
lacked spaces altogether

⇒ no "words"...?

"scriptio continua"

Furthermore:

- The writing system for modern-day Vietnamese, for example, has spaces – but they individuate ~syllable-sized units
 - smaller than anything that could realistically be called "word" in the language (Noyer 1998)
- and, of course, not every natural language even has a writing system

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At this juncture, one typically launches a final attack on any remaining, "intuitive" notion of word (see, e.g., Marantz 2001).

MEANING: "chew the fat" (cf. *chew, the, fat*)
"believable" (cf. *believe, -able*)
"terrific" (cf. *terrify, -ic*)

FORM: "went" (cf. *go*)
"ownership" (cf. *owner, -ship*)
"cat" (cf. *cap, hat, ...*)

But I've come to believe that this is completely unnecessary —

In science, we do not need to refute intuitive, nebulous "proto-theories" based on folk-scientific notions.

Unless & until someone presents an explicit, non-phonological non-orthographic definition of "word" that is not post-hoc...

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PRELIMINARIES:



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(II) Morphological exponents cannot serve as units of FORM-MEANING mapping, either.

(Aronoff 1976, i.a.)

(a) Just like "chew the fat" requires X-MEANING mapping where $X > \text{"word"}$...

it also requires X-MEANING mapping where $X > \text{morphological exponent}$

(b) And so does "terrific" (cf. *terrify*, *-ic*).

(c) suppletion:

go – went ——— What's the FORM side of the
FORM-MEANING mapping, here?

Anishinaabemowin (Algonquian);
Sigwan Thivierge, p.c.:

miskomin-**ag** ni-gii-**amw**-aa-**ag**
raspberry.ANIM-ANIM.PL 1-PST-eat.TA-DIR-ANIM.PL
'I ate raspberries.'

miin-**an** ni-gii-**miji**-n-Ø-**an**
blueberry.INAN-INAN.PL 1-PST-eat.TI-TI3-INAN.PL
'I ate blueberries.'

(d) forms without meaning:

complete ~ completion

compete ~ *competition (cf. *competition*)

⇒ What is this "extra" *-ti/-it*?
In particular: what does it MEAN?

"Just morphology"...? **Not quite...**

(Harley 2006)

(d') in cahoots
short shrift
spick and span

(cf. competition)

(Noyer 1998, Harley 2006)

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TOWARDS A THEORY: the role of *late-insertion* at PF

Let's take *go-went* as a representative case:

- T[**past**] and $\sqrt{\text{GO}}$ are separate syntactic terminals
 - remember: to argue otherwise, one would have to provide a non post-hoc definition of "word"
- Therefore: the choice between *go* and *went* depends on derived syntactic structure

CONCLUSION:

To the extent that knowledge of English includes something like $\langle \text{FORM}, \text{🚶} \rangle$ —

- the "FORM" part of that data structure needs to be a conditional that is informed by — and operates on the output of — the completed syntactic derivation

Notice that it's not enough for T[PAST] to be "next to" $\sqrt{\text{GO}}$ — the two have to stand in a particular structural relationship:

(1) Sprocket went home.

(2) ... and once they did, going/*wenting home was no longer possible

Adjacency in this notation is not "innocent"! It stands for what is, in reality, a **structural** relationship.

So, for example, in Distributed Morphology (DM; Halle & Marantz 1993, 1994):

$\sqrt{\text{GO}} \leftrightarrow \text{went} / \text{ ______ } [\text{FINITE, PAST}]$
 $\sqrt{\text{GO}} \leftrightarrow \text{gon} / \text{ ______ } [\text{PTPL}]$
 $\sqrt{\text{GO}} \leftrightarrow \text{go:} / \textit{elsewhere}$

Adjacency in this notation is *not innocent!* It "conceals" a bit of (in this case syntactic) structure.

√GO ↔ went / _____ [FINITE, PAST]

√GO ↔ gon / _____ [PTPL]

√GO ↔ go: / *elsewhere*

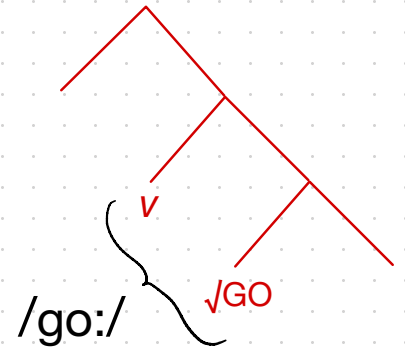
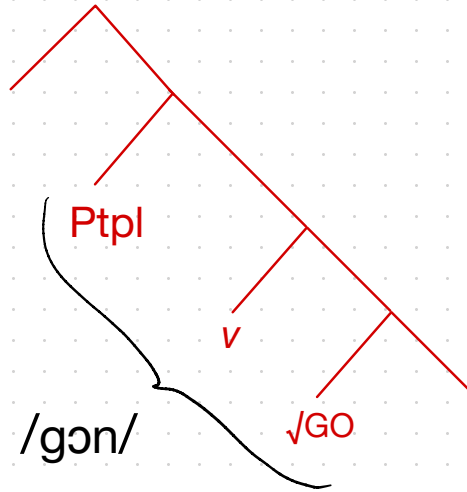
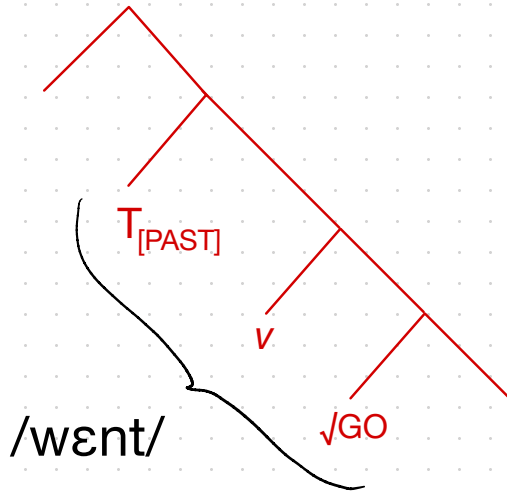


There is no FORM, strictly speaking, that can be associated with √GO.

At most, what can be associated with √GO (on the FORM side) is a tiny little "syntax engine" —

one which can have various different FORM outputs, depending on which treelet you feed it.

⇒ Arguably more perspicuous to just say...:



We'll have more to say about the choice between these two formalizations —

the terminal-centric (DM) one, and the many-to-one mapping one

— in what follows.

But first...

TOWARDS A THEORY: the role of *late-insertion* at LF

What's less often remarked upon: the very same thing we just saw for FORM holds for MEANING, as well.

Let's take *terrify-terrific* as a representative case:

- *-ic* is the FORM associated with a **syntactic terminal** (or multiple **terminals**)
- remember: to argue otherwise, one would have to provide a non post-hoc definition of "word"
- Therefore: the choice between what *terrify* means on its own and what *terrif(y)-* means when it occurs in the relevant configuration with *-ic* depends on derived syntactic structure

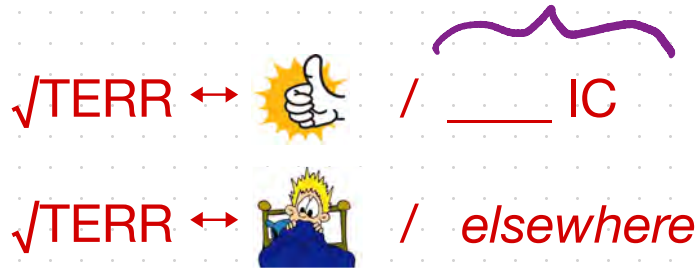
CONCLUSION:

To the extent that knowledge of English includes something like $\langle \text{terr}(\text{if}(y))-, \text{MEANING} \rangle$ —




- the "MEANING" part of that data structure needs to be a conditional that is informed by – and operates on the output of – the completed syntactic derivation

As before, we could encode this via a DM(-like), terminal-centric "rule block":

And as before, **adjacency** in the notation, here, must stand for what is, in reality, a **structural** relationship.



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$\sqrt{\text{TERR}}$ ↔  /  IC
 $\sqrt{\text{TERR}}$ ↔  / *elsewhere*

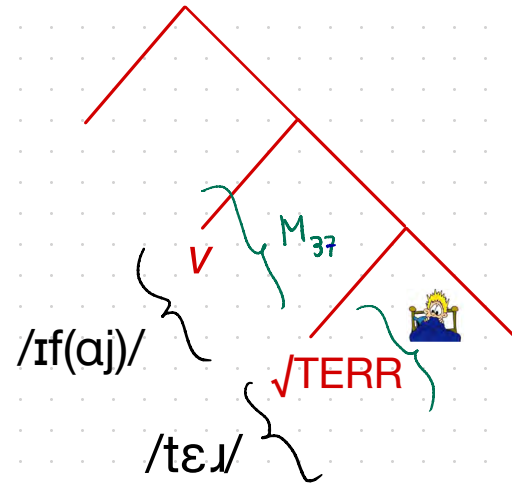
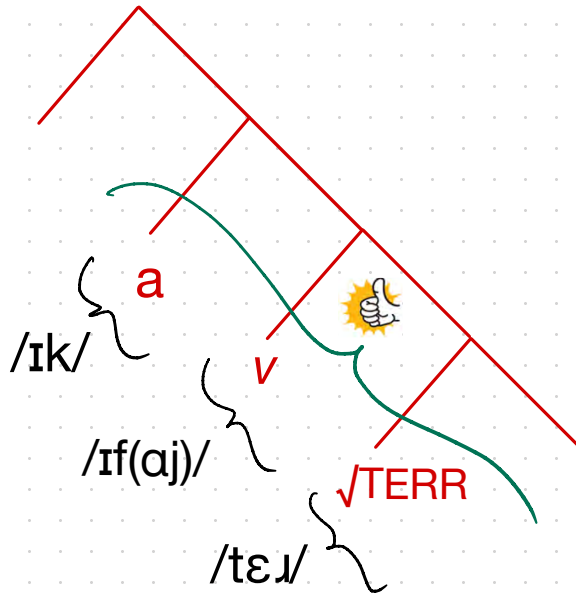


There is no **MEANING**, strictly speaking, that can be associated with $\sqrt{\text{TERR}}$.

At most, what can be associated with $\sqrt{\text{TERR}}$ (on the **MEANING** side) is a tiny little "syntax engine" —

one which can have various different **MEANING** outputs, depending on which treelet you feed it.

⇒ As before, arguably more perspicuous to just say....:



SOME HOUSEKEEPING: what these facts are not about

These are all (*went, terrific, etc.*) **syntactically complex** forms with FORMS or MEANINGS that are nevertheless non-compositional.

This is not about whether the compositional form does or does not exist alongside the non-compositional one —

cf.: *dreamt* ~ *dreamed*

transmission (opaque thing in my car) ~

transmission (result or event of transmitting)

This is also (in case there was any lingering doubt...) about sub-"word" vs. super-"word" compositionality —

cf.: *terrific*

(blocks access to compositional meaning)

transmission

(doesn't block access to compositional meaning)

fat chance

(blocks access to compositional meaning; would be an antonym of *slim chance* – but is unavailable)

kick the bucket

(doesn't block access to compositional meaning)

INTERIM SUMMARY:

What we've seen so far:

- Syntactic terminals don't "have forms".
- Syntactic terminals don't "have meanings".
- At best, syntactic terminals are associated with:
 - a **context-sensitive** spellout mechanism that determines their contribution to form; *and*
 - a **context-sensitive** interpretation mechanism that determines their contribution to meaning

As a result, we can now be quite certain that things like the following are not legitimate parts of a theory of grammar:

(1) *Terminal Nodes* (TN)

If α is a terminal node, $[[\alpha]]$ is specified in the lexicon.

(Heim & Kratzer 1998: 43)

And things like the following carve out a particular subset (in DM's terms: *elsewhere* rules; in our terms here, many-to-one mapping rules where 'many' happens to equal 1), **for reasons that are never justified...**

(3) *Terminal Nodes* (TN)

If α is a terminal node, then α is in the domain of $[[\]]$ if $[[\alpha]]$ is specified in the lexicon.

(Heim & Kratzer 1998: 48)

... and more importantly, without providing the complementary mechanism for the (as we will see) many, many cases that do **not** fall under (3).

THE QUESTION THAT REMAINS IS: Which of these two models is better?

Adjacency in this notation is not "innocent"! It stands for what is, in reality, a **structural** relationship.

√GO ↔ went / ____ [FINITE, PAST]

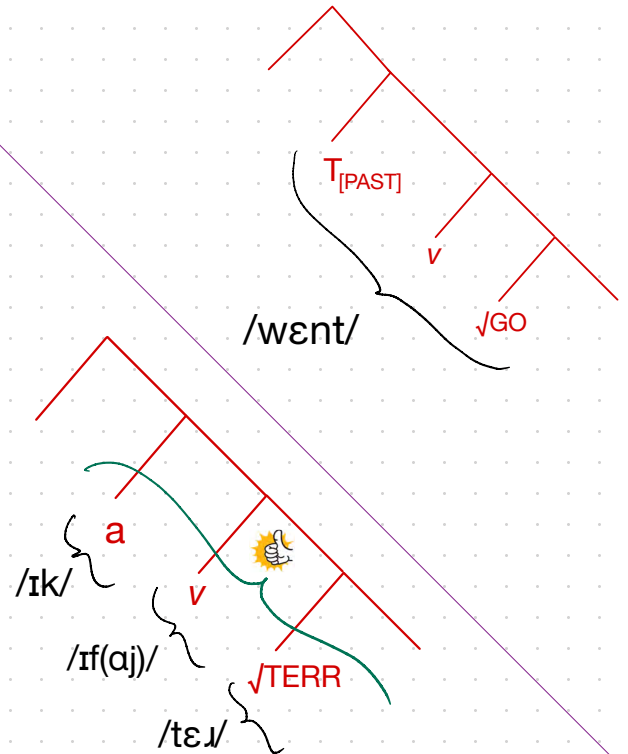
√GO ↔ gon / ____ [PTPL]

√GO ↔ go: / *elsewhere*

And as before, **adjacency** in the notation, here, must stand for what is, in reality, a **structural** relationship.

√TERR ↔  / ____ IC

√TERR ↔  / *elsewhere*



First, some more data....:

"go off" ~ explode, be triggered

"go"_{NONPAST} ~ "went"_{PAST}

"went off" ~ exploded, was triggered

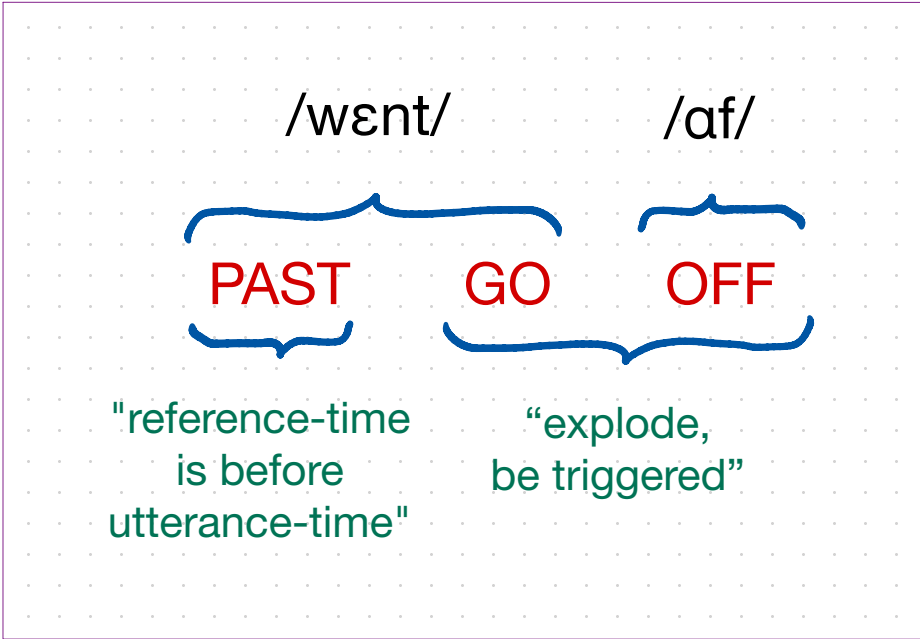
syntactic elements – at minimum:

PAST ~ T or Infl or ... bearing [+PAST] features

GO ~ whatever it is that distinguishes the verb "go" from "run", "dance", etc.

OFF ~ whatever it is that distinguishes the preposition/particle "off" from "on", "up", "in", etc.

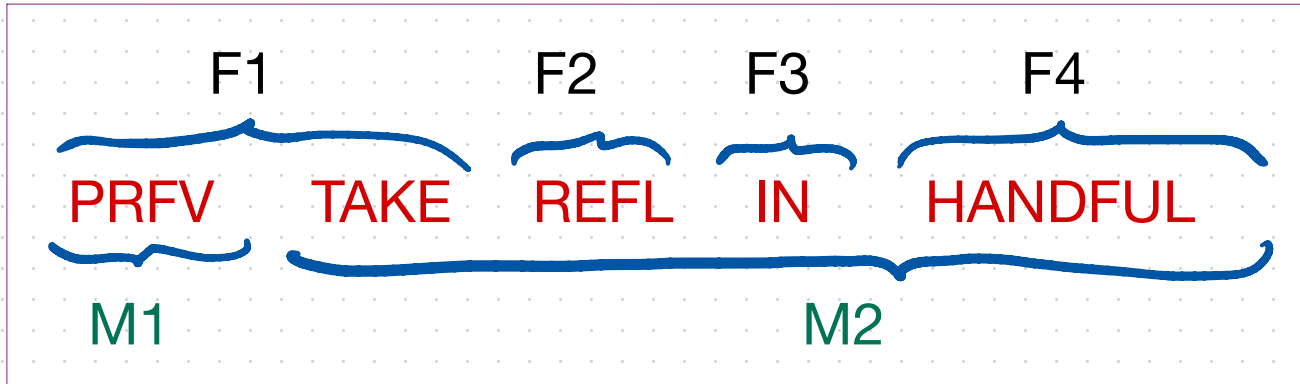
mappings from syntax to FORM and to MEANING:



Polish (Slavic);

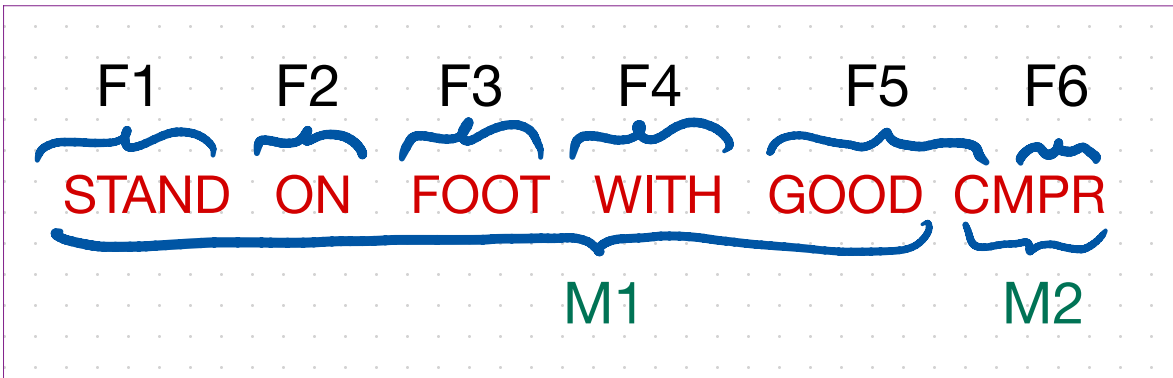
Asia Pietraszko, p.c.:

- a. Bierz się w garść!
take.IMPF.IMP.2SG REFL in handful
'Pull yourself together (*imperfective*)!'
- b. Weź się w garść!
take.PRFX.IMP.2SG REFL in handful
'Pull yourself together (*perfective*)!'



German (Germanic);
Hagen Blix, p.c.:

- a. mit jemand-em auf gut-em Fuß stehen
with someone-DAT on good-DAT foot stand
'to get along well with someone'
- b. Wir standen damals auf besser-em Fuß als heute.
we stand.PAST.3PL back.then on good.CMPR-CMPR-DAT foot than today
'Back then, we got along better than today.'



Many-to-one mappings: rare?

At this juncture, a potential concern:

are we reducing-to-the-worst-case based on a handful of "unusual" examples?

- (1) a. /k-b-f/ + CaCuC kvufim 'pickles' (Hebrew)
b. /k-b-f/ + CCiC kvif 'road'
c. /k-b-f/ + Ci(C)CuC kibus 'conquest' Aronoff 2007

- (2) a. /x-f-b/ + CaCaC xafav 'think'
b. /x-f-b/ + CiC(C)eC xifev 'calculate'
c. /x-f-b/ + hiCCiC hixfiv 'consider'

NB1: Every instance of composition that is not *exclusively phonological* or *exclusively semantic* is **syntactic**.

NB2: NB1 is not an "assumption" — it's the only game in town (unless & until someone comes up with a working, cross-linguistic definition of "word" ... *don't hold your breath!*)

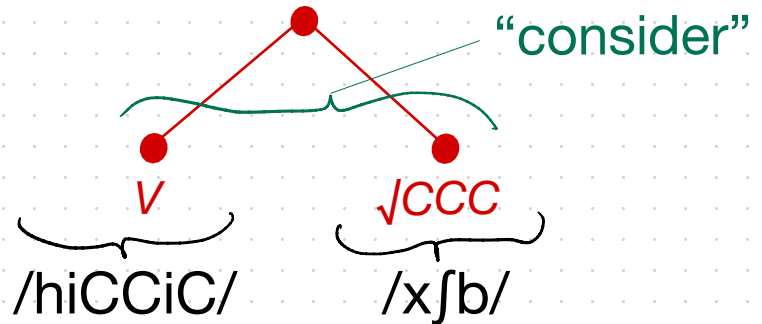
⇒ Pretty much every open-class item in Semitic involves a *joint* mapping

from at least two syntactic terminals –
the $\sqrt{\text{CCC}}$ root, and the $n/v/\text{etc.}$ associated
with the template – to a meaning

AND REMEMBER:

If we're able to learn something about interpretation & meaning from open-class items –

It should be taken to be general, as well, and apply to closed-class items too.



Gaps, gaps, gaps

in cahoots

newfrangled

short shrift

huckleberry

spick and span

cf.:

* s-cahoot in

* shrift short

* spick span and

(Noyer 1998, Harley 2006)

In a many-to-one model:

in cahoots:

$\{ \sqrt{\text{CAHOOT}} \} \rightarrow \times$

$\{ n, \sqrt{\text{CAHOOT}} \} \rightarrow \times$

■
■
■

$\{ \text{IN}, \text{D}[-\text{def}], \text{Num}[\text{pl}], n, \sqrt{\text{CAHOOT}} \} \rightarrow$ “engaged in a conspiracy” ✓

In a terminal-centric (e.g. DM'ian) model:

in cahoots:

√CAHOOT → “engaged in a conspiracy” / _____ {IN, D[-def], Num[pl], n} ✓

-
-
-

√CAHOOT → ✗ / _____ {n}

√CAHOOT → ✗ / *elsewhere*

Claims:

In a terminal-centric (e.g. DM'ian) model:

A language that lacked any "*cahoot*"s/"*fangle*"s/etc. would be a fairly unremarkable computational object.

It would simply be a language for which every syntactic terminal had a "complete" rule block (i.e., one that included an *elsewhere* rule).



In fact, this would arguably be the most computationally natural state of affairs.

Given that DM, at least, is explicitly built around a Pāṇinian logic.

Whereas in a many-to-one model...

(A) fully abstract syntactic atoms
(e.g. DOG, PAST, RUN, IN, etc.)

(B) many-to-one rules from sets of
nodes in (A) to units of FORM

(C) many-to-one rules from sets of
nodes in (A) to units of MEANING

... absolutely nothing guarantees that for every x in list (A),
there will happen to be a member of list (C) whose input
is the set $\{x\}$.

In fact, that would be an extreme edge-case.

Which brings me to ...

What is "lexical acquisition" on this type of model?

traditionally: the child learns a "word" — its form(s), its meaning(s), and its syntactic properties

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traditionally: the child learns a "word" — its form(s), its meaning(s), and its syntactic properties

That's not a thing...

⇒ what does “learning /'tej.bl/'”

or “learning ”

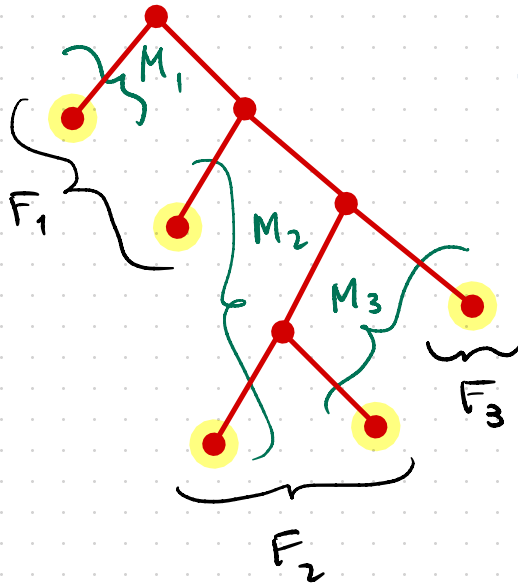
or ...

amount to, in the proposed
architecture?

Let's make the simplifying assumption
that the child has successfully done
"morphological segmentation" —

i.e., division of the incoming speech
stream into morphological exponents

This means the child has successfully identified that they heard the sequence "F1 F2 F3"



But this still radically under-determines the *structure* that could have spelled out —

and even more so the meanings that this structure could have been associated with

The role of exposure to isolated words in early vocabulary development

M R Brent ¹, J M Siskind

Affiliations + expand

PMID: 11376642 DOI: [10.1016/s0010-0277\(01\)00122-6](#)

Abstract

Fluent speech contains no known acoustic analog of the blank spaces between printed words. Early research presumed that word learning is driven primarily by exposure to isolated words. In the last decade there has been a shift to the view that exposure to isolated words is unreliable and plays little if any role in early word learning. This study revisits the role of isolated words. The results show (a) that isolated words are a reliable feature of speech to infants, (b) that they include a variety of word types, many of which are repeated in close temporal proximity, (c) that a substantial fraction of the words infants produce are words that mothers speak in isolation, and (d) that the frequency with which a child hears a word in isolation predicts whether that word will be learned better than the child's total frequency of exposure to that word. Thus, exposure to isolated words may significantly facilitate vocabulary development at its earliest stages.

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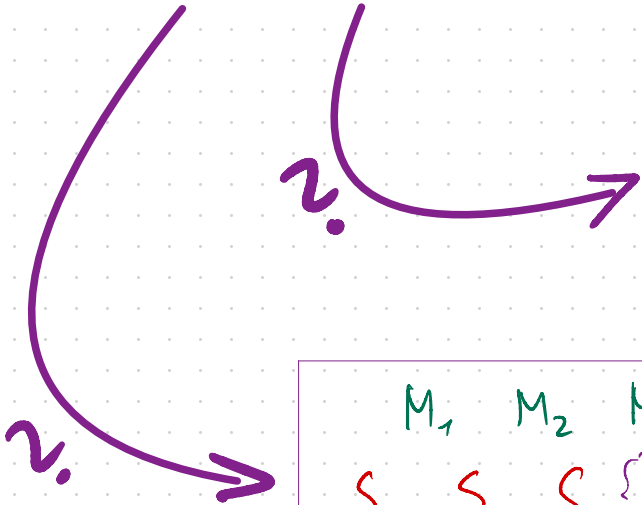


Why?

M_1	M_2	M_3	M_4	M_5	M_6	
S_1	S_2	S_3	S_4	S_5	S_6	S_7
F_1	F_2	F_3	F_4	F_5		

M_1	M_2	M_3	M_4	M_5	M_6	
S_1	S_2	S_3	S_4	S_5	S_6	S_7
F_1	F_2	F_3	F_4	F_5		

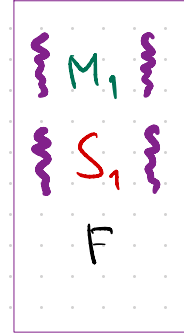
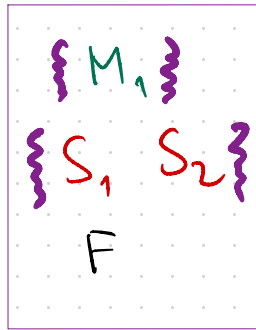
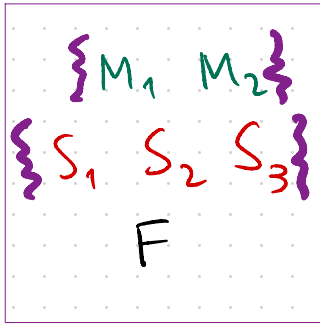
M_1	M_2	M_3	M_4	M_5	M_6	
S_1	S_2	S_3	S_4	S_5	S_6	S_7
F_1	F_2	F_3	F_4	F_5		



M_1 M_2
 S_1 S_2 S_3
F

M_1
 S_1 S_2
F

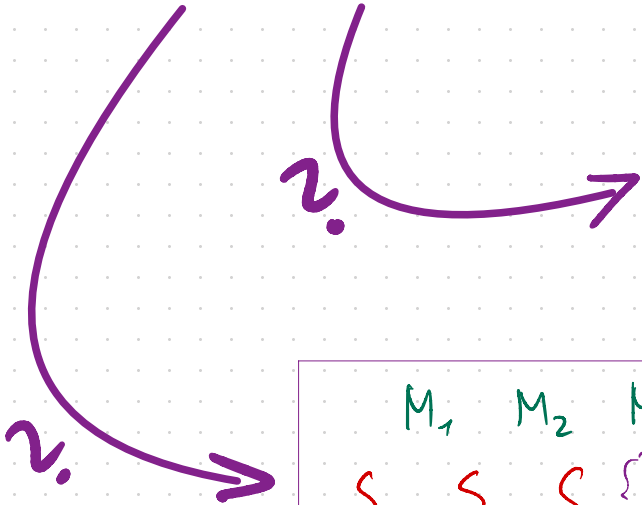
M_1
 S_1
F



M_1	M_2	M_3	M_4	M_5	M_6	
S_1	S_2	S_3	S_4	S_5	S_6	S_7
F_1	F_2	F_3	F_4	F_5		

M_1	M_2	M_3	M_4	M_5	M_6	
S_1	S_2	S_3	S_4	S_5	S_6	S_7
F_1	F_2	F_3	F_4	F_5		

M_1	M_2	M_3	M_4	M_5	M_6	
S_1	S_2	S_3	S_4	S_5	S_6	S_7
F_1	F_2	F_3	F_4	F_5		



Quantitative Linguistic Predictors of Infants' Learning of Specific English Words

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Affiliations + expand

PMID: 28146333 PMCID: PMC5538897 DOI: 10.1111/cdev.12731

Table 5

Regression Coefficients and Descriptive Statistics of Significant Predictors in the Word-Saying Analysis

Predictor	Coef	Exp(coef)	IQR	90-10R	p Value
Total	0.2754	1.3171	2.77	4.01	.0005
frequency.c					
Isolated freq.c	0.5197	1.6815	0.00	1.10	.0005
MLU.c	-0.1147	0.8917	1.00	3.00	.0527
Duration ratio.c	0.2922	1.3393	0.53	2.42	.1233
Class(closed)	-0.7239	0.4848	na	na	.1709
Class(pred.)	-1.5665	0.2088	na	na	.0031

Note. Coef refers to the estimated beta coefficient. Exp(coef) provides the number by which the odds of saying a word should be multiplied given an increase of 1 in the predictor's value. IQR (interquartile range) is the difference in value between the 75th and 25th percentiles for values of the numerical predictors. 90-10R is like the IQR but uses the 90th and 10th percentiles. MLU = mean length of utterance.

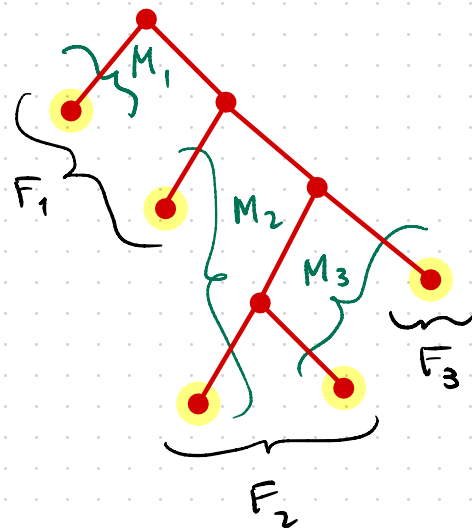
⇒ Learners attempt to "penetrate" this massive *many-to-many-to-many* mapping problem by establishing single-exponent (or low-number-of-exponent) foot-holds

As evinced by their *over*-reliance on fragmentary ("one-word") utterances.

SUMMARY

I have sketched a grammatical architecture in which *listed knowledge* consists in:

- (A) fully abstract syntactic atoms
(e.g. **DOG**, **PAST**, **RUN**, **IN**, etc.)
- (B) many-to-one rules from sets of nodes in (A) to units of FORM
- (C) many-to-one rules from sets of nodes in (A) to units of MEANING



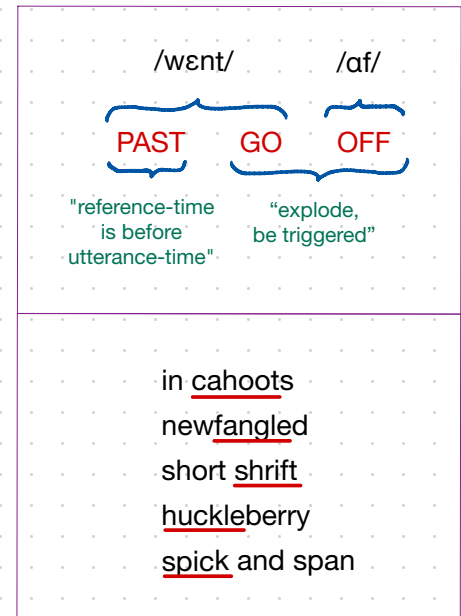
NB:
contiguity

We also looked at data that seemed more natural to account for in a many-to-one architecture of the kind proposed here

As opposed to a terminal-centric architecture (e.g. Distributed Morphology)

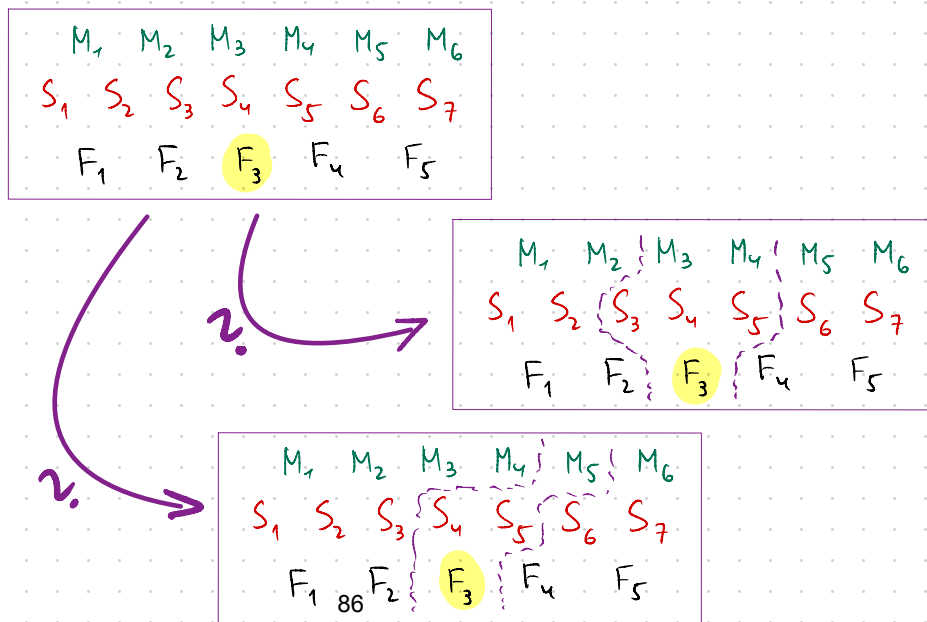
Including:

- cases of "proper partial overlap"
- the "gaps, gaps, gaps" data



Lastly, we saw some data from so-called "lexical acquisition" that showed over-reliance on *isolated forms* in vocabulary development —

Data which, I argued, made perfect sense from the perspective of the architecture proposed here.



METHODOLOGICAL CONSEQUENCES:

Things like...

“What does the word/morpheme *w* mean?”

“How do speakers (of this language)
pronounce the meaning *m*?”

... belong in the folk-science dustbin alongside “nouns are things and verbs are actions”

The following, in contrast, are ontologically sound questions:

“How is syntactic structure S pronounced?”

“How is syntactic structure S’ interpreted?”

But it is incorrect to presume that the chunks of syntax that are mapped onto discrete units of meanings are the same chunks that are mapped onto discrete units of form.

Comparison with other *non-terminal-centric* architectures

- **Nanosyntax (~phrasal spellout)**

Starke (2009), Caha (2019 / to appear)

- **"spanning"** *Svenonius (2012), Merchant (2015)*

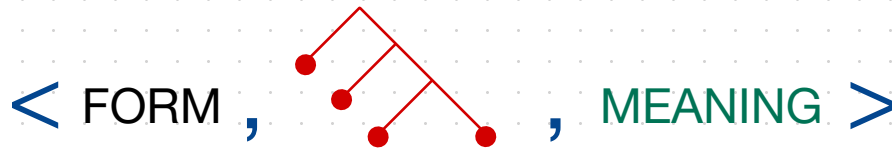
These are frameworks which —

like the architecture proposed here and unlike DM —

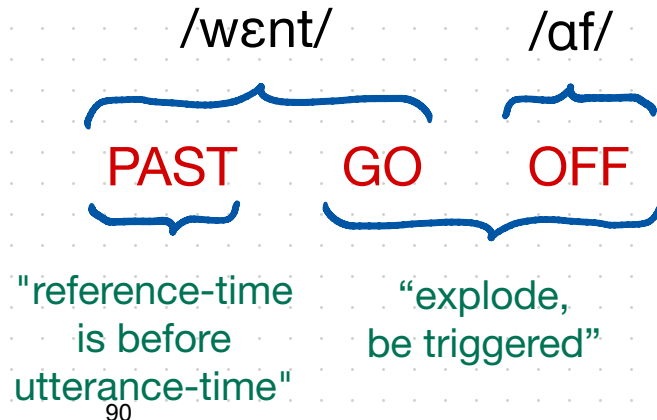
take the operand of syntax-interface mappings to be structured (rather than atomic)

But to the extent that they pair this structured object with both a FORM *and* a MEANING —

they are still fundamentally semiotic in their approach:



We have seen, however, that natural language simply isn't semiotic in this fashion:



If, however, we consider a modification of these frameworks that eschews the <FORM, STRUCTURE, MEANING> triad —
in favor of <FORM, STRUCTURE> pairs and,
separately, <STRUCTURE, MEANING> pairs —
then we are looking at something much closer
to what is being proposed here.

Indeed, the current proposal can be informally characterized
as **"spanning with dissociated PF- and LF-spans."**

Thank you!