Unifying Syntax and Morphology and the SSWL database project
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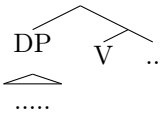
Plan and some background
Two different aspects of my research (the fieldworker and the theoretical linguist): two different, though interconnected, talks.

Historical development: from relatively flat syntactic structures, to ever increasing decomposition and derivational depth....
→ **Decomposition, Cartography and Antisymmetry**.

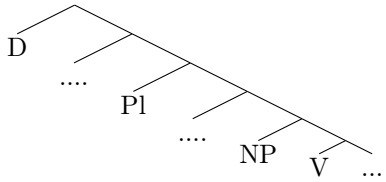
- Detailed maps/cartography ...
  → ever increasing importance of comparative syntax[1]. *first and second part of the presentation*

(1) a. → questions about sequence of Merge.
b. → questions about interfaces, and general architecture.
c. → questions how surface constituency is built. Starting point of the derivation?

(2) What is the starting point of the syntactic derivation?
a. *standard*: DP merges with V or $\sqrt{V}$:



b. *most likely* Pieces of DP are *scattered*[2].



(3) What sequences are stable crosslinguistically? *focus on morphology... first part of the presentation*
a. → universal hierarchies? How-to discover the sequence of Merge?
b. → syntax/phonology interface: morphology and linear order

(4) What (if anything) is variable, what (if anything) is stable in the variation?
→ need to build tools to investigate these questions: *SSWL database project: second part of the presentation.*

An example of variation
Languages differ w.r.t. to the spell out of case.
....but once case is present, it seems to be visible at all structurally higher regions, and a (potentially) stable abstract case hierarchy is revealed (see in partcular Caha (2009)).

What's the theory behind the variation?

[1] See in particular Kayne (1994, 2000, 2005, 2010b), and Cinque (2005a, 2009)
[2] See Kayne (op cit.) and Sportiche (2005)

(5) Hypothesis: case atoms can be merged at different levels in the syntactic derivation[3].
   a. merged at the NP level (Icelandic, Russian, Maasai[4]. → case concord within DP.
   b. merged at the D level (→ visible on DPs, and pronouns).
   c. merged at the D[+person] level (→ English pronouns).
   d. etc..

(6) What other elements may be merged at different levels? Same for Ds? How would this manifest itself? *linked to second part of the talk* .

Plan with an eye towards further talks this week

- **First part**: Morpheme order, and the syntax phonology interface (Koopman 2015,.).

  (7) Do morphological objects form Universal 20 (U20) patterns (Cinque 2005a)?
  Expectations: an exploration.

- **Second part**: The SSWL database project (work in progress with Cristina Guardiano).

[3] The level of embedding conjecture (Williams 2003)
[4] Koopman (2005b)

Part 1– Syntax/Phonology Interface: Generalized U20 and Morpheme ordering

General background

- **Syntax and morphology**: Separate components or not? [5]
- → There is no morphology-free syntactic representation.
  Morphology is syntax based.
  Not: morphology precedes syntax. **Not**: atoms of syntax are "words".
- Families of syntax-based frameworks:
  - **Distributed Morphology** (DM) attributes a major, but not exclusive, role to the syntax.[6]
  - **Antisymmetry** Morphology and syntax are unified. Linear order is read off directly from the syntactic output [7] →
    Nanosyntax Antisymmetry and phrasal spell out/ peeling/ lexical insertion. [8]
  - **Representation Theory** Decomposition, layers of representations, level of embedding conjecture. Special (non-movement) mechanism to relate levels of representation Williams (2003).
- **Deciding between different syntactic frameworks for morpheme ordering: Antisymmetry vs. Distributed Morphology** .

(8) a. Theory internal considerations: decide on the basis of a notion of complexity (which sets boundary conditions).
b. → decide between different frameworks w.r.t. morpheme ordering **on the basis of what is attested and not**?
What are the empirical predictions of the different frameworks? *see below*

- Why not decide on the basis of (an intuitive notion of) complexity)?
  What's wrong with: **" let's keep syntax simple/ structurally minimal. It is OK for phonology to be complex."** .
- Formal language theory defines what kind of syntax we need.
  - As Edward Stabler Stabler (2011) and his colleagues have shown frameworks with antisymmetry or without, with head movement or without, all fall within the class of **Mildly Context sensitive grammars** (see Joshi (1985)) for the proposal that the class of possible human languages is properly included in this class.)
  - This means that we cannot decide between frameworks on the basis of specific implementations.
- So, how do decide?

(9) The syntax we need **is the one that is most suitable for the interfaces with the semantics and the phonology.**
a. → Clean, direct interfaces.
..reason about syntax from the interfaces, which is the appeal of Kayne's LCA.

[5] For an overview that that there is no fundamental difference between morphological and syntactic composition, see (see Sportiche, Koopman, and Stabler (2013) chapters 2 and 12)

[6] Halle and Marantz (1993), Embick and Noyer (2007), Harley (2012), Bobaljik (2015) Bobaljik (2012).. Arregi and Nevins (2012),...

[7] Kayne (1994).
Kayne (2010a), Julien (2002), antisymmetry and phrasal movement Koopman and Szabolcsi (2000), Koopman (2005a, 2014, 2015), among others.

[8] Starke (2010), Caha (2009), Muriungi (2009),....

In sum–Here is the general guide to the form of the syntactic theory we are looking for, one which

- models the empirical data, not just for individual languages, but for the typology of human languages in general.
- falls within mildly context sensitive grammars.
- is appropriate for the interfaces with phonology and semantics.
- provides a likely path to acquisition. *mapping linear orders onto hierarchical structures*
- makes empirical predictions about what is found and what is not.
- is implementable in Stabler's Minimalist Grammars.

Details of the syntactic representation matter!

- Frameworks differ substantially with respect to the specific syntactic representations and derivations that are supposed to underly morpheme ordering.
  - As a result of specific assumptions about syntactic representations, mismatches may arise between the syntactic representations and linear morpheme orders in some frameworks, but not in others. Such mismatches are historically taken to motivate postsyntactic readjustment rules, as in DM, and are part of the standard toolkit.
    In practice, they do not generally lead to a questioning of the syntactic derivations or surface constituency.
  - Does antisymmetry yield a better match?
    - → Contrast DM (broadly construed) vs theory based on Antisymmetry and phrasal movement. Details matter! Can we decide between these two different frameworks on the basis of the available empirical evidence? How far can we get towards unifying syntax and morphology?
    - → spell out predictions from what we know about ordering patterns in the syntax, and investigate.
- General questions:
  - Do we need lowering and local dislocation or not? Embick and Noyer (2001), Embick and Noyer (2007), Koopman, 2015)*suggested answer: no*
  - Is syntax the only component determining linear order? *suggested answer: yes*

Distributed Morphology DM

DM is in essence a (narrow) syntax → "morphology" → phonology model.
Word building is distributed over different components, with spell out following syntactic composition.

- Narrow syntax and morphology use different atoms, and rules.
- Only semantically meaningful atoms are part of "narrow syntax".
  Semantically empty, but phonologically meaningful atoms (case, agreement, linkers, theme vowels etc) are merged in the (postsyntactic) morphological component which interfaces with phonology.

- The syntax in practice is a standard Minimalist one (without antisymmetry), with head with head- (not phrasal-) movement responsible for creating the skeleton of word structure.
- feature bundles are input to the syntax.
- The syntax underlying DM creates expectations about the linear orders of morphemes, namely those derivable by head movement.
  Mismatches require additional mechanisms that deal with what are "unusual" linear orders (unusual w.r.t. to the syntactic expectations), or feature combinations.
  Operations in the postsyntactic morphology module, with its own structural atoms, structure building and reducing mechanisms, and readjustment rules/ realization rules further adjust and modify the syntactic structures for vocabulary insertion and the interface with phonology.
  - morphological merger (lowering based on the hierarchical structure)
  - local dislocation (based on linear, not hierarchical, order)
  - metathesis (reorders morphemes)
  - Impoverishment, fusion, fission, deletion (deal with feature complexes)

Antisymmetry and the specific assumptions underlying the investigation

The specific assumptions that guide the investigation are as follows (assuming late spell out)

- The syntax of natural languages shows a fundamental left right asymmetry (cf starting with Kayne (1994), and numerous books and articles since 1994).
- There is a single syntactic component (no distinction between 'narrow' syntax (interpretable), and postsyntactic syntax).
- Syntax is strongly decompositional, with small atoms (probably single features) and their associated lexical properties driving the derivation.
- Lexical properties have to be locally satisfied, i.e. checked under sisterhood.

  Important: neither complex feature bundles, nor fully inflected lexical items are selected from the lexicon as input to merge, with feature checking from the inside out, mirroring the syntactic hierarchy Chomsky (1992). *for lexical properties of prefixes, suffixes, see below*
- Traditional verb placement or noun placement results from Internal merge ((remnant) phrasal movement, not head movement (a conclusion that follows from crosslinguistic generalizations), as well as language internal considerations Koopman and Szabolcsi (2000).
  This holds for morpheme ordering as well.
- There is no syntax/ structure building postsyntactically, hence there can be no postsyntactic adjustment rules for morpheme orders either.
- Within this framework, what are the assumptions about **prefixes** and **suffixes**?

  (10) a. Prefixes are heads (or perhaps specifiers of silent heads) merging with a complement.
  b. Suffixes merge with a complement, and are endowed with an epp feature Koopman (2005a), (Sportiche, Koopman, and Stabler 2013).
- The role of epp:

– **epp**: forces building a specifier.
Triggers internal Merge (and perhaps external merge (expletives)).

– Hypothesis:
epp is the locus of phonological restrictions (size restrictions).
Claim: these are stated on the output of the syntactic derivation Koopman and Szabolcsi (2000), "grafts" on structure building epp features in (Koopman 2014), Koopman and Szabolcsi (2000).
This restricts the effects that phonology can have on syntax to highly local syntactic environments at the interface with spell out, part of the properties of lexical items.

Basic epp properties, with different distributional effects:

* epp → *second position phenomena: move closest XP*
* epp_{cat}: forces building a specifier of a specific category (Vp, A,.., epp d), and moving a

These can further combine with Ph-restrictions:

* epp $_{Phsize(min--max}$ (max=min=light foot, CV, etc..
* epp (Min=1): must have Ph material at spell out
* epp .. Min=o: must have P material at some point in the derivation
* epp .. [[[Ph]]] max depth of spelled out Ph material (computed on the output of the syntactic derivation)

Testing predictions

- Use the research around the syntactic modeling of Universal 20 (U20) Cinque (2005a) to generate empirical predictions for a crosslinguistic typology w r t morpheme order.
U20 patterns Cinque (2005a, 2009) generalize to many other syntactic domains (Koopman (2010), including object positions Koopman (2015)).

(11) If morphology is syntax, we expect the same ordering patterns and gaps in morphology that we find in syntax.

- In Koopman (2015) I moved from arguing about patterns we find to testing the actual predictions, working out case studies, and implementing the syntax, the phonology, and the lexical properties of the lexical items involved. (in Stabler's Minimalist Grammars)
- Here I will lay out the argument, and present one case study.
  – has consequences for the independently motivated syntax/architecture we need.
  – has implications for the cartographic project (which hierarchies are fixed universally (and why))

U20 and Predictions from Generalized Universal 20

- Approach morpheme ordering from what we currently know about typological ordering patterns in the domain of syntax.
→ building on the vibrant research that has emerged around Cinque (05) 's modeling of Greenberg's Universal 20 (U20).
- which hierarchies form a U20 pattern? which do not? Why?

In a nutshell: from Greenberg (1963) to Cinque (2005b) Greenberg's extensively studied[9] Universal 20, formulated as follows in Cinque (2005b):

[9] Hawkins (1983) Deligianni (2001), Croft &Rijkhoff 1981, and Cinque himself, among others)

(12) a. *Prenominally*:
The order of demonstrative, numeral, and adjective (or any subset thereof) conforms to the order Dem Num A (basically uncontested).
b. *Postnominally*
The order of the same elements (or any subset thereof) conforms either to the order Dem Num A or to the order A Num Dem.

Only 14 out of the 4!=24 logically possible patterns are attested.
These generalizations hold up in Cinque's now extensive database of 1700 languages.

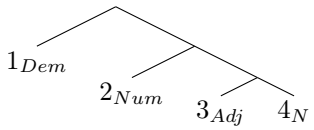
In the table below and throughout: 1, 2, 3, 4 represent an independently established syntactic/semantic(scopal) hierarchy where 1 c-commands 2, 2 c-commands 3, etc). For U20, this translates as 1= Dem, 2= Num, 3= Adj, and 4= N. with 1Dem > 2Num > 3 Adj > 4 N >.

U20 patterns: Attested ✓; Un-attested 0 [10] Neutral orders (no contrast)

1234	✓	1324	0
1243	✓	1342	✓
1423	✓	1432	✓
4123	✓	4132	✓ or 0?
2134	0	2314	0
2143	0	2341	✓
2413	0	2431	✓
4213	0	4231	✓
3124	0	3214	0
3142	0	3241	0
3412	✓	3421	✓
4312	✓	4321	✓

Cinque's modeling:

(13) a. Antisymmetry (Kayne 1994).
b. An independently motivated fixed universal syntactic/semantic hierarchy:



c. Different surface orders (in neutral orders) are derived from this hierarchy by (leftward) Movement (Internal Merge) of
(i) a *phrase*, that
(ii) must contain the lexical noun.

Variation(language internal or crosslinguistic) is due to the interaction with two different types of parameters
(i) **height-of-movement**: how high up in the hierarchy does the subtree containing the noun move (if at all)?
(This captures well-established empirical generalizations starting with Pollock (1989) study of the distribution of verbal forms in English and French.)
(ii) **pied-piping** parameters: determine if the nominal constituent can pied-pipe Adjectives, or Numerals etc. on its journey up into the hierarchy.

[10] Frequency of patterns omitted, alternative orders not included/not known.

(14) Unattested patterns cannot be derived.

- U20 type patterns turn out to:
  generalize to many hierarchical syntactic/semantic domains (i.e. given an independently motivated (universal) syntactic/semantic hierarchy, it turns out only certain linearization patterns are attested, and
- show a fundamental *left right asymmetry* [11]
- Research question: Do "morphological" objects form U20 patterns?

  If there is one computational system underlying orders in syntax and morphology, if morpheme order is entirely determined by the syntax, we derive, through generalized U20, predictions about attested and unattested morphological patterns crosslinguistically, given a particular fixed hierarchy:

Expected Patterns and Gaps for any hierarchy of 123

123	yes
132	yes
312	yes..
321	yes
231	yes
213	?0

- Is this typology attested?
  Some orders are expected to arise: 312.
  These necessitate lowering/infixation in DM.
  Some gaps are expected (*213). DM makes no such predictions.

A comparison: Expected Patterns and Gaps for 123 under U20, and DM

	U20	DM		
123	✓	✓		
132	✓	✓		
312	✓	✓from 132 by lowering 1		
	✓from 321 by local disloc of 1 to the left			
321	✓	✓by head movement		
		✓from 1 [32] by lowering 1 231	✓	✓
		✓from 321 by leftward mvt of 2 to 3		
		✓from 321 by local dislocation of 3		
213	0	✓ from 123 by lowering 1		

(15) On 213: Second position phenomena have a different derivational signature from U20 orders. Derive as a consequence of epp property on some lexical item with a epp property (satisfied through attract closest XP).

- → Case studies. Hyman (2003), Chichewa (Bantu), Wolof, Ryan (2010), Quechua Muysken, Myler (2013)

[11] Cinque (2009), Abels and Neeleman (2009), Abels (2011), Koopman (2015)....

- Predictions about asymmetries? Asymmetries prefixes and suffixes: *213
  Thanks to Andre Nevins for focusing the research on three potential cases of 213 orders in his class/workshop presentation. Working out individual case studies within the current assumptions of the interactions with the phonology is important, and the last word has not been said about these cases. For some discussion, see Koopman, 2015.

- If so, prefixes can be (more reliably used) to establish underlying hierarchies.

- Care should be taken drawing conclusions from suffix ordering, as variation between 321 and 312 is expected.

- What about the cases that the DM literature have show-cased as requiring special postsyntactic mechanisms (merge/lowering) or local dislocation? Do these fall within the predicted patterns work through each case, so far: yes?

- Interactions with cyclic phonology, and non local phonology are found in 312 cases (and only in 312 cases). Kiparsky (2012), Myler (2013).

Expected Patterns and Gaps for any hierarchy of 123

123	✓ Malagasy ..
132	✓ Zulu ..
312	✓Chichewa, Wolof, Huave, Japanese, Korean,..
321	✓ Chichewa, Wolof, Japanese, Korean, ..
231	✓ Malagasy, Dutch.
213	0

Expected Patterns and Gaps for any hierarchy of 123: English

123	✓ [re [de [activate]]]
132	✓ [un [lock able]] (not able to be locked)
312	✓ [madonna [wanna [be]]];
321	✓ [[[[nation] al] iz] e]
231	✓ [[un [lock]] able])(able to be unlocked)
213	?0

(16) evaluating *213. .

a. redeactivate Surface scope $re > de > activate$

b. dereactivate Surface scope $de > re > activate$

- If syntax and morphology are unified/ a single computational system, we expect to find traditional syntactic islands. Do we?

- For an identical fixed hierarchy crosslinguistically, we expect to find U20 typology crosslinguistically. But not every hierarchy is a U20 hierarchy (determiners, articles). See the appendix for expectations. At this point, we don't have typological data comparable to Universal 20 for the specific hierarchies. (i.e. the situation is understandably very different from Greenberg's U20).

A case study from Wolof

Wolof present a particularly interesting case of morpheme orders which show a mix of stranding, pied-piping, and failures of transitivity.
We next turn to an analysis of the various morpheme orders that can arise from a single fixed hierarchy in Wolof (Atlantic). [12]

Morpheme orders should fall out:

- a fixed (universal) hierarchy (independently motivated, consistent with universal)
- lexical properties of the specific morphemes.
- pied-piping and stranding options
- island constraint
- Attested orders should fall within possible U20 patterns, and no instances of gaps should occur.
- The analysis should be internally consistent, and make further predictions.

These expectation are borne out, as we will see below.

This section is organized as follows.

- start with V-suffix orders, and then look at the order of 5 elements
- determine a fixed hierarchy
- figure out the lexical properties of the parts (construct lexical entries) (at every step):
  how does the linear order map onto the hierarchical order?
- build up the analysis starting with the smallest patterns (V+ 2 suffixes, V+ 3suffixes, V + 4 suffixes)
  Why? (Acquisition)
- map linear order onto the syntactic/semantic hierarchy. linear order =output of the syntactic derivation. Do the patterns fall within U20 ?
- → puzzles? problems? predictions?
- some derivations are excluded because they violate islands

Wolof data

(17) Wolof (Atlantic), SVO, Prep, noun classes, D final;

a. structure SVO sentence (neutral, non-negative, no focus; root)
   DP_S V- DECL/FIN S_{cl}- (V) O_cl (S) (V) O

The data presented in this section are drawn from Buell and Sy (2005)[13]. They present the complete ordering patterns for the following four suffixes (a small selection of Wolof's 25 or so verbal suffixes):

- The impersonal causative suffix *-lu*:

[12] The specific research presented in this section is the result of collaborative research on Wolof by and with members of the UCLA Africanist linguist community in early 2000 (Harold Torrence, Leston Buell, Mariam Sy (native speaker linguist of Saint Louis Wolof)). What is new here w.r.t. the earlier work is framing the derivations in U20 terms, looking for what is expected to occur, and what should not, given the properties of lexical items in question.

[13] who put to test an analysis sketched in Koopman (2004), which is taken up here and further expanded

(18) Faatu togg -lu -na jën wi.
Faatu cook -IMP.CAUS -DECL.3 fish the
Faatu had someone cook the fish

In the impersonal causative the causee cannot be expressed, and must be interpreted as an existential.

- the causative suffix *-loo*:

(19) Faatu togg -loo -na Gàllay jën wi.
Faatu cook -CAUS -DECL3s Gàllay fish the
Faatu had/made Gàllay cook the fish.

- Benefactive *-al* [14],

(20) Faatu togg -al -na Gàllay jën wi.
Faatu cook -BEN -3s GĹllaay fish the
Faatu cooked the fish for GĹllaay.

- and finally, instrumental -e.

(21) Faatu togg -e -na jën wi (ag) diwtirr
Faatu cook -INSTR -3s fish the (with) palm.oil
Faatu cooked the fish with palm oil.

Each suffix must build a specifier, and attract a (remnant) verbal category (Vp), as all arguments show up outside the complex verb.

Lexical entries (to be further specified):

(22) a. lu, ImpCaus, $+epp$
b. loo, Caus, $+epp_{Vp}$
c. al, Ben, $+epp_{Vp}$
d. e, Instr, $+epp_{Vp}$

A fixed hierarchy

When all morphemes cooccur they occur in a fixed linear order. But in smaller combinations, we see a mixture of stranding and piedp-piping.

(23) Jàngalekat bi bind -lu -loo -al -e (/luloole/)
teacher the write -IMP.CAUS -CAUS -BEN -INSTR
- na xale yi gan gi taalif bi kereyon.
- DECL child the guest the poem the pencil
The teacher had someone make the children write the poem for the guest with a pencil. (Buell and Sy 2005: 14)

(24) Linear order and Hierarchy?
a. $lu_{impcaus} > loo_{caus}$
b. Instrumental can only combine with the lexical verb, not with either causative $lu_{impcaus} > loo_{caus} > Inst$

[14] Benefactive *-al* is syncretic with the change-of-state selecting causative *-al*. The Benefactive *-al* and the change-of-state causative *-al* may cooccur. A third *-al* is the imperative suffix

c. Benefactive can only combine with the lexical verb, not with either causative $lu_{impcaus} > loo_{caus} > Ben$
d. $al_{ben} > e_{Instr}$[15]

(25) $lu_{impcaus} > loo_{caus} > al_{ben} > e_{Instr} > V$

(25) gives us the complement domains.

lu attracts just the V (itself morphological complex). No role up, all derivational suffixes are stranded! → phrasal movement.

(26) a. lu, ImpCaus, $+epp_{Vp[+small]}$,
b. loo, Caus, $+epp_{Vp}$
c. al, Ben, $+epp_{Vp}$
d. e, Instr, $+epp_{Vp}$

Not done! Other orders are possible with fewer combinations.

Patterns of 3, and derivations

We observe 312 and 321 orders for combinations of 3 elements in this hierarchy. These are precisely the two possible U20 orders that can be derived for multiple suffixes, with 312 solidly attested:

(27) *Attested Patterns of 3*

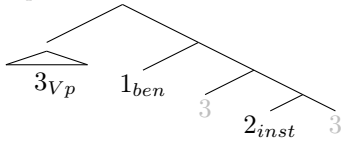
a.	$V - al_{ben} - e_{inst}$	312
b.	$V - e_{inst} - loo_{caus}$	321
c.	$V - loo_{caus} - al_{ben}$ /lool/[16]	312
d.	$V - lu_{impcaus} - al_{ben}$	312
e.	$V - lu_{impcaus} - loo_{caus}$	312
f.	$V - lu_{impcaus} - e_{instr}$	312

- The instrumental suffix strands below the benefactive and $lu_{impcaus}$, yielding a 312 order ((27-a) and (27-f)).
- Vp pied-pipes the instrumental to causative loo_{caus}, yielding a 321 order which reveals the 32 substructure underlying the stranding order.
- The remaining orders in (27) are all 312 stranding orders: $-al_{ben}$ strands after the loo_{caus} (27-c) (but note that V pied pipes the instrumental to loo_{caus}); benefactive, causative loo_{caus} and instrumental strand below the impersonal causative $lu_{impcaus}$ (27-d), (27-e), and (27-f).

This leads to the following derivations for the examples in (27).

Derivations: Patterns of 3

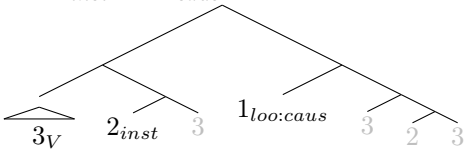
a. $Vp - al_{ben} - e_{inst}$ 312



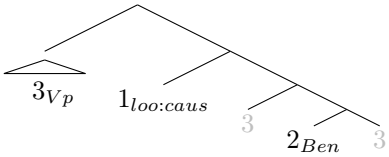
[15] Further support comes from comparative syntax. Schweikert (2005:p.132) uses three syntactic tests to combinations of PPs in the German Mittlefield. QS (quantifier scope), PLR(pair list readings) and IF (information focus). These all gave rise to the same hierarchy of PP types or thematic roles: *Evidential* > *temporal* > *locative* > *Comitative* > *Benefactive* > *Reason* > *Source* > *Goal* > *Malefactive* > *Instrumental/Means/Path* > *Matter* > *Manner*

[16] -loo and -al contract to /lool/, suggesting -a may be a separate morpheme

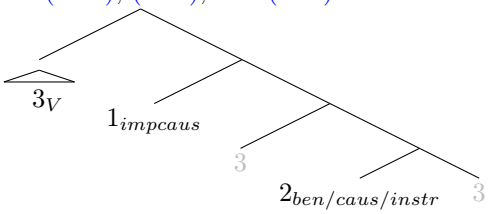
b. $V - e_{inst} - loo_{caus}$ 321



c. $V - loo_{caus} - al_{ben}$ 312



d. for (27-d), (27-e), and (27-f) 312



As we can see, stranding keeps the Vp structures at spell out small, as Vp is an immediate sister to the highest suffix. V ends up as close to the suffix as possible, i.e. both structurally and linearly adjacent.

(28) Individual suffixes differ whether they force stranding or not.

(29) a. lu, ImpCaus, $+epp_{Vp[+small]}$,
b. loo, Caus, $+epp_{Vp}$
c. al, Ben, $+epp_{Vp[+small]}$
d. e, Instr, $+epp_{Vp}$

Pied-piping embeds the V(p)(27-b), and as a consequence V is no longer the immediate sister of the highest suffix, nor linearly adjacent.

Lexical properties don't explain everything. We see that the instrumental sometimes pied-pipes, and sometimes strands.

(30) If the instrumental can pied-pipe, or strand, why is instrumental stranding with the loo_{caus} as in (31) c excluded?

(31) a. $V - al_{ben} - e_{inst}$ 312
b. $V - e_{inst} - loo_{caus}$ 321
c. $*V - loo_{caus} - e_{inst}$ *312

(32) Pied-pipe when you can (widely attested within Wolof)
Stranding must be forced by the epp size restriction of some individual lexical item

(33) Problem: piedpiping Ben is excluded: * V-al -loo
a. As we see below, the sequence [V-al-e-]- loo is fine.

This cannot be forced by lexical properties of *loo*. There must be another reason to strand -al.
I leave this problem open: this recalls the Chichewa/(almost total cross Bantu ban) on *V-Appl$_b$*en*-Caus for benefactives. these both add a + human argument, which must move to positions outside the VP, suggesting minimality may be at play
More on this below..

We now have the following grammar fragment to derive the linear orders.

(34)
a. Merge (External and Internal)
b. Phrasal movement (feature driven: all suffixes have a +epp$_V$ property, some morphemes have an additional size restriction (+$epp_{V[+small]}$).
c. Fixed hierarchy (Wolof), morphemes with size restrictions indicated (on their left). $_{[+small]}lu_{impcaus} > loo_{caus} >_{[+small]} al_{ben} > e_{Instr} > V$
d. pied-pipe if you can.
e. stranding forced by (i) size restriction (ii) other where do we look?
f. Remaining problem: blocking piedpiping Ben: * V-al -loo

Patterns of 4

Here are attested patterns of 4 are found for this fixed hierarchy.

(35) *Attested Patterns of 4*:

a.	$V - e_{instr} - loo_{caus} - al_{ben}$	4312
b.	$V - al_{ben} - e_{instr} - loo_{caus}$	4231
c.	$V - lu_{impcaus} - al_{ben} - e_{instr}$	4123
d.	$V - lu_{impcaus} - loo_{caus} - al_{ben}$	4123

- (35-a) and (35-b) are two alternate orders for the same elements in the hierarchy[17].
- (35-a) derives by V pied-piping the instrumental, and stranding $-al_{ben}$, (35-b) derives by pied-piping the benefactive as well $V - al_{ben} - e_{instr}$
- (35-c) and (35-d) involve smallest Vp movement, basically spec to spec movement, because of the size restriction of $V - lu_{impcaus}$.

Wolof orders and U20

We can now compare the patterns found in this specific hierarchy in Wolof morphology against the possible U20 patterns in the noun phrase, given a single hierarchy of 4 elements. Since all the morphemes in Wolof are suffixes, there are 6 logically possible orders in the table on page (12), namely all those starting with 4=V.

Patterns in Wolof morphology from a single hierarchy;
*Expected gap in red Expected (and attested), expected but ungrammatical * Table to be adjusted*

4123	(35-c), (35-d)	4132	*(37)
4213	0	4231	(35-b)
4312	(35-a)	4321	(occurs in Wolof, but not with these morphemes)

- 3 of the 5 patterns occur.
- A fourth pattern, 4213 is excluded in principle, and a predicted gap.

[17] Buell and Sy (2005:(28) and (29)) show that the preferred argument orders used with the two forms are different. Given a postverbal linear V+affixes DP1 DP2 DP3 DP4 order, the preferred interpretations of DP1 and DP2 vary (DP3= (inanimate) theme of V and DP4 (Instr) are constant). With (35-a) DP1 is the agent of the transitive V, and DP2 is the beneficiary, with (35-b) DP1 is the beneficiary, and DP2 the agent of V. This suggests pied-piping plays a role in smuggling and aligning the arguments. The syntax of postverbal arguments orders, and how these relate to the complex morphological form remains to be studied.

- 4321 is widely attested in Wolof, but not for this hierarchy.
  This follows because two of the suffixes in question have small size restrictions, as shown in (36).

  (36) $_{[+small]}lu_{impcaus} > loo_{caus} >_{[+small]} al_{ben} > e_{Instr} > V$

- 321 can surface (*V-e-loo*), but 4321 cannot in this particular hierarchy: it would require at least one higher suffix than *loo* without a size restriction. There is no such morpheme in this particular hierarchy

- Outside of this particular hierarchy, there are no problem. (*V-e-loo*) can be merge with a suffix that translates as *go*
  Each of these V complexes can merge with Fin in neutral (non negative, non focused clauses) (where Fin is is higher than the clitic complex).

- 4132, however turns out to be ungrammatical. Why?

  (37) $*V - lu_{impcaus} - e_{instr} - loo_{caus}$ 4132

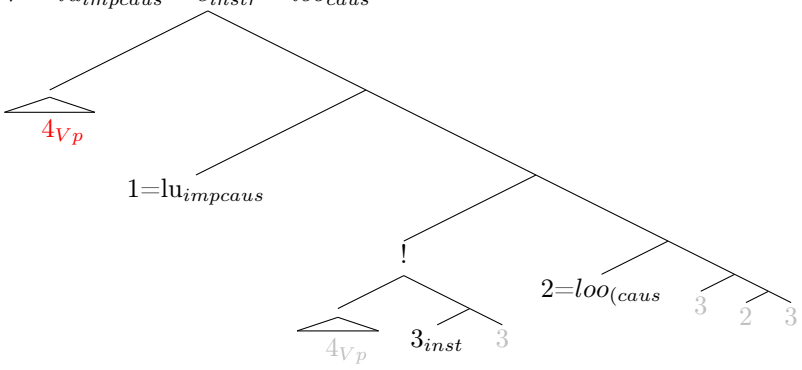
  The ungrammaticality of (37) is puzzling, as the substructure it would be derived from is itself well-formed ((35-a)):

  (38) $V - e_{inst} - loo_{caus}$

- **What goes wrong *4132: you would have to subextract Vp from a complex specifier, arguably an island violation!**
  Suppose that $lu_{impcaus}$ merges with the independently converging (38).

  the size restriction of $Lu_{impcaus}$ would force subextraction of Vp to satisfy its epp properties, yielding the following derivation:

  (39) $*V - lu_{impcaus} - e_{instr} - loo_{caus}$



- → Island effect.
  subextraction from a complex specifier is prohibited, as frequently argued (and an assumption we had to make in Koopman and Szabolcsi (2000) to make verbal complexes work).

- extraction from a complex specifier is not permitted (at least in some cases). *4132
  → stranding can be forced if the derivation fails to converge.

Follow up: discussion questions

(40) But: when is spec extraction from a spec an island violation and when is it not?

a. Long literature dealing with subject island/left branch violations (no extraction from complex specifiers: when it looks you extract, you extract from a separate constituent)
b. Problems with smuggling (the smuggled constituent must be a big larger, or Koopman and Szabolcsi (2000)
c. Phases.. how would it work?

(41) On aside on 4132 in the Noun Phrase (from Cinque's extended data base, and Cinque 2015 paper (Is it a U20 pattern or not? Cinque 05 assumed it was possibly spurious..)
I would like to argue it is spurious.

- "In Cinque (2005) the order N Dem A Num(=4132) was assumed only tentatively as a genuine order, as in my sample at the time only one language displayed this order as an exclusive order, Pitjantjatjara (Bowe 1990:111), two more having it as an alternative order only (see Cinque 2005,fn27). Since then that order has proved to be attested in a fair number of other languages, both in Dryers (2013) sample and in the enlarged sample utilized here. "(from Cinque, 2015)

- analyses:
its the numerals (they can be adjectives (Baker, Abels and Neelman, Shlonksy): look at their morphology))
its how languages treat Adjectives Cinque (2010), Dixon..
How to support the latter empirically is clear!

Patterns of 5

There is only one possible pattern of 5:

(42) *One Attested pattern of 5*
$V - lu_{ImpCaus} - loo_{Caus} - al_{Ben}\ e_{Instr}$ 51234

This follows straightforwardly.
$Lu_{impcaus}$ has a size restriction, it attracts the smallest Vp, stranding all suffixes.

(43) $_{[+smallVP]}lu_{impcaus} > loo_{caus} >_{[+smallVP]} al_{ben} > e_{Instr} > V$

Other orders are excluded, because of the ban on subextraction from a specifier: neither the independently occurring surface strings in (35-a), nor (35-b) can feed into this pattern, because of the ban on subextraction of a complex specifier is at work here as well, as indicated in (44).

(44) a. $*V\ - lu_{ImpCaus} V - e_{instr} - loo_{caus} - al_{ben}$ *51423
b. $*V - lu\ V - al_{ben} - e_{instr} - loo_{caus}$ *51342

In conclusion

- The complex morphological patterns for a single fixed hierarchy in Wolof discussed in this section track the U20 patterns in the noun phrase perfectly, as we show below in the adjusted table.

- Lexical properties of the morphemes can be deduced from quite simple surface properties, with pied-piping and stranding playing a role in the derivations.

- Islands effects exclude some expected orders. The fact that island effects play a role is expected if there is no distinction between morphology and syntactic composition.

4123	✓ (35-c), (35-d)	4132	0 *(37)
4213	0 not found	4231	✓ (35-b)
4312	✓(35-a)	4321	✓non occurrence explained in this particular hierarchy

2 patterns are excluded in principle, 4213 because 42 is not a constituent, and 4132, because subextraction cannot be violated. 3 of the patterns are found, and a 4th possible pattern, which we expect to be possible, occurs elsewhere in Wolof but not in this specific hierarchy, because the properties of the morphemes/lexical items do not make it possible for this order to arise.

In conclusion

Can we unify syntax and morphology?
Can we test predictions to distinguish between different theories?

(45) Use results from generalized U20 patterns in the syntax to make old questions about the relation of morphology and syntax tractable.
While in many ways programmatic, results are encouraging!
(raising many further questions).

The theory defended here yields results:

- models the empirical data, not just for individual languages, but for the typology of human languages in general.
- falls within mildly context sensitive grammars.
- seems appropriate for the interfaces with phonology and semantics.
- provides a likely path to acquisition. *mapping linear orders onto hierarchical structures*
- makes empirical predictions about what is found and what is not. So far test results are highly encouraging, but much more work is needed in the future.
- is implementable in Stabler's Minimalist Grammars.
- needs no postsyntactic ordering adjustments

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Part 2: Introduction to the Linguisticexplorer project: the SSWL database and Terraling

Need for a syntactic/semantic database that can support current and future theoretical research

- Internal to formal linguistics
  - The role of comparative syntax and future theoretical development.
  - Possible application of current available and future research tools (phylogenetics,...)
- External to formal linguistics
  - Database to complement and offer an alternative to WALS.
  - Database were variability is not hidden, properties are finegrained, which do not only code what we already know, but allow future discovery and exploration.
  - General education of the scientific public at large.

SSWL: (Syntactic (and Semantic) Structures of the World's Languages),
(Chris Collins, Richard Kayne), Hilda Koopman and Dennis Shasha (Prof Computer Science NYU, plant genomics)). http://sswl.railsplayground.net/

Goal: develop an open-ended database (for the community by the community) of the (morpho-)syntactic structures of the world's languages that can serve as a tool in support of fundamental research.
Vision: build a "genomics" database of the (morpho-) syntactic/semantic properties of human languages.
This project is directly related to strongly decompositional approaches to syntax, and cartography, "maps of structures".

Provide over time as detailed cross-linguistically comparable data as needed:

- to document the internal structure of such systems
- to document all the basic ingredients needed for their description
- to record the extent and limit of their variation

Terraling– a collection of databases. http://terraling.com SSWL Hilda Koopman, Dennis Shasha (NYU), Marco Liberati (back-end), Hannan But (back-end).

Terraling, version 2.: (Reprogrammed), deployment imminent.

Data base functionality:
Building a database in support of theoretical research is a longtime project: the database must be able to last, allow for new content and new languages to be added, which, in the case of SSWL must involve linguistic experts (expert crowdsourcing).

- store the data in a secure world-wide accessible database-backed website
- allow flexible additions to data as new properties and new languages are added
- allow disciplined and secure curation of data by multiple linguists (user friendly, for contributors, administration, and the general research community)

- allow sophisticated queries.

Relational database with highly flexible database scheme.

(46) Language, property, value (yes,no)
Italian, SV, yes
Italian, VS, yes

- Database schema can be adapted to anything, as there is no preconceived idea of what Language is. Can be adapted to other linguistic (as well as non linguistic) research projects.
  - Sand data from Meertens institute
  - Cinque's Universal-20 database (in final stages of conversion)
  - anaphora ..
  - semantics *Conjunction and disjunction from a typological perspective*, Viola Schmitt (Vienna)
  - Possible projects to develop:
    Left (and right) periphery (syncart), microvariation in Indian languages, microvaration in Italian dialects, microvariation in African languages (special areas, typology of adjectives...

Who is involved in "seeding" the database?
Linguistic experts: propose properties that generate the data. *How to.. (see below)*
Linguistic experts: (native speaker linguists where available, people with a deep knowledge of the language set the properties for the language and provide examples.)

Current state of the database, accessed on 6/6/2016...
Waiting for migration, as soon as Terraling version 2 is deployed.

Number of Languages: 262
Number of Contributors: 390

Number of Properties: 148
Number of Examples: 4123
Number of Property:Value Pairs: 17677

Research:

- download

Search functions:

- Language (any subset of languages), Properties, (all, any), Cross (up to 6 properties), Property Values (AN: yes, NA, yes), examples. glosses, strings...
- Compare (all values for up to 8 languages)
- Universal Implications if .. then (any, all, for a group of languages, any language....)
- Similarity trees
- Geo-mapping tools
- ..other visualization tools (in development).
- Save searches.

Towards a cartography of the D region: Bare nouns and "Articles" (Demonstratives, case, classifiers, and noun classes.)

Cristina Guardiano and Hilda Koopman.

This short document discusses three aspects of the documentation project to code certain properties of the D region, concerning the distribution of bare nouns and determiners. This illustrates the various aspects involved in the development of content for the SSWL/linguistic explorer database project.

- Seeding the database (property definitions, defining the task, and illustrate the values with examples from languages)
- Populating the database (with property values, yes/no for language X)
- Exploring the database (browse, query, download, examining predictions, looking for gaps... a very preliminary investigation)

Nominal structures in object position, (and in subject position)

So far, a set of 22 (subdivided in 3 or 4) properties has been deployed in 2014 and 2016 that probe for a particular set of phenomena related to nominal structures.
(this is in addition to 33 more basic nominal properties). Another 15 properties are ready for subject properties and will be deployed after migration.
The properties are organized around the following variables: which can be further expanded, or refined

1. indefinite vs. definite reading of (unmodified) noun phrases
2. generic reading of noun phrases
3. mass nouns vs. sg/pl count nouns
4. nouns with (intrinsically) unique reference
5. proper names, proper names modified by adjectives
6. ordering properties:
    - defart-N, N defart, art Name, Name article etc... *to add, still missing: Order indefinite articles-N, and scopal properties for indefinites*
    - order Modifier-Proper Names
7. syntactic position: object (*vs. subject properties have been prepared but not yet posted*)
8. vocatives

In particular, we are interested in whether a nominal expression, according to each of the variables 1-6/ 1-5-7:

a. can be "bare" (i.e. lack an "article"), or
b. must have an "article", or
c. can have an article (i.e. can either be bare or occur with an article)

This gives rise to different property definitions for objects, organized in the following fashion. The task (defined below) asks for yes/no values:

(47) Indefinite mass nouns in object position

a.	can be bare	yes/no
b.	must have an article	yes/no
c.	can have an article	yes/no

(48) definite mass nouns in object position.

a.	can be bare	yes/no
b.	must have an article	yes/no
c.	can have an article	yes/no

and so forth.

These properties apply to:

- unmodified mass/count nouns (NO quantifiers, adjectives, possessors, relative clauses, adpositional complements)
- objects in affirmative transitive sentences (NO negative, interrogative, passive)

Each **property definition**: is a small field-work questionnaire with instructions on how to set the value, elicitation contexts and illustrations, and is organized in the following way.

- definition of the property
- elicitation context(s)
- explicit instructions on how to set the values for the language in question
- examples that illustrate the yes/no values for different languages
- comments

Definitions: What counts as bare and what counts as an "article"?
This is necessary because of the absence of stable linguistic definitions: the current terminology depends on the language, but does not allow crosslinguistic comparisons
For the purposes of this set of properties, we do this as follows (this is repeated and slightly adjusted in each property definition),

A bare noun phrase ....

- for languages with definite/indefinite articles, specificity markers, definite/indefinite affixes: lacks an article
- for languages without articles but with case, adpositional affixes/endings, classifiers, noun classes/augments, exhibits no alternation with noun phrases of a particular type (defined in each property definition)

An "article" .....

- self explanatory for languages with articles
- for languages without articles: sometimes "case", adpositions, count as "article" (if case expresses a contrast definite and indefinite readings of objects.)
- Demonstratives counts as an "article" if they can be used like articles (and should show homogeneity (aka as consistency) effects (Löbner, 2000))

- Classifiers can count as articles (in certain readings/circumstances).
- noun class markers/ augments may count as articles in a subset of contexts.

The way to proceed: read the property definitions.. (these define what you are supposed to do)

(49)
a. step 1: "fieldwork": elicit examples in language X. (Questionnaire, with elicitation sentences and contexts;
b. step 2: construct the examples (can be more than one per property), paying attention to the property definitions.
Type up the examples in the format given, (and feel free to send them to me and Cristina for comments).
c. step 3: Classify the examples: read property definitions carefully, and set the property values. (Use the supporting excel sheets..)
Can the task be done in your language? note any questions/ unclarities, and run them by us.
d. step 4: (creating the language and) enter the property values, with examples, and comments into the database (we added a *how sure are you* measure in Terraling.
Comments about distribution are particularly important. In many cases further work will be needed, please feel free to indicate so !
e. step 5: explore with the database search tools (simple at this point most of the search tools in the original pilot http://sswl.railsplayground.net/ are no longer functioning, but they will in Terraling. Searches include: complex searches, implications, compare (up to 8 languages), similarity trees, map results, download, saved searches with stable handle (when one returns to the database the searches will update...)

Findings and Theory

The property definitions define 3 types of languages for each set of a/b/c/:
3 types of languages are excluded.

Indef Mass N	can be bare	must have article	can have article	found?
	yes	no	yes	found
	no	yes	no	
	yes	no	no	
*	yes	yes	no	0 *contradictory*
*	no	no	yes	0 *contradictory*
*	no	yes	yes	0 *contradictory, for same article*

Some raw results 6/28/2016

...for object positions for around 62 languages (not a balanced sample):

Indefinite Mass in object position: *where B stands for blank/not yet set.*

Indef Mass N	can be bare	must have article	can have article	found?
	yes	no	yes	12/62 Russ.(perf), Ital...
	no	yes	no	3/62 .. (Fr, Bas, Sam)
	yes	no	no	41/62 nounclass Bantu, English ..
	yes	no	B(lank)	5/62 (missing value)
	no	yes	B(blank)	1/62

(50) Bare mass in object position: 56/62
12 languages allow a partitive/genitive "article"
2 languages must have partitive/genitive article for mass nouns, and disallow bare nouns

Definite Mass in object position: w2a,w2b,w2c:

Def Mass N	can be bare	must have article	can have article	found?
	yes	no	yes	8/57
	no	yes	no	34/57
	yes	no	no	11/57 nounclass bantu
	yes	no	B	1/57
	no	y	B	1/57
	no	yes	yes	0 1/57

(51) Since Case can count as an article, and Dem-like forms can count as an article, a contradictory setting can arise for the *can have an article* definite mass/count nouns.

Finnish (from SSWL, Anders Holmberg)

(52) Marja joi maidon
Marja drink.PST.3SG milk.ACC
Marja drank the milk
comment Definiteness encoded by case: PART vs. ACC., so: must have an article is yes

In colloquial Finnish a demonstrative-like article can optionally cooccur with the Acc. so can have an article(dem) is yes. –> no yes yes

Indefinite sg Count in object position: w3a, w3b, w3c

Indef Count N	can be bare	must have article	can have article	found?
	yes	no	yes	16/60
	no	yes	no	21/60
	yes	no	no	17/60 nounclass bantu, Eng ..
	yes	no	B	5/60 (B=blank;missing value)

Definite sg Count in object position: w4a,b,c.

Def sg Count	can be bare	must have article	can have article	found?
	yes	no	yes	11/57
	no	yes	no	33/57
	yes	no	no	9/57 ..
	yes	no	B	5/57 (missing value)

Research questions

Form (including silence), meaning, distribution.

- What is the decomposition of the (definite) D region ($\text{def}_{fam,+2}$, $\text{def}_{uniqueness}$, $\text{def}_{?}$)..
- What is the decomposition of the (indefinite) region? (indefinite articles and numerals, indefinite quantifiers ('some"), scope properties ...)
- Is there a fixed universal hierarchy ? (from individual languages to universals) ?
- Are there left right asymmetries? (as expected under antisymmetry;)
- Are there predicted gaps (once we have a hierarchy)? Can we test for these gaps ?

Are Ds scattered?

- Scattering Hypothesis (cf. case on page 1): Hierarchical closeness to V correlates with what kind of marking on N /DP (or on V), if any, one gets.

- Language may vary at what level the overt vocabulary comes into the structure. Williams (2003) Once a D comes into the structure, all D located in higher levels of the structure will be marked.
- Because of scattering, some languages never build DP surface constituents (Ds ends up bundled with V/T), and A and Dem are always discontinuous, it is: never seem to form a surface constituent with N. (Candidates for this type of language are languages like Hixkaryana, see)
- Predicts a typology:
  for definites: article (demonstrative), case (or adpositions), (any type, case (differential interpretation), classifiers (differential interpretation)..)
  for indefinites: numerals (one, a) or case (gen/part).

  Is there such an implicational hierarchy crosslinguistically? Are impossible languages found or not?

- Toy Example: Formal marking, table of expectations

def	spec indef	indef count	indef mass	"incorp"	found?
bare	bare	bare	bare	bare	
art	bare	bare	bare	bare	
art	art	bare	bare	bare	
art	art	art	bare	bare	
art	art	art	art	bare	
art	art	art	art	art	
		bare	art		*
bare	art	bare			*

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