

Set Theoretic Constituency and Morphophonological Conditions on Linearization¹

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BCGL3 -- Trees and Beyond

OUTLINE OF TALK

- 1) Describe what may be a clear case of phonological factors determining the linearization of a constituent structure.
- 2) Outline a theory of dependency and constituency relations couched in set theoretic representations that allow for directed graphs that allow multidimensions and multidominations etc.).
- 3) Provide a sketch of how this system accounts for the linearization process described in section 1
- 4) Give a brief outline of how this approach, combined with a late insertion model like Distributed Morphology can explain cross linguistic variation in the spell out of chains without making reference to covert movement.

1. A PHONOLOGICAL CONDITION ON LINEARIZATION?

- | | | | | | |
|-------|------------------------------------|-----------|----------------|-----------------------------|------------------|
| 1) a) | Chuir | Muirgheal | am ball | air a' bhòrd. | V S O PP |
| | Put.past | Muriel | the ball | on the table | |
| | "Muriel put the ball on the table" | | | | |
| b) | *Chuir | Muirgheal | | air a' bhòrd am ball | *V S PP O |
| c) | ?Chuir | Muirgheal | e | air a' bhòrd. | ?V S e PP |
| | Put.past | Muriel | 3sm | on the table | |
| | "Muriel put it on the table" | | | | |
| d) | Chuir | Muirgheal | | air a' bhòrd e . | V S PP e |

¹ The work here would be impossible without the help of Muriel Fisher, a native speaker of Scottish Gaelic from Skye who has been working with me for the past year to develop a database of Scottish Gaelic sentence types. Mòran taing, a Mhuirgheal. Thanks also to David Adger and Heidi Harley for helpful discussion. This work has been supported by a grant from the US National Science Foundation (grant number BCS0639059).

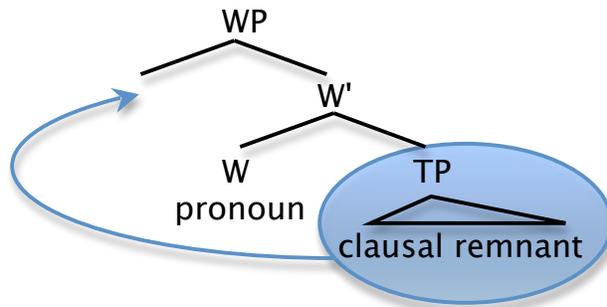
2) Syntactic theories of PPP?

a) McCloskey and Chung 1989: rightward movement rule

b) Duffield (1997) adopts a Kaynian approach.

-pronoun moves to a 2nd position clitic position

-TP shifts around 2nd position clitic



Problems (see Adger 1997 for discussion)

- doesn't allow pronoun groups (unlike Germanic)
- pronoun can't appear after an embedded clause which would be included in the remnant TP:

i) Chuala mi *e* air a ràdh [CP gum b' fhathaist dha a' bhidh annsin]
 heard 1s 3sm perf 3s.poss say.vn that cop used-to to.3sm prt be there
 "I heard it said that he used to be there"

VS *e* ... CP

ii) Chuala mi air a ràdh *e* [CP gum b' fhathaist dha a' bhidh annsin]

VS ... *e* CP

iii) *Chuala mi air a ràdh [CP gum b' fhathaist dha a' bhidh annsin] *e*

*VS ... CP *e*

3) This ordering is post-syntactic:

i) Has no (repeat **no**) semantic effect

ii) Adger 2007:

- VP ellipsis is PF VP deletion, adjuncts can survive
- If pronoun post-posing is syntactic, then the post-posed pronoun should survive ellipsis.
- It does not, so the rule must also be a PF rule

a) Smaoinich mi gun do dh'fhàg [VP mi mo leabhar] agus dh'fhàg [VP mi *e*] aig an sgoil.
 Think.past 1s that past leave.past 1s 1s.poss book and leave.past at the school
 'I thought I left my book and I had left it at school.' (Adger 2007) ... V [VP ~~S O~~] PP

b) *Smaoinich mi gun do dh'fhàg mi mo leabhar agus dh'fhàg [VP mi *t_i*] aig an sgoil *e_i*.
 Think.past 1s that past leave.past 1s 1s.poss book and leave.past at the school 3sm
 'I thought I left my book and I had left it at school.' (Adger 2007) *... V [VP ~~S t_i~~] PP *e_i*

4) Adger's (Descriptive) rule (rephrased)

Encliticize e-grade pronouns to the non-verb, non-subject word bearing

- i) Focal stress,
- ii) Nuclear stress

5) (Adger 2007b) Nuclear Stress in SG falls:

- 1) on the main stress last word of the object DP, unless it is a pronoun
- 2) if there is no object, then on the main stress of the final non-function word in the VP [Temporal adverbs like *today, yesterday, Monday* etc. behave as if they are VP internal for these purposes]

6) *Cliticized to nuclear stress*

Chunnaic Mòrag [ann an] Lunnainn [an +dè] *i*. **V S PP Adv i**
saw.past Mòrag [in] London [yesterday] 3sf.
'Mòrag saw her in London yesterday.' (Adger 1997)

7) *Cliticized to focal stress.*

Q. Càit' am faic Mòrag do mhàthair?
where wh-C saw.past Morag 2s.poss mother
'Where did Mòrag see your mother?' (Adger 1997)

A. Chunnaic i [ann an] LUNNainn *i* [an dè]. **V S PP i Adv**
saw.past 3sf [in] London 3sf [yesterday]
'She saw her in London yesterday.' (Adger 1997)

1.2 Refining the description

Adger's rule, while capturing the basic pattern, is actually not quite fine-grained enough.

8) The process is typically optional, with a vague preference for postposing:

a) Thug Muirgheal *e* do Phòl. **V S e PP**
Give.pst Muriel 3sm to Paul
"Muriel give it to Paul"

b) Thug Muirgheal do Phòl *e* **V S PP e**
(vaguely preferred)

9) PPP is obligatory when non-movement would result in an iamb (*dha* is not a pure function word, it is an inflected preposition thus phrasal):

- x
(x x)
- a) *Thug Muirgheal *e* dha Dihaoine ***V S e PP Adv**
 Give.past Muriel 3sm to3sm Friday
 "Muriel gave it to him on Friday"

- x
(x x)
- b) Thug Muirgheal dha *e* Dihaoine **V S PP e Adv**

10) PPP resists attachment to already existing final trochees (with focal stress on temporal adverb Dihaoine 'Friday').

- x
(x x)
- a) Phòg Muirgheal Pòl Dihaoine
 Kiss.past Muriel Paul Friday
 "Muriel Kissed Paul on Friday"
- b) Phòg Muirgheal *e* Dihaoine **V S e Adv**
 c) *Phòg Muirgheal Dihaoine *e* ***V S Adv e**
 d) ?Phòg Muirgheal Dihaoin' *e* **?V S Adv e**
 (requires focal stress on Dihaoine and final vowel deletion)

11) More examples of resistance to already existing trochees with clear VP adverbs

- trochee final stress
- a) Leugh Bob an leabhar gu cùramach/gu tric
 Read.past Bob the book adv careful/ adv frequent
 "Bob read the book carefully/frequently"
- b) Leugh Bob *e* gu cùramach **V S e Adv**
 c) ?Leugh Bob gu cùramach *e* **?V S Adv e**
 d) ?Leugh Bob *e* gu tric **?V S e Adv**
 e) Leugh Bob gu tric *e* **V S Adv e**

12) More examples of resistance to already existing trochees, this time with a choice of a monosyllable or a bisyllabic trochee to attach to.

- a) ?Chic Muirgheal *e* gu cùramach gu Pòl **?V S e Adv PP**
 kick.past Muriel 3sm adv careful to paul
 "Muriel kicked it to Paul carefully"
- b) Chic Muirgheal gu cùramach gu Pòl *e* **V S Adv PP e**
 (preferred order)
- c) Chic Muirgheal gu cùramach *e* gu Pòl **(?)V S Adv e PP**
 (ok but less preferred)
- d) ?Chic Muirgheal *e* gu Pòl gu cùramach **?V S e PP Adv**
 Kick.past Muriel 3sm to Paul 3sm adv careful
 "Muriel kicked it to Paul carefully" (ok, but not preferred)
- e) Chic Muirgheal gu Pòl *e* gu cùramach **V S PP e Adv**
 (preferred order)
- f) ?Chic Muirgheal gu Pòl gu cùramach *e* **?V S PP Adv e**
 (ok, but requires focal stress on cùramach)

13) Vowel Vowel sequences seem to trigger PPP² (a-b), (c-d), and PPP seems to avoid creating such sequences (e-g)

- a) ?Bhris *e e* leis. **?V S e PP**
 Break.past 3sm 3sm with.3sm
 "he broke it with it"
- b) Bhris *e* leis *e* **V S PP e**
- c) ?Chuir Muirgheal *e* air a' bhòrd **?V S e PP**
 Put Muriel 3sm on the table
 "Muriel put the ball on the table"
- d) Chuir Muirgheal air a' bhòrd *e* **V S PP e**

² Note however this similar paradigm where a VV sequence appears to be ok:

- a) Bhris *e e* leis an ord
 break.past 3sm 3sm with the hammer
 "He broke the chair with the hammer t"
- b) Bhris *e* leis an ord *e*

While the (b) example is preferred to the (a) example here, the (a) example did not receive the negative response that (13a) elicited in my native speaker. The contrast between these examples and (13a-b)-- if there is one -- escapes my understanding.

e) Dh'fhàgar *e* 'na laighe air an làr **V S e AP PP**
 past'give.impers 3sm in.3sm.poss lie.vn on the ground
 "It was left lying on the ground.

f) *Dh'fhàgar 'na laighe e air an làr ***V S AP e PP**
 g) Dh'fhàgar 'na laighe air an làr **V S AP PP e**

14) There are three pronouns that shift: *e, i, iad*. The last of these is trochaic already /'i.ət/. When it shifts to adjoin to the stress it must take its reduced form 'ad /ət/.

a) Dh'inns i iad do Sheumais
 past'say 3sf 3pl to James
 "She said them to James."

b) Dh'inns i do Sheumais 'ad

This shows us two things. (1) The motivation for the movement has something to do with the pronoun itself (only the 'ad form postposes, not the already footed iad form) (2) The motivation is clearly prosodic rather than syntactic.

15) Phonological conditions aside, pronoun post-posing seems not to care which projection of the V it cliticizes to (Data from Modern Irish, where PPP seems to be a little freer than in SG. Data from Ó Siadhail 1989):

a) Deir sí gur bhris sé an doras leis an ord aréir
 says she that broke he the door with the hammer yesterday
 She says that he broke the door with the hammer yesterday.

b) ?Deir sí gur bhris sé *é* leis an ord aréir

c) Deir sí gur bhris sé leis an ord *é* aréir

d) Deir sí gur bhris sé leis an ord aréir *é*

TENTATIVE CONCLUSIONS OF THIS SECTION:

Descriptive Generalization About Scottish Gaelic PPP

Optionally linearize object pronouns to a modifier of the verb bearing

i) Focal stress,

ii) Nuclear stress

with a preference to forming trochees, and avoiding VV sequences

Syntactic conditions:

May not adjoin after a tensed embedded clause.

Must adjoin to a modifier of the verb (or temporal adverb when focused)

Brief aside: There is a lot of the data on SG PPP that I still don't understand, including some very subtle judgments and contradictory data. You can see transcripts of my sessions with my native speaker on <http://www.dingo.sbs.arizona.edu/~gaelic>, click on "data" and then on "Andrew Carnie: Basic Clause Structure". Comments and reanalysis are welcome.

Consequences for our model.

- 1) Linearization is post-syntactic and thus open to phonological conditioning
- 2) Linearization can't be (purely) based on asymmetric c-command.
- 3) The phenomenon here seems to treat all adjuncts as equals for linearization of object pronouns, once we factor out the phonological conditions. How is this possible?

This is where a looser theory of constituency comes in. I'll sketch such a theory below—it's more complicated than is necessary for dealing with the SG facts, but I wanted to set out a theory that is relatively complete for concreteness.

2. DEPENDENCY BASED MERGE.

INTELLECTUAL ANTECEDENTS:

This section draws heavy inspiration from the work of Brody (2000) and Bury (2005) -- although my notation is different from theirs, the work on Phrase Linking Grammar by Gaertner (2002), and the unpublished work of Collins and Ura (2004), Collins (2002), Zwart (2004, et seq), and Seely (2004) who have all suggested that Merge is really an operation that implements a dependency relation where a non-head element satisfies some requirement of the head. (And of course the extensive work on Dependency Syntax such as Tesnière 1959, Hudson 1994, Mel'čuk 1988, and many others)

2.1 *A basic framework for dependency based MERGE*

- Following the basic insights of Brody 2000 and Bury 2005, let us assume that merge happens only when there is a feature checking.
- Further, let's adopt the notation of Zwart (2004) (similar to Langendoen 2003) where merge is an asymmetric operation: MERGE renders ordered pairs of elements, where the second element checks a feature of the first.

15) MERGE:

Numeration: α, β

where α has an unchecked SUBCAT feature and β checks that feature,

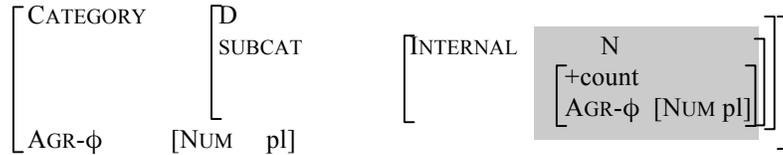
the resultant merge is the ordered pair

$\langle \alpha, \beta \rangle$ (read as " β is the dependent of α ")

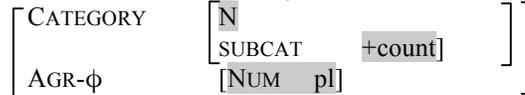
16) Preliminary example 1:

(HPSG inspired features structures from Carnie (forthcoming))

1) "THESE"



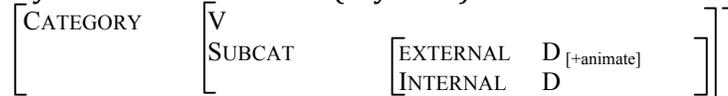
2) "PLURAL COUNT NOUN" (for concreteness: cats)



resultant merge: $\langle \text{THESE, CATS} \rangle$

16) Preliminary example 2:

Lexical entry for a transitive verb (say KISS):



- Assume the sets $\langle \text{THE, CAT} \rangle$ and $\langle \text{A, POODLE} \rangle$ have already been merged
- Assume that the "the" in $\langle \text{THE, CAT} \rangle$ bears an animacy feature.

$\langle \text{KISS, THE} \rangle$ this satisfies the EXTERNAL feature

$\langle \text{KISS, A} \rangle$ this satisfies the verb's INTERNAL feature.

17) Following Collins and Ura (2004), let us assume that dependencies like those in (15) and (16) express **relations**. Unlike Collins and Ura let us define those relations in terms of the feature values that are being checked.

$S1 = \{R1, R2\}$

R1: INTERNAL = $\{ \langle \text{THE, CAT} \rangle, \langle \text{A, POODLE} \rangle, \langle \text{KISS, A} \rangle \}$

R2: EXTERNAL = $\{ \langle \text{KISS, THE} \rangle \}$

18) First pass at a linearization rule for English (again following the spirit of Collins & Ura, but with a different formulation):

- a) If $\langle x, y \rangle \in \text{INTERNAL}$, then $x < y$
- b) If $\langle x, y \rangle \in \text{EXTERNAL}$, then $y < x$

19) SPELLOUT

- a) Let Z be a phase, let X be a head, and let Y be a dependent with no unchecked features, linearize using language specific linearization rules, resulting in either /X+Y/ or /Y+X/ in Z. (Follows in part Hudson’s 1990 Adjacency requirements).
- b) Once a precedence or adjacency relation is established at Spell-Out, it is not disrupted later in the derivation (Collins & Ura 2004)

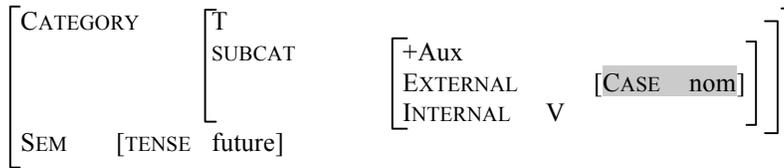
20) Simplified linearization of S1 in (17):

Assume lexical insertion occurs with linearization, abstract away from tense and the TP phase for the moment.

- i) THE < CAT (18a)
 - ii) /the+cat/ (19a) DP Phase 1
 - iii) A < POODLE (18a)
 - iv) /a+poodle/ (19a) DP Phase 2
 - v) KISS < A (18a)
 - vi) KISS < /a +poodle/ by (19b) and (v)
 - vii) /kissed+a+poodle/ by (19a) VP Phase
 - viii) THE < KISS (18b)
 - ix) /the+cat/ < KISS by (19b) & (viii)
 - x) /the+cat/ < /kissed+a+poodle/ (19b), (viii), (ii), and (ix)
- (tense isn’t specified here so the linearization is not complete)

21) More complex Example with DP movement and tense

WILL



Let us assume that the THE in “the cat” is marked as nominative case

22) S2 = <R1, R2>

R1: INTERNAL = { <THE, CAT>, <A, POODLE>, <KISS, A>, <WILL, KISS> }

R2: EXTERNAL = { <KISS, THE>, <WILL, THE> }

23) Linearization of S2:

... (as in 20) ...

x) /the+cat/ < /kiss+a+poodle/ (19b), (viii), (ii), and (ix)

xi) WILL < KISS (18a)

xii) WILL < /kiss+a+poodle/ (19b), (xi)

xiii) THE < WILL (18b)

xiv) /the+cat/ < WILL (19b), (xiii)

xv) /the+cat+will+kiss+a+poodle/ (19a), (x-xiv)

2.2 Adjuncts

24) *Some relevant properties of adjuncts:*

A. Adjuncts have scope with respect to one another

i) The sexy muscled firemen

ii) The muscled sexy firemen

(The subset of muscled firemen who are sexy vs. The subset of sexy firemen who are muscled)

iii) The boxes in the storeroom with the red label

iv) The boxes with the red label in the store room

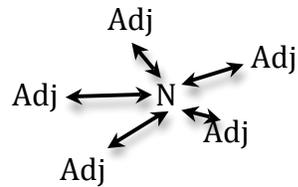
(The subset of the boxes in the storeroom with red labels, not the ones with the yellow labels vs. the subset of boxes with red labels that are in the store room, not the ones with red labels in the office.)

B. Adjuncts are not selected for by the head of the phrase they modify, but instead select for that head (eg. Adverbs may select for V or certain kinds of T, but no V or T selects for an adverb).

C. Adjuncts don't participate in the main spine of tree with respect to c-command and reconstruction. (Uriagereka 1998, building on Lebeaux's (1988) anti-reconstruction data), and perhaps such phenomena as *do*-support (Bobaljik 1994)

25) Unlike quantifier scope, binding etc, where the c-command relationships can be derived via a chain of dependencies (i.e. refers to a sequence of merge operations. e.g., Q₁ scoping over Q₂: Q₁ ← T → V → Q₂), the scope relations of adjuncts can't be derived in system like that sketched above in section 2.1,

since all the adjuncts are related to a single head. For example, all the adjuncts of an N head presumably hold equal relations to the head and each other.



- 26) **Claim:** adjuncts have precisely the property that they select for dependencies to scope over.

We will encode this in a MOD feature (thanks HPSG). Where \textcircled{v} and \textcircled{n} stand for “projection of v” and “projection of n” respectively. These are projections of dependencies.

skillfully

$$\left[\begin{array}{l} \text{CATEGORY} \\ \left[\begin{array}{l} \text{A} \\ \text{SUBCAT} \quad [\text{MOD} \quad \textcircled{v}] \end{array} \right] \end{array} \right]$$

Yellow

$$\left[\begin{array}{l} \text{CATEGORY} \\ \left[\begin{array}{l} \text{A} \\ \text{SUBCAT} \quad [\text{MOD} \quad \textcircled{n}] \end{array} \right] \end{array} \right]$$

in

$$\left[\begin{array}{l} \text{CATEGORY} \\ \left[\begin{array}{l} \text{P} \\ \text{SUBCAT} \quad \left[\begin{array}{l} \text{INTERNAL} \quad \text{N} \\ \text{MOD} \quad \textcircled{n/\textcircled{v}} \end{array} \right] \end{array} \right] \end{array} \right]$$

- 27) *Projection: (A recasting of Speas 1990 in terms of dependencies)*
 An ordered pair \textcircled{x} is a projection of x if \textcircled{x} contains an uninterrupted sequence of left angle brackets between the brackets defining \textcircled{x} and x .

- 28) \textcircled{a} is a projection of a in the following: But not in the following cases:
- | | | |
|--|---|--|
| $\textcircled{a} = \langle a, b \rangle$ | $\textcircled{a} \neq \langle b, a \rangle$ | $\textcircled{a} \neq \langle \langle b, a \rangle, c \rangle$ |
| $\textcircled{a} = \langle \langle a, b \rangle, c \rangle$ | $\textcircled{a} \neq \langle b, \langle a, c \rangle \rangle$ | |
| $\textcircled{a} = \langle \langle \langle a, b \rangle, c \rangle, d \rangle$ | $\textcircled{a} \neq \langle \langle b, \langle a, c \rangle \rangle, d \rangle$ | |
| etc. | etc. | |

- 29) The rule **ADJOIN**:
 Adjoin only applies in the context of a **MOD** feature. Given a lexical item y whose **Mod** feature selects for a dependency-projection \textcircled{x} , create an ordered set headed by \textcircled{x} : $\langle \textcircled{x}, y \rangle$

This is a little bit like type raising (find a function and an argument, raise the argument into a function that selects for the original function.)

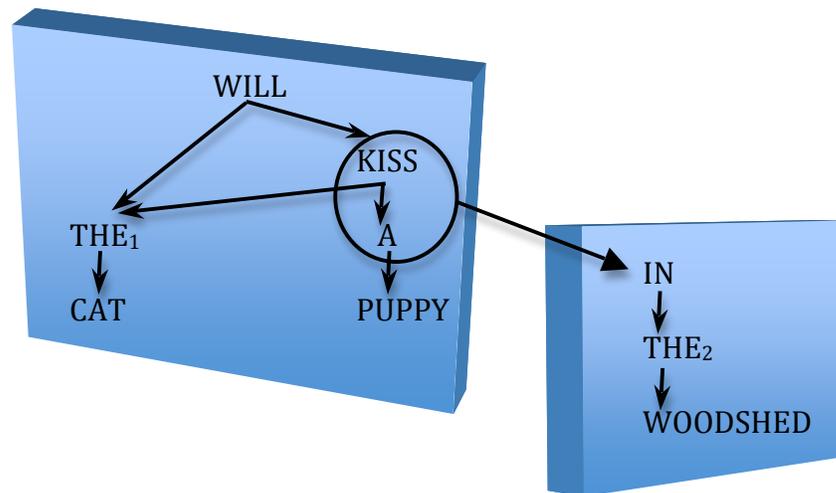
- 30) Linearization of Adjuncts is a little trickier. Here I think the matter is largely lexical. Most Adjectives in English are specified to precede the head they modify, but there are lexical exceptions. For example, *general* when used in the sense of “ranking” follows the noun it modifies: Attorney General, Linguist General, etc. Similarly in Irish, most adjectives follow the noun, but a small number (including *droch* ‘bad’ and *sean* ‘old’ precede the noun)
- 31) *An example sentence with an adjunct*

- a) *The cat will kiss a puppy in the woodshed*
- b) Assume the vocabulary item “in” is specified to follow the dependency projection that it scopes over.

c) $S3 = \{ \langle R1, R2 \rangle, R3 \}$

R1: INTERNAL= { $\langle \text{THE}_1, \text{CAT} \rangle$, $\langle \text{A}, \text{PUPPY} \rangle$, $\langle \text{THE}_2, \text{WOODSHED} \rangle$,
 $\langle \text{KISS}, \text{A} \rangle$, $\langle \text{IN}, \text{THE}_2 \rangle$, $\langle \text{WILL}, \text{KISS} \rangle$ }
 R2: EXTERNAL= { $\langle \text{WILL}, \text{THE}_1 \rangle$, $\langle \text{KISS}, \text{THE}_1 \rangle$ }
 R3: MOD = { $\langle \langle \text{KISS}, \text{A} \rangle, \text{IN} \rangle$ }

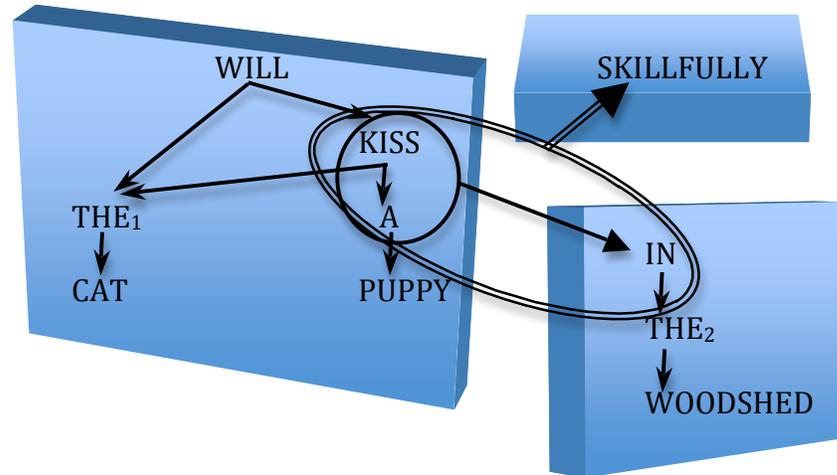
- d) A very imperfect stemma of the edge sets in (c). The circle and the planes are meant to evoke the connections between multiple dimensions.



e) Additional adjuncts will be linked in a similar way

S4: *The cat kissed the puppy in the woodshed skillfully.*

R3: Mod = { <<KISS, A>, IN>, <<<KISS, A>, IN>, SKILLFULLY> }



f) Linearization of S3

1) DP Phase:

i) $THE_1 < CAT$

ii) /the+cat/

2) DP Phase:

i) $A < PUPPY$

ii) /a+puppy/

3) PP/DP Phase:

i) $THE_2 < WOODSHED$

ii) /the+woodshed/

iii) $IN < THE$

iv) $IN < /the+woodshed/$

v) /in+the+woodshed/

4) VP phase

i) $KISS < A$

ii) $KISS < /a+puppy/$

iii) /kiss+a+puppy/

iv) $<KISS, A> < IN$

v) /kiss+a+puppy/ < /in+the+woodshed/

vi) /kiss+a+puppy+in+the+woodshed/

5) TP phase (includes VP edge)

i) THE < KISS

ii) /the+cat/ < KISS

iii) /the+cat/ < /kiss+a+puppy+in+the+woodshed/

iv) THE < WILL

v) /the+cat/ < WILL

v) WILL < KISS

vi) WILL < /kiss+a+puppy+in+the+woodshed/

vii) /the+cat+will+kiss+a+puppy+in+the+woodshed/

32) *The cat will kiss in the woodshed the puppy* is ruled out by (19b). Movement will be required to license such orders in languages that allow them.

ASIDE: Am I cheating by making use of Phases? Don't they work out to be the same thing as phrases? I think this is an artifact of the examples I'm using. If I were including little *v* or causatives etc. the notions of phase and phrase would not be synonymous.

3. BACK TO SCOTTISH GAELIC PPP

33) All of the above was overkill on showing you that one could derive the following partial representation for Scottish Gaelic sentences with e-grade pronouns and an a PP adjunct:

Chuir	Muirgheal	t_{put}	air a' bhòrd	<i>e</i>
Put	Muriel		on the table	3sm

R1: INTERNAL = { ..., < t_{put} , E>, <AIR, A'>, <A', BHÒRD> }

R3: MOD = { << t_{put} , E>, AIR>, }

34) a) Assume that t_{put} in R1 has a phonologically null spell out (\emptyset).

b) The VIs for accusative *e*, *i*, and 'ad (but not *iad* or any other noun) have the following phonological representation like the following in their vocabulary list entries:

$$\begin{array}{c} x \\ (x \quad x) \end{array}$$

<V, E> : < (v), /... $\sigma_c\#$ +__ />

(where $\sigma_c\#$ stands for a closed syllable at the end of the dependency)

This is a little bit like a word-specific right-wrap rule. Additional stipulations are needed to make sure that the stresses in embedded clauses aren't accessible to the rule.

c) What this lexical entry says: the e-grade pronouns are linearized after any adjunct that modifies a projection of the verb, provided it ends in a closed stressed syllable.

e) linearization of *air a' bhòrd e*.

i) $V < E$

ii) $*/\emptyset+e/$ ← not an ideal linearization because of clitic.

iii) $\langle\langle V, E \rangle\rangle \text{ AIR} = \textcircled{v}$

iv) $\langle\emptyset, E\rangle < \overset{x}{(x} /air+a+bhòrd/$

iv) $\emptyset \overset{x}{(x \ x)} /air+a+bhòrd+e/$

And similarly to any other adjunct that is the dependent in a projection to the verb.

f) linearization of *iad air a' bhòrd*.

i) $V < IAD$

ii) $/\emptyset+iad/$

iii) $\langle V, IAD \rangle < \text{AIR}$

iv) $/\emptyset+iad/ < /air+a+bhòrd/$

v) $/\emptyset+iad+air+a+bhòrd/$

4. THE LINEARIZATION OF HEAD-MOVEMENT CHAINS

35) Thus far we have looked at dependency relations based on subcategorization features and MOD. Don't let the word-word pairings distract you; these are not head-head dependencies of the kind we normally understand in generative grammar.

- 36) To deal with these let us introduce dependencies based on the checking of HEAD features (thank you HPSG), which might include TENSE, among others features.
- 37) AGREE:
 Create a dependency between two terminals $\langle x, y \rangle$, such that y is an uninterpretable checker for the first's HEAD features.
 C-command condition: $\exists R_n, R_n \subseteq \text{INTERNAL}$: R_n = a sequence of connected dependencies, where x is the highest head and y is the lowest dependent.
- 38) *Connected dependencies*:
- A connected dependency is one where the dependent of one pair is the head of another.
 - A *sequence* of connected dependencies is set of connected dependency pairs, where each terminal occurs exactly twice (no more and no less), once as the head of a pair and once as the dependent.
- 39) LEAVE [HEAD uT]
 PAST [HEAD T]
- R4: HEAD = { $\langle \text{PAST}_T, \text{LEAVE}_{uT} \rangle$ }
- 40) HEAD dependencies are not linearized (linearization happens only in the Subcat relations). But are subject to the following conditions:
- CONDITION ON THE SPELLOUT OF HEAD DEPENDENCIES:
 Only 1 element in any sequence of connected HEAD dependencies may be realized by vocabulary insertion. All other elements in the sequence are rendered as null.
- PRINCIPLE OF \emptyset INSERTION FOR UNINTERPRETABLE FEATURES.
 If at the end of a phase, no vocabulary item exists compatible with an uninterpretable feature on a terminal, then \emptyset is inserted.
- 41) The choice of where in the HEAD chain a word is inserted is determined by language-specific morphological stipulations on vocabulary based on the category specified in the vocabulary item.
- eats* is of category V (presumably with T features specified)
eat/eaten are of category V
mange is of category T
mangé is of category V.

- So in French T is linearized by the lexical items like *mange*, and V is rendered as \emptyset . This is licensed by the HEAD dependency.
 - In English the T terminal is rendered as \emptyset , and *eats* is inserted into V.
- 42) Prediction: particular lexical items can vary from the normal patterns: Scottish Gaelic Future and past tense forms are of category T, but only the present tense of the verb to be, is of category T. There are no other present tense verbs.
- 43) Intervention/Relativized Minimality/HMC effects are due to linearization paradoxes. (Thanks to Heidi Harley for discussion).

INTERNAL = { ... < T, Neg>, <Neg, V> ... }

Therefore T < Neg < V

But at linearization the verbal content is in T, so in effect you also get V < Neg.

Since you have both Neg V and V Neg, you have an unlinearizable string.

[One thing that isn't clear to me is if such an account could be given to other intervention effect constructions, such as super-raising and wh-islands. This is open to investigation]

5. CONCLUSIONS

- Scottish Gaelic exhibits a phonological condition on linearization
- This condition requires a more flexible notion of constituency
- Perhaps with a bit of overkill, a version of generative dependency is given, which allows for language-specific and lexical-item specific principles of linearization, such as SG PPP.
- This in turn opens up the possibility of explaining head-movement in terms of dependencies paired with language specific morphological conditions on position of exponence in the syntax.

APPENDIX A: THE RULES & DEFINITIONS PROPOSED IN THIS TALK.

MERGE:

Given a Numeration: α, β where α has an unchecked INTERNAL or EXTERNAL feature and β checks that feature, the resultant merge is the ordered pair $\langle \alpha, \beta \rangle$ (read as " β is the dependent of α ")

Projection:

An ordered pair $\langle x \rangle$ is a projection of x if $\langle x \rangle$ contains an uninterrupted sequence of left angle brackets between the brackets defining $\langle x \rangle$ and x .

ADJOIN:

Adjoin only applies in the context of a MOD feature. Given a lexical item y whose Mod feature selects for a dependency-projection $\langle x \rangle$, create an ordered set headed by $\langle x \rangle$: $\langle \langle x \rangle, y \rangle$

SPELLOUT:

- a) Let Z be a phase, let X be a head, and let Y be a dependent with no unchecked features, linearize using language-specific linearization rules, resulting in either $/X+Y/$ or $/Y+X/$ in Z .
- b) Once a precedence or adjacency relation is established at Spell-Out, it is not disrupted later in the derivation (Collins & Ura 2004)

AGREE:

Create a dependency between two terminals $\langle x, y \rangle$, such that y is an uninterpretable checker for the first's HEAD features.

- C-command condition: $\exists R_n, R_n \subseteq \text{INTERNAL}$: R_n = a sequence of linked dependencies, where x is the highest head and y is the lowest dependent.

Connected dependencies:

- A connected dependency is one where the dependent of one pair is the head of another.
- A *sequence* of connected dependencies is set of connected dependency pairs, where each terminal occurs exactly twice (no more and no less), once as the head of a pair and once as the dependent.

CONDITION ON THE SPELLOUT OF HEAD DEPENDENCIES:

Only 1 element in any sequence of connected HEAD dependencies may be realized by vocabulary insertion. All other elements in the sequence are rendered as null.

PRINCIPLE OF \emptyset INSERTION FOR UNINTERPRETABLE FEATURES.

If at the end of a phase, no vocabulary item exists compatible with an uninterpretable feature on a terminal, then \emptyset is inserted

Sample Language Specific Linearization Principles

- i) If $\langle x, y \rangle \in \text{INTERNAL}$, then $x < y$ (both English and SG)
- ii) If $\langle x, y \rangle \in \text{EXTERNAL}$, then $y < x$ (both English and SG)
- iii) If $\langle x, y \rangle \in \text{INTERNAL}$, then $y < x$ (Japanese)
- iv) If $\langle x, y \rangle \in \text{INTERNAL}$, and $x = V$ or T , then $y < x$ (German)
- v) if $\langle x, y \rangle \in \text{MOD}$, and $y = \text{GENERAL}$ then $x < y$ (English)
- vi) if $\langle x, y \rangle \in \text{MOD}$, and $y = \text{SEAN}$ then $y < x$ (SG)
- vii) if $\langle x, y \rangle \in \text{MOD}$, and $y = \text{Adj}$ then $y < x$ (English)
- viii) if $\langle x, y \rangle \in \text{MOD}$, and $y = \text{Adj}$ then $x < y$ (SG)
- ix) if $\langle x, y \rangle \in \text{MOD}$, and $y = P$ then $x < y$ (both English and SG)
- x)

x
 $(x \quad x)$

$\langle V, E \rangle : \langle \langle V \rangle, / \dots \sigma_c \# + _ / \rangle$ (SG)
etc.

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