Movement as tree-balancing: an account of Greenberg's Universal 20

David P Medeiros

Linguistic Society of America, 7 January 2012

Abstract: The cross-linguistic ordering of demonstratives, numerals, adjectives, and nouns can be explained by supposing that syntactic movement is a tree-balancing mechanism, constrained to instantaneously decrease the number of c-command relations in the tree (assuming traces). All attested orders are derived by tree- balancing movements, while no unattested orders are, so long as the universal base DP structure meets certain geometrical requirements. The required tree- shape (explored computationally) aligns well with recent cartographic proposals; strong predictions about the shape of the base DP tree are described. On this view, typological variation in word order reflects multiple derivational routes to a more balanced tree.

0 Introduction

- Cross-linguistically, we find many, but not all, of the possible relative orders of demonstrative, numeral, adjective, noun as unmarked/neutral word orders.
- The array of possible and impossible basic DP orders is the topic of Greenberg's Universal 20, and much subsequent research.
- Cinque (2005) showed that the attested orders can all be derived from a common underlying structure (Dem > Num > Adj > Noun), via phrasal movement affecting the Noun, or something properly containing it.
- I endorse the outlines of his analysis, but propose that movement in this domain (and elsewhere) is driven by purely geometrical concerns.
- In particular, I propose that movement is constrained to reduce the total number of c-command relations defined in the tree (taking movement to leave a trace).
- I provide an existence proof that the cross-linguistic typology of possible and impossible orders of demonstrative, numeral, adjective, and noun can be given a sufficient account solely in these terms.
- There are possible shapes of the universal base DP structure such that all and only the attested orders arise via c-command-reducing movements.
- These tree shapes are rare (~.03% of possible tree shapes, in "equal radius" samples), but they align well with independent cartographic proposals.

1 Economy of Command

- I argue that language design reveals a bias to minimize the number of c-command and dominance relations in syntactic structures,
- in effect, a preference for "bushy", shallow trees.
- C-command and/or dominance relations are indispensable in the description of syntactic phenomena, "carrying" core linguistic relations like binding, agreement, linearization, scope, and movement.

- In a bushier tree, fewer such structural relations are defined, indicating a tighter limit on the number and depth of c-command based computations.
- This is related to Locality/Minimality (e.g., the Minimal Link Condition, Shortest Move, Attract Closest, Relativized Minimality, Superiority, the closest c-command requirement on government, etc.).
- In effect, that is a minimization constraint on individual "wires" (c-command paths along which linguistically relevant relations are computed).

1) X … Z … Y (* X–Y; √ Z–Y)

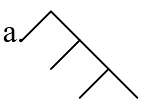
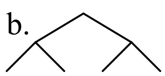
In (1), "X cannot govern Y if there is a closer potential governor Z."

- I propose a global "save wire" application of Locality/Minimality, minimizing not (just) individual links (c-command relations) but overall "wirelength" (sum of c-command relations).

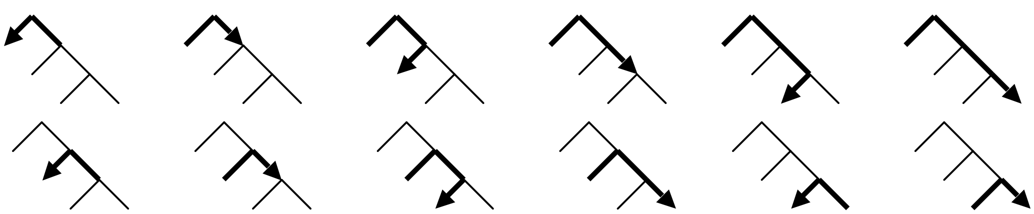
C-Command: Node A c-commands node B if neither A nor B dominates the other and the first branching node which dominates A dominates B.

(Reinhart 1976: 32)

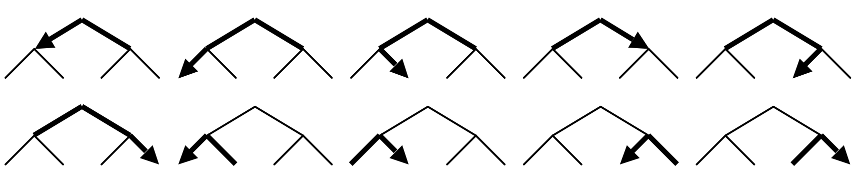
"…[D]espite substantive changes in the theory of syntax, Reinhart's definition, proposed almost two decades ago, remains linguistically significant." Epstein et al (1998: 24)

2) a.  b. 

- already in structures as small as the trees above, with equal number of nodes we observe non-equal number of c-command relations.



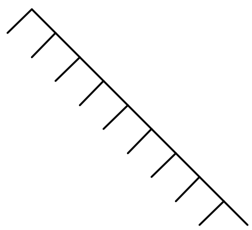
- There are 12 total c-command relations in the tree above.

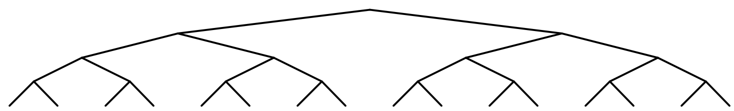


- Here, there are only 10.
- ***"Bushy" trees save wire.***

- The tree-shape at left has the most and longest "wires" (c-command relations)
- The shape at right minimizes length and number of c-command relations.
- The difference between the extremes is small for small trees, but quickly becomes dramatic for larger trees.

3) a. *The Spine* b. *The Bush*





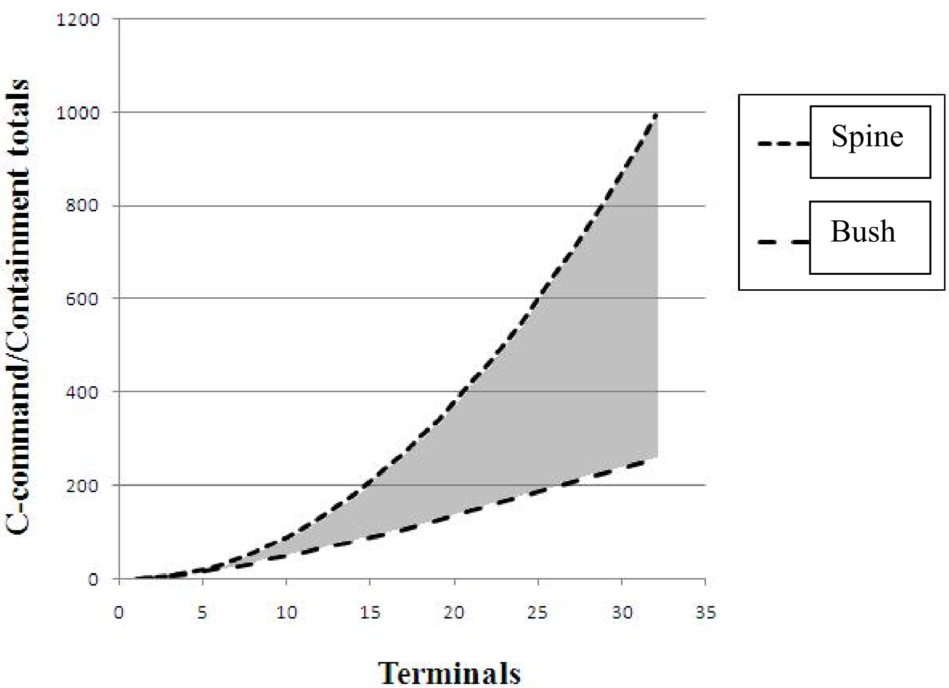


Figure 1: Total numbers of c-command (or containment) relation totals as a function of tree size (total terminal nodes).

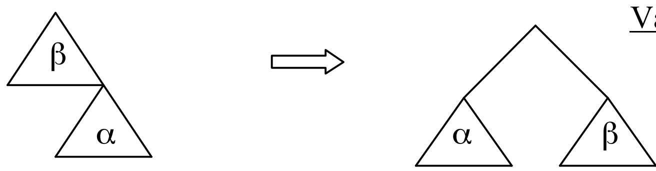
2 Movement as tree-balancing

- Much current research adopts the "copy theory" of movement.
- Under the copy theory, movement creates new structure but does not destroy old structure; thus movement should only increase the number of c-command relations defined in the tree.
- However, there is good reason to think many of the relevant relations are computed post-syntactically, over configurations in which typically only the highest copy in a chain is visible.
- In those circumstances, movement can indeed reduce the total number of c-command relations in the tree.

2.1 The Fundamental Movement Condition

- This condition describes when movement reduces the number of c-command relations in the tree.
- I hypothesize that this condition is the only constraint on syntactic movement.

4)



Variable	Stands for:
a	nodes in α
b	nodes in β
s	depth of α in β

5) Fundamental Movement Condition (FMC):
Move α only if $(a\text{-}1)(s\text{-}2) > b\text{+}1$

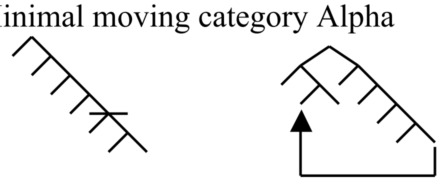
We derive three hard limits on movement:

(i) **Antilocality**: movement must not be too local (something immediately dominated by the root node may not move).

(ii) **Absolute Size Threshold**: the moved alpha must be big enough (at least 3 terminals, 5 nodes). (~*Phrasal-only movement*)

(iii) **Minimal Transformable Tree**: the tree affected by movement must comprise at least 13 total nodes (7 terminals).

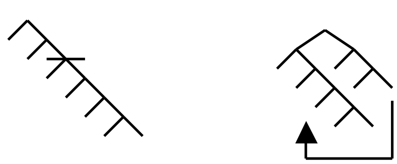
6) Minimal moving category Alpha



$a = 5, s = 5, b = 9$

FMC: (5-1)*(5-2) > 9+1; 12 > 10

7) Minimally Anti-Local Movement



$a = 9, s = 3, b = 5$

FMC: (9-1)*(3-2) > 5+1; 8 > 6

3 Tree-balancing & Universal 20

Greenberg's Universal 20:

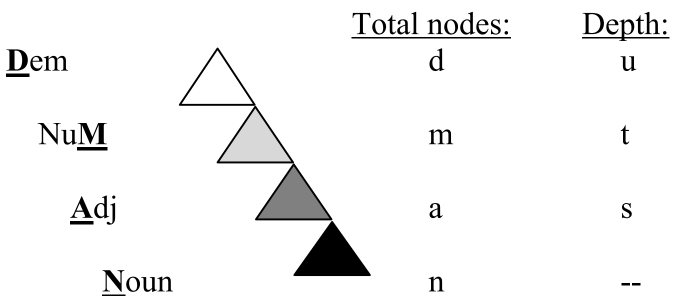
> ''When any or all of the items (demonstrative, numeral, and descriptive adjective) precede the noun, they are always found in that order. If they follow, the order is either the same or its exact opposite.'' (Greenberg 1963: 87)

Cinque (2005) and Abels & Neeleman (2009) update this description; Figure 1 summarizes their findings (orders in grey cells are unattested).

a. DMAN	b. DMNA	c. DNMA	d. NDMA
e. MDAN	f. MDNA	g. MNDA ◊	h. NMDA
i. ADMN	j. ADNM	k. ANDM	l. NADM †
m. DAMN	n. DANM	o. DNAM	p. NDAM †
q. MADN	r. MAND	s. MNAD	t. NMAD †
u. AMDN	v. AMND	w. ANMD	x. NAMD

Table 1: Attested (white) and unattested (grey) orders of (D)emonstrative, Nu(M)eral, (A)djective, and (N)oun in the world's languages.
◊: *Greenberg's formulation incorrectly allows this order.*
†: *Greenberg's formulation incorrectly excludes these orders.*

Cinque's Generalization: the attested orders are derived from a base Dem > Num > Adj > Noun hierarchy by movement(s) of NP, or an XP containing NP.



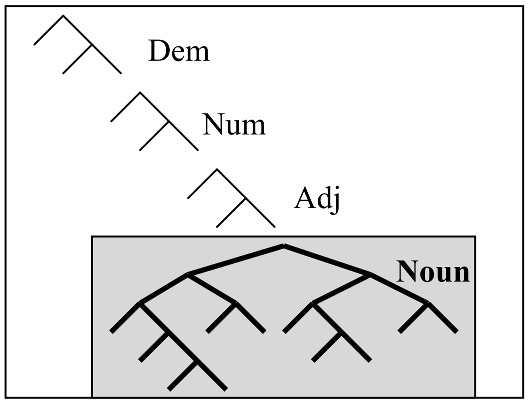
In what follows, I demonstrate that this array of facts falls out very naturally from the idea that movement is regulated by the FMC.

Assumptions:

(i)	**Universality**: the DP orders of every language represent transformations of a single, common base structure.
(ii)	**Coherence**: Take the D, M, A, N to correspond to coherent partitions of the tree that cannot be broken apart further by movement.
(iii)	**Monotonicity**: All movement within the DP must satisfy the FMC.
(iv)	**Continuity**: Every monotonic derivation corresponds to an attested order.

First question: Can there be a base tree such that (i-iv) yield all and only the attested orders in Table 1? -- *Yes*

- It's clear how this could work: if Dem, Num, Adj are small subtrees, just large enough to allow movement to cross them (recall the Antilocality prediction above), and N is very large, Cinque's generalization follows at once.
- The tree below illustrates this kind of structure:

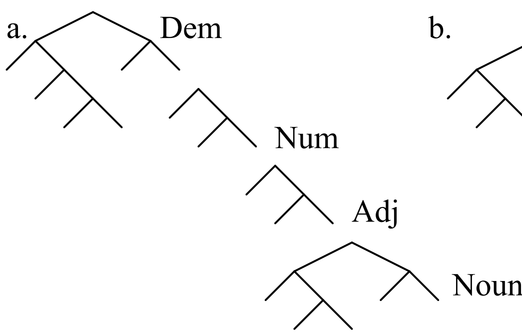


FMC: (a-1)(s-2) > b+1

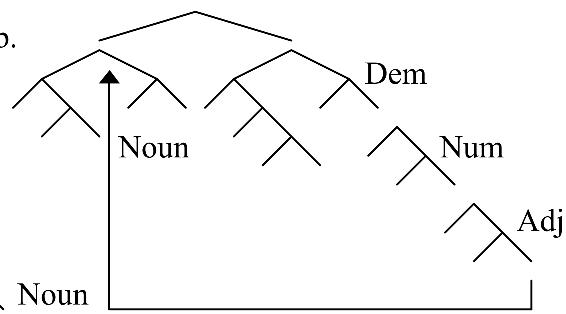
Roughly:
\# of nodes moved * distance of move
> # of unmoved nodes

- That doesn't look wildly plausible as a hypothesis about the structure of DP.
- What else could the base tree have to look like, for this to work? - *See below.*

8) a.



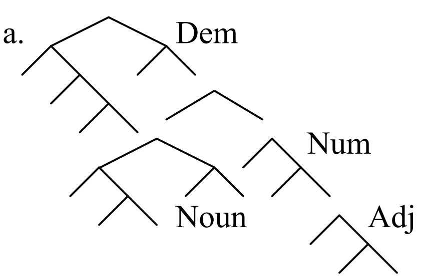
b.



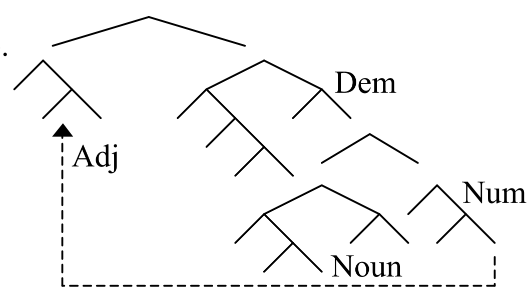
(Base) DMAN: **124** c-command relations NDMA: **104** c-command relations

- Above: attested NDMA derived by a single, FMC-satisfying move.
- Below: the last step of movement deriving unattested *ADNM from attested DNMA does not satisfy the FMC; it is thus correctly excluded.

1) a.



b.



Attested DNMA: **114** c-command relations *ADNM: **124** c-command relations.

- And so on: if the base DP tree looks like this (or another shape meeting the geometrical requirements I describe), every attested order is derived by a series of “improvements”, and every unattested order would make the tree “worse”.
- The typology of DP orders can thus be explained without appeal to features, or other constraints on movement.

4 Methodology

There are two ways to investigate this.

1. Algebraic: apply the FMC to each step of movement, in every conceivable derivation of each attested and unattested order, to be ruled in or out appropriately. This is an infinite task, but we can corral the combinatoric explosion with well-motivated heuristics. This gives us the DP condition (below).
2. Direct: subject a single candidate base structure to all possible movements that improve tree-balance, and check that all and only the attested orders emerge.

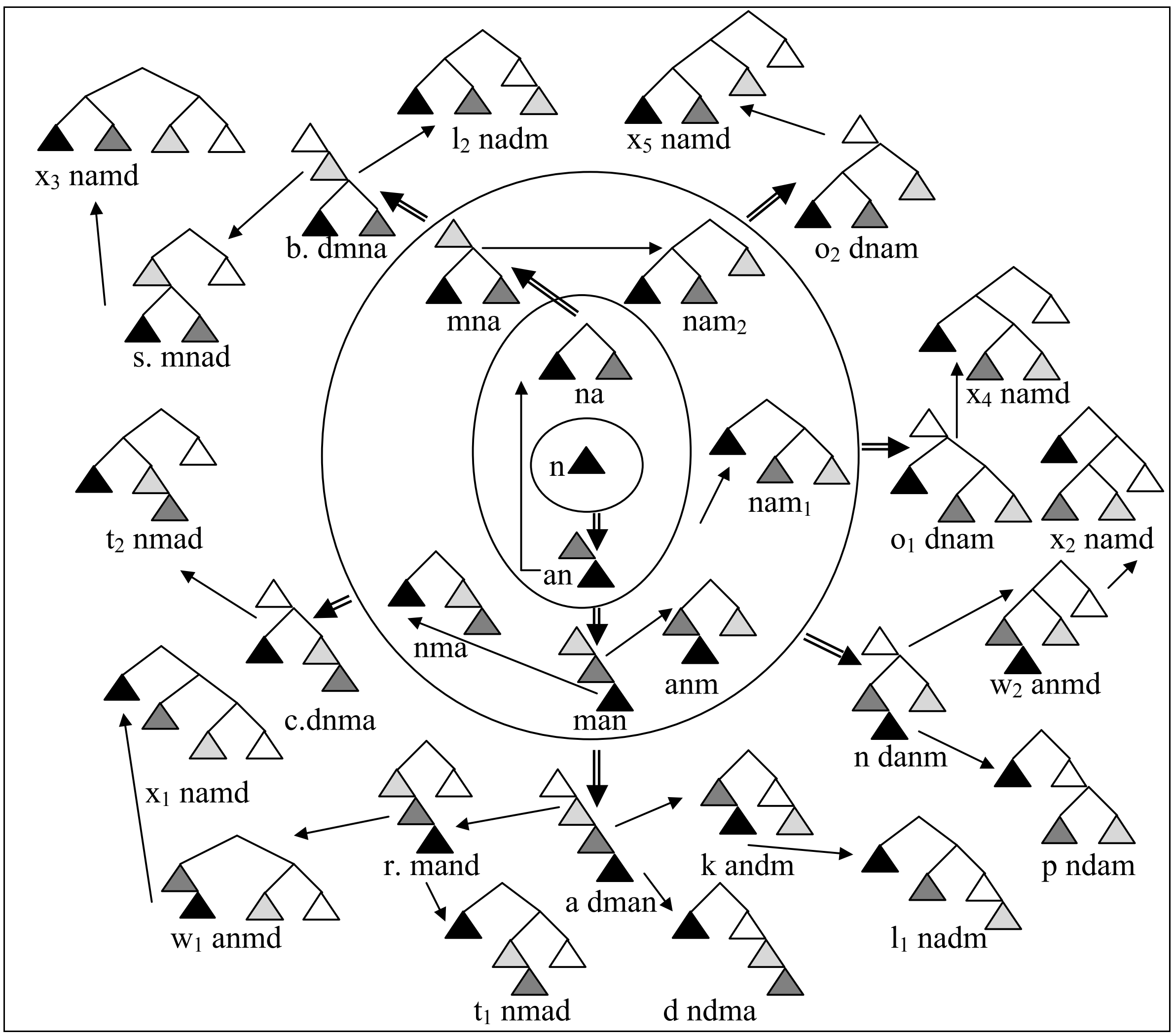


Figure 2: Derivations of attested orders considered in this work.

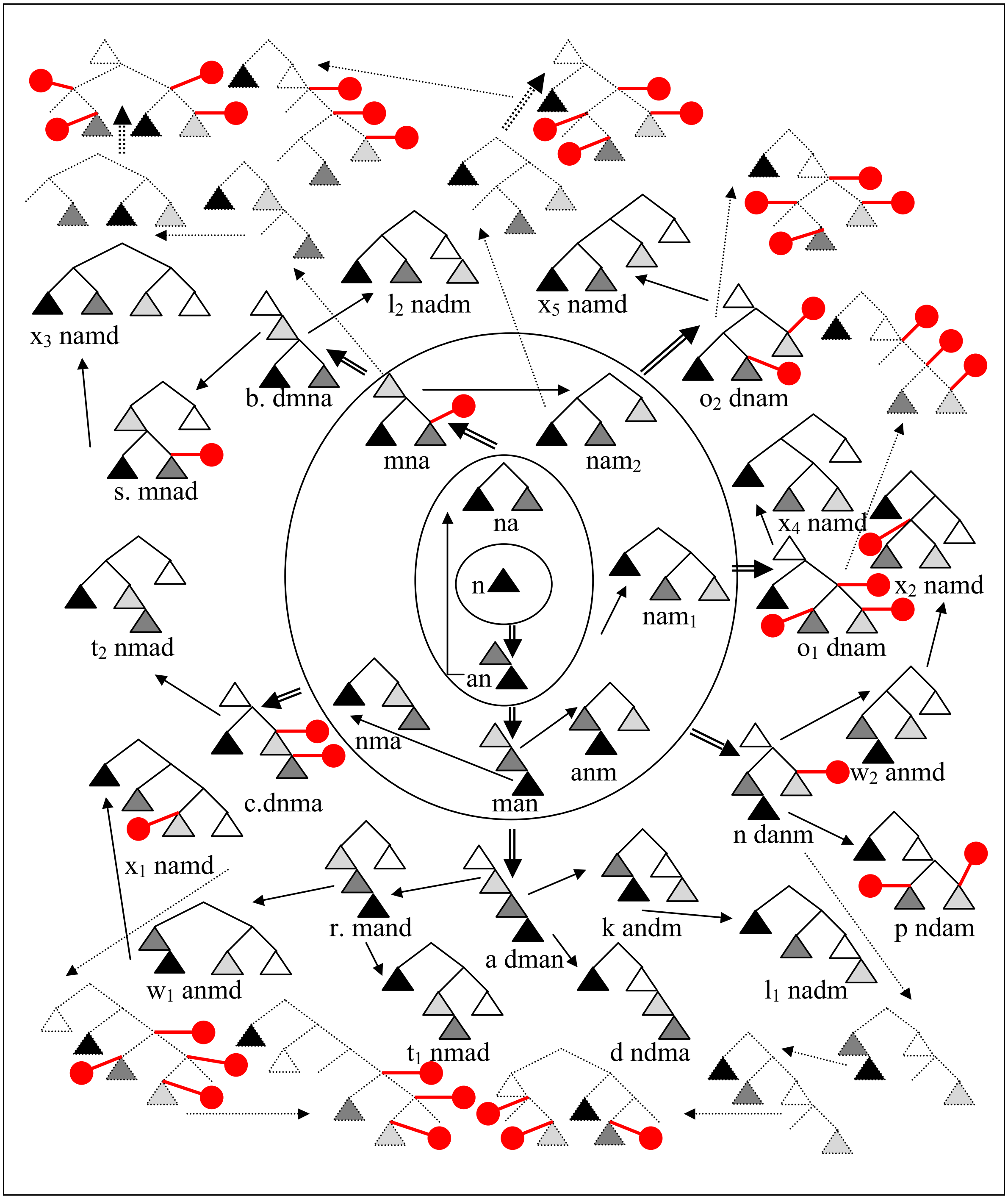


Figure 3: Expanded combinatoric map, showing most of the negative conditions (red dots). Derivations outside the best-route-to-attested-orders network are greyed out.

For “fun”, here’s the full DP condition:
A 7-tuple of values *n,a,s,m,t,d,u* counts as a solution if:

```
((a+1 < (s-2)*(n-1)) && (m+a < (s+t+3)*(n-1)) && (a+m+d-1 < (s+t+u-4)*(n-1)) &&
(m+d < (t+u-3)*(a+n-2)) && ((a+m+d+1 < (s-1)*(n-1)) || (m+d < (t+u-3)*(n+a))) &&
(m+1 < (t-2)*(a+n-2)) && ((a+m+2 < (s-1)*(n-1)) || (m+1 < (t-2)*(n+a))) && (a+m+d+1
< (s+u-2)*(n-1)) && (d+1 < (u-2)*(a+n+m-3)) && (d+1 < (u-2)*(a+n+m-1)) &&
((a+m+d-1 < (s+t-2)*(n-1)) || (d+1 < u*(a-1) + (u-2)*(n+m))) && ((m+d+2 < (t-1)*(a+n-
2)) || (d+1 < u*(n-1) + (u-2)*(a+m))) && (((m+d+2 < (t-1)*(a+n-2)) && (a+m+d+3 < (s-
1)*(n-1))) || ((d+1 < u*(n-1) + (u-2)*(a+m)) && (a+m+d+3 < (s-2)*(n-1))) || ((d+1 < (u-
2)*(a+n+m-1)) && (m+d+2 < (t-1)*(a+n))) || ((a+m+2 < (s-1)*(n-1) && (d+1 < (u-
2)*(a+n+m+1))) || ((m+1 < (t-2)*(n+a)) && (d+1 < (u-2)*(a+n+m+1))))) &&
(2*(a+n)+d+2 > (u-1)*(m-1)) && (a+n+d+4 >(u-1)*(m-1)) && (a+n+d+4 > u*(m-1))
&& (n+m+d+2 > (t+u-2)*(a-1)) && (n+m+d+4 > u*(a-1)) &&(n+m+3 > (t-1)*(a-1))
&&(n+d+3 > (u-1)*(a+m-2)) && (n+d+3 > (u-1)*(a+m)) && !((d+m > a+n+4) &&
((m+n+a-3)*(u-2)>d+1)&&((a+n-2)*(t-1)>d+m+2)&&((n-1)*(s-1)>d+m+a+3))  && !((
((m-1)*3 > d+a+n+7 ) || ((a-1)*2 > d+m+n+7) || ((m+1)*2 > d+a+n+5 ) || (a+m+2 >
n+d+4) || ( (n-1 > d+m+a+7) && (((a+m+2)*2>d+n+6) ||((m+1)*3>d+a+n+7)||((m-
1)*4>d+a+n+9) ) ) ) &&((d+1)*2> n+a+m+5) &&((m+n+a-3)*(u-2)>d+1)&&((a+n-
2)*(t-1)>d+m+2)&&((n-1)*(s-1)>d+m+a+3) ) && ! ( ((n-1)*(s-1)> a+m+2)&&((n+a-
2)*(u-2)>m+1) &&( ((a+m)*(u-1)>d+n+2) || ((m-1)*u>d+a+n+3) || ((a-1)*u>d+m+n+3)
|| ( ((n-1)*(u-1)>d+m+a+3) && (((a+m+2)*(u-1)>d+n+2)||((a+m)*u>d+n+4)||((m-
1)*(u+1)>d+a+n+5))) ) ) &&! ((a+m > d+n+4)&&((n-1)*s>d+m+a+3)&&((n+a+m-
1)*(u-2)>d+1)&&((n+a-2)*(u-2)>m+1) ) &&!( ((n+a-2)*(u-2)>m+1) && ( ((m-1)*(u-
1)>d+a+n+1) || ( ((n-1)*(s+u-2)>d+a+m+1) && ( ((a+m)*(u-1)>d+n+2) || ((m-
1)*u>d+a+n+3) ) ) ) ) && ! (  ((d+m > n+a+4)&&((n-1)*(s-1) >d+m+a+3)&&((a+n-
2)*(u-1)>d+m+2) &&((n+a-2)*(u-2)>m+1)) && ( (a+1>d+m+n+5) || ((a-1)*2
>d+m+n+7) || ((m+1)*(u-1)>d+a+n+5) || ((m-1)*u>d+a+n+7)  ) ) && ! ( ((n-1)*(s+t-
3)>a+m)&&( ((a+m-2)*(u-1)>d+n+2)||((a-1)*(t+u-2)>d+m+n+1))) &&! ( (((n-1)*(t-
1)>a+m+2)&&((n-1)*(s-2)>a+1)) && ( ((a+m)*(u-1)>d+n+2) || ((a+1)*(t+u-
2)>d+m+n+1) || ((a-1)*(t-1)>m+n+2) ) ) &&! ( ((a-1)*(t-1) > m+n+2) && ((n-1)*(s-
2)>a+1) ) &&!(((n-1)*(s-2)>a+1) && (((a-1)*(t+u-2)>d+m+n+1) || ((a-1)*t>d+m+n+3) )
) && ! (  ((n-1)*(s-2)>a+1) && ((n+a)*(t-2)>m+1) && ( ((m-1)*(u-1)>d+a+n+3) || ((a-
1)*u>d+m+n+3) || (((n-1)*u>d+m+a+3) && ( ((a+m+2)*(u-1)>d+n+2) || ((m-
1)*u>d+a+n+5) || ((a+1)*u>d+m+n+3) || ((a-1)*(u+1)>d+m+n+5) ) ) )  ) && ! ( ((m-
1)*(u-1)>d+a+n+5) && (d+m-2>n+a-4) && ((n-1)*(s-1)>d+m+a+1) && ((a+n)*(t+u-
3)>d+m) ) && ! ( (n-1>a+m-4) && ((n+a)*(t-2)>m+1) && ((n-1)*(s-2)>a+1) && (
((a+m-2)*(u-1)>d+n+2) || ((m-1)*u>d+n+a+5) || ((a+1)*u>d+m+n+3) || ((a-1)*(u+1)>
d+m+n+5) || ( (n-1>d+m+a+7)&&((n+a+m+3)*(u-2)>d+1) && ((a+m+2)*2 >d+n+6)) || (
((n-1)*(u-1)>d+m+a+5)&&(((a+m+4)*(u-1)>d+n+2)|| ((a+m)*u>d+n+4) ||((m-1)*(u+1)>
d+m+n+7))))) && ! ((a+m+2>d+n+4) && ((n-1)*2>d+m+a+5) && ((n+a+m+1)*(u-
2)>d+1) && ((n+a)*(t-2)>m+1) && ((n-1)*(s-2)>a+1) )
&&! (  ((a+n-2)*(t-2)>m+1) && ((n-1)*(s-1)>m+3) && ((n-1)*(u-1)>d+m+a+3) && (
((a+m+2)*(u-1)>n+d+2) || ((a+m)*u>n+d+4)) ) &&! (((a+1)*(t-1) > n+m+2) && ((n-
1)*(t-1)>m+a+2) && ((n-1)*(s-2)>a+1) && ( ((a+1)*(u-1)> d+m+n+3) || ((a-
1)*u>d+m+n+5) || ((n+m)*(u-1)>d+a+4) || ((m-1)*u>d+a+n+5))))
```

4.2 A look at the solutions.

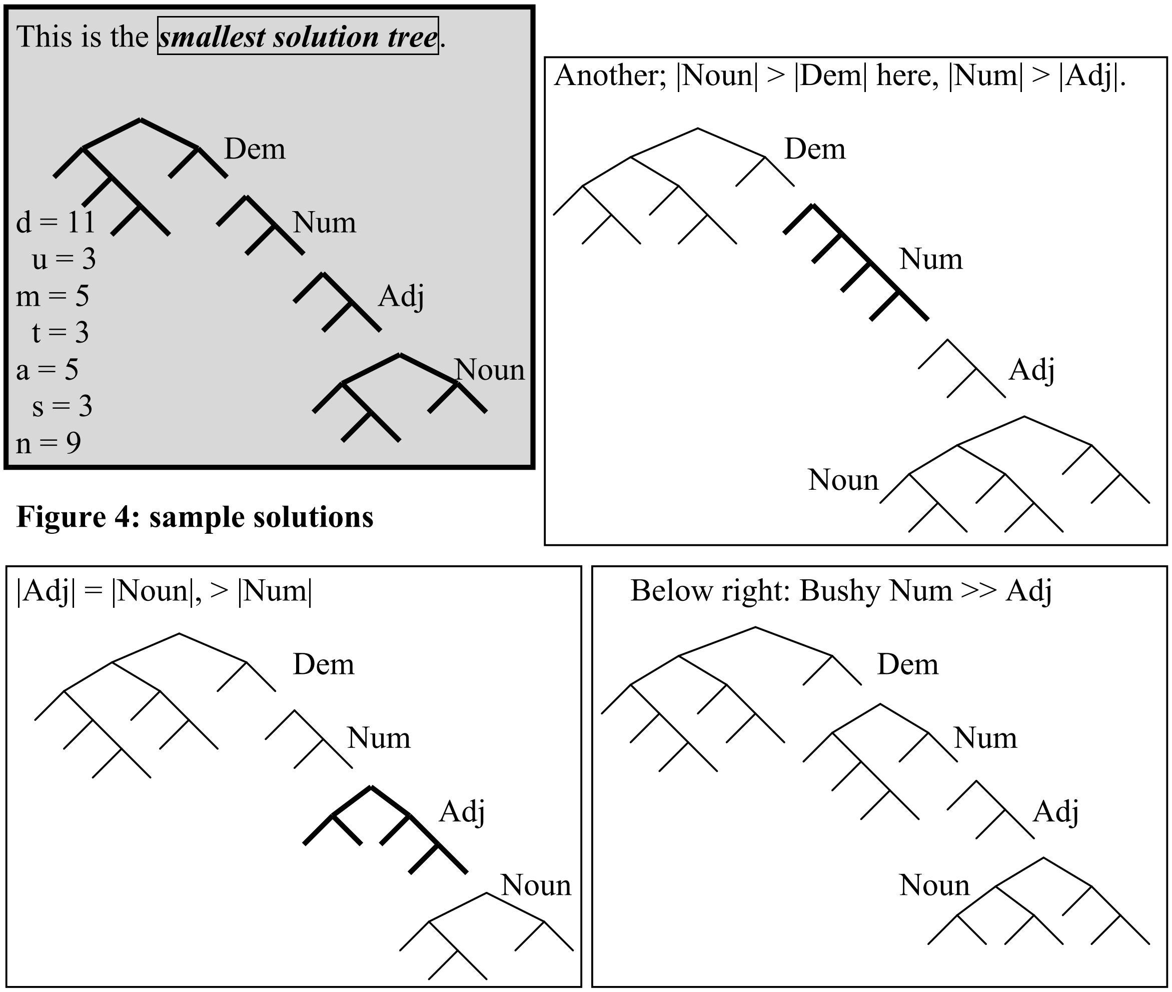
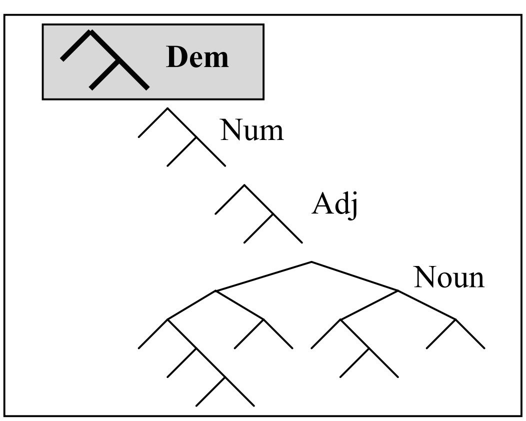


Figure 4: sample solutions

All of these have a very large, bushy Dem. As it turns out, that is a requirement only for small values of n. For $n \geq 21$, Dem can be as small as a single X-bar 'molecule':



Fixed n = |Noun|	Min d = |Dem|
17	9
19	7
21 (left)	**5**

In the smallest solutions, there is a trade-off between size of Noun and size of Dem. Even the depth of Dem (u=3 for all solutions diagrammed so far) is fuzzy; it can be 4 (perhaps larger, though no solutions with u = 5 detected within radius 25).

2) n = 9, a = 5, s = 3, m = 5, t = 3, d = 19, **u = 4**

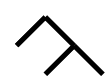
- That seems like a lot of latitude.
- But within the space of possible tree-forms, solution trees comprise a tiny sliver.
- Consider taking "equal radius samples" of the space of tree-forms: each category is allowed to have up to some fixed maximum number of nodes (the radius), and we count the solutions, compared to the number of possibilities.

Radius	# solutions	Total possibilities	Solutions/total
11	2	20,250	.00009
15	44	175,616	.00025
19	271	911,250	.00030
23	1,009	3,449,952	.00029
27	2,814	10,549,994	.00027
31	6,595	27,648,000	.00024

4.2.1 Numerical Predictions:

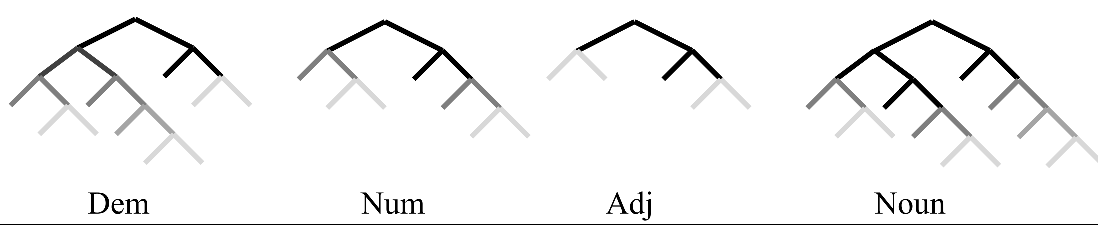
|Noun| ≥ 9 What do the cartographers posit in this part of the tree?
- Little *n*, identified with gender/classifiers (Lowenstamm 2007, Svenonius 2008), a likely-internally-structured phi bundle (Harley&Ritter 2002),
- a self-Merged noun Root (Kayne 2008, following an idea of Guimaraes 2000)
- that already provides most or all of the requisite structure.

|Dem|, |Num|, |Adj| ≥ 5; depth ≥ 3. The Dem, Num, Adj subtrees are each at least as big as an X-bar molecule (right).



Large Dem? As noted, if Noun is small, Dem has to be pretty big, and bushy.
- Gerner (2009) identifies 15 deictic features, with 52 possible values.
- If these hang off as syntactic structure in a left branch, that is well within the structural bounds here.
- On the other hand, a deep stack of heads on the main projection line is not generally consonant with the present account.

"Quantum cartography":



4.3 Direct growth

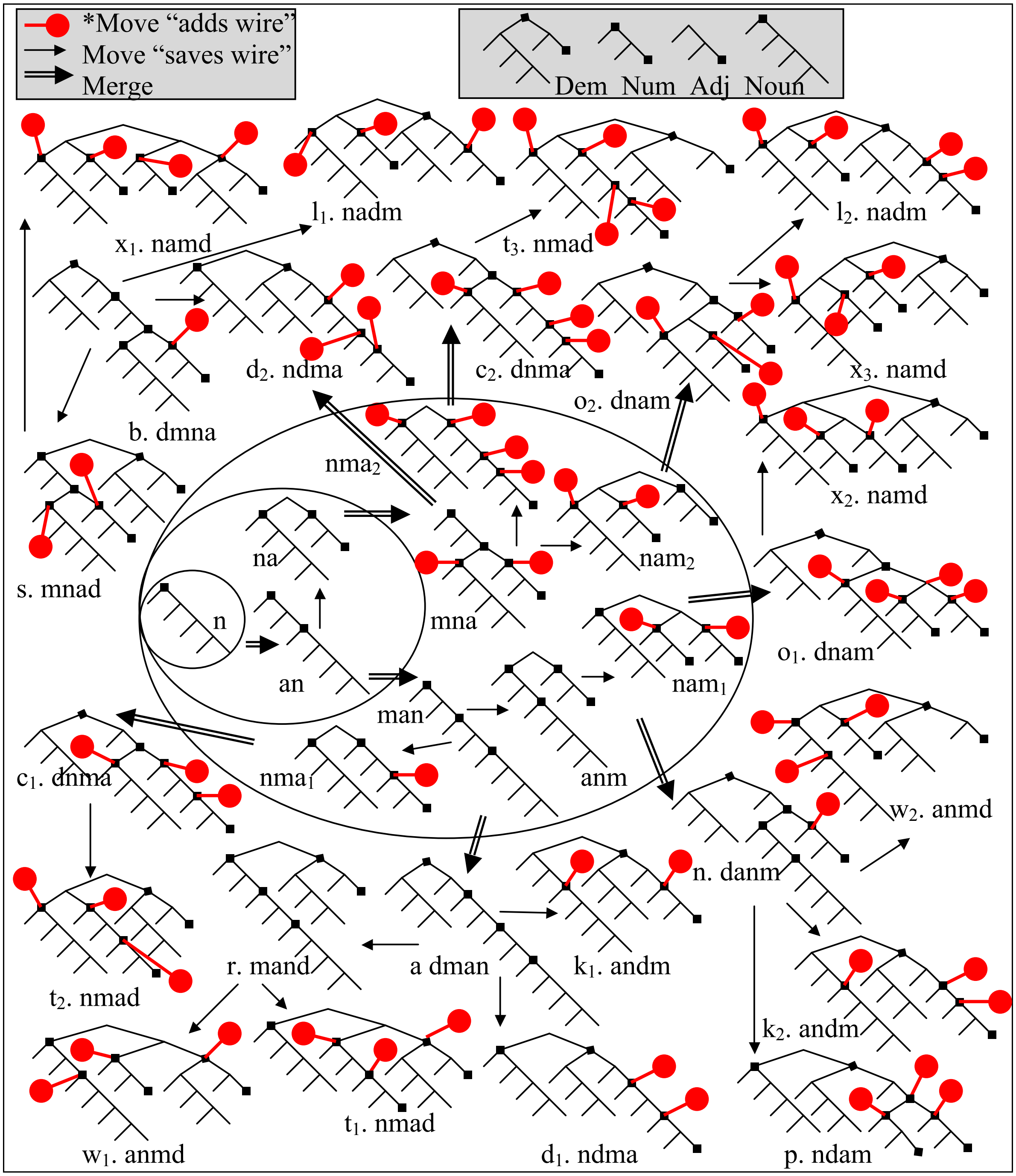


Figure 5: Hand-checked space of movement possibilities for minimal tree <n,a,s,m,t,d,u> = <9,5,3,5,3,11,3>. Every possible movement respecting coherence has been considered: explored here if possible, or marked in red to indicate it is impossible.

Does this say something interesting about cross-linguistic frequency?

Here's one way of assessing it. In the table on the left are Cinque's reports of the cross-linguistic frequency of each of the orders. In the table at right is a simple count of how many distinct ways each order is derived, for the solution tree exhaustively explored here. I see some interesting trends…

Cross-linguistic frequency per Cinque (2005): very many (4), many (3), few (2), very few (1), unattested (0)			
a 4	b 3	c 1	d 2
e 0	f 0	g 0	h 0
i 0	j 0	k 1	l 2
m 0	n 1	o 3	p 1
q 0	r 1	s 2	t 2
u 0	v 0	w 1	x 4

Number of distinct derivations of each order in the growth set of the minimal solution tree.			
a 1	b 1	c 2	d 2
e 0	f 0	g 0	h 0
i 0	j 0	k 2	l 2
m 0	n 1	o 2	p 1
q 0	r 1	s 1	t 3
u 0	v 0	w 2	x 3

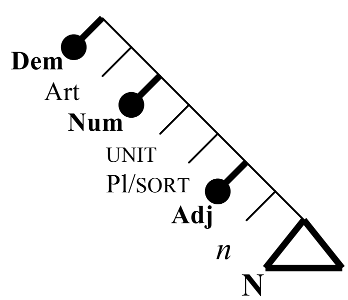
5 Cartography of the DP

Let us turn briefly to the cartographic literature. Svenonius (2008: 27) gives this structure:

3) Dem> Art > Num > UNIT > Pl/SORT > Adj > *n* > N[1]

We can represent the structure as below, where I've used darker lines to mark the relevant four categories amidst the larger cartography.

4)



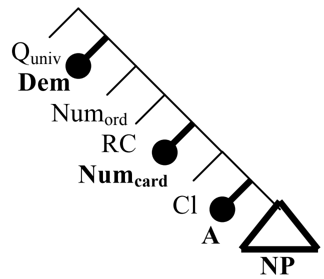
Cinque (2005: 328) proposes this (simplified) structure:

5) [Q_{univ} … [Dem … [Num_{ord} … [RC … [Num_{card} … [Cl … [A …NP]]]]]]][2]

---

[1] This adds, to demonstrative, numeral, adjective, and noun, positions for articles (Art), and numeral classifiers (UNIT), plural markers (Pl) or sortal classifiers (SORT), and noun classifiers, identified with little *n* (Svenonius 2008: 23).

6)



- That certainly accords with the strong position that Dem, Num, Adj are at least the size of X-bar molecules; there is at least one other position between them.
- "Fixing" some portion of the structure to align with cartographic maps makes very strong predictions about what the rest of the structure must look like.
- It remains a delicate issue to evaluate the further predictions so derived.
- In general, the flavor of what we have seen above continues: Adj and Num zones are small, Noun is large, Dem may be small or even bigger than Noun.
- Again, that sounds vague, but the numerical conditions narrow down the set of cartographic analyses consistent with the account to a tiny proportion of possible (classes of) tree shapes.

6 Conclusions

I have shown that assuming movement is "for" reducing the number of c-command relations in the tree yields a single-principle account of the typology of DP orders.

In this investigation, two of the core activities of modern syntax converge:
(i) drawing accurate maps of syntactic structure, and
(ii) describing the constraints on movement (within and across languages).

The present work, if on the right track, unites these strands into a single study:
(i) patterns of movement diagnose structure, and
(ii) structure determines possible movements.

---

[2] This includes positions for universal quantifiers (Q_{univ}), ordinal and cardinal numerals (Num_{ord}, Num_{card}), relative clauses (RC), and classifiers (Cl). Cinque notes that there is evidence for still more material, with Adj standing in for an internally-structured stack of adjective positions, and further slots for "Case, number, possessors, demonstrative reinforcers, various types of determiners, functional adjectives like other and same […], diminutives/augmentatives, complements, and so on." (Cinque 2005: 327)

Selected References:

Abels, Klaus, and Ad Neeleman. 2009. Universal 20 without the LCA. In *Merging features: Computation, interpretation and acquisition*, ed. Josep M. Brucart, Anna Gavarró, and Jaume Solà, 60–80. Oxford: Oxford University Press.

Abney, Steven. 1987. The English Noun Phrase in its Sentential Aspect. PhD dissertation, MIT.

Alexiadou, Artemis, & Elena Anagnostopoulou. 1998. Parametrizing Agr: Word order, V- movement and EPP-checking. *Natural Language and Linguistic Theory* 16: 491-539.

Bahloul, Maher, and Wayne Harbert. 1993. Agreement asymmetries in Arabic. In Mead, Jonathan, ed., *Proceedings of the Eleventh West Coast Conference on Formal Linguistics*, 15-31.

Belletti, Adriana, ed. 2004. *Structures and Beyond: The Cartography of Syntactic Structures*, vol. 3. Oxford: Oxford University Press.

Bobaljik, Jonathan. 2008. Where's Phi? Agreement as a post-syntactic operation. in Harbour, Daniel, David Adger, and Susana Béjar, eds., *Phi Theory: Phi-Features across Modules and Interfaces*. Oxford: Oxford University Press. 295-328

Boeckx, Cedric. 2008. *Bare Syntax*. Oxford: Oxford University Press.

Chomsky, Noam. 1981. *Lectures on Government and Binding*. Dordrecht: Foris.

Chomsky, Noam. 1986. *Barriers*. Cambridge, Mass.: MIT Press.

Chomsky, Noam. 1995. *The Minimalist Program*. Cambridge, Mass.: MIT Press.

Chomsky, Noam. 2001. Derivation by Phase. In *Ken Hale: A Life in Language*, M. Kenstowicz (ed.), 1-52. Cambridge, MA: MIT Press.

Chomsky, Noam. 2005. Three factors in language design. *Linguistic Inquiry* 36:1, 1-22.

Cinque, Guglielmo. 1994. On the evidence for partial N movement in the Romance DP. In *Paths Towards Universal Grammar: Essays in Honor of Richard Kayne*, eds. Cinque, G, Koster, J, Pollock, J-Y, Rizzi, L, Zanuttini, R. Georgetown University Press, 85-110.

Cinque, Guglielmo. 1999. *Adverbs and Functional Heads*. Oxford: Oxford University Press.

Cinque, Guglielmo, ed. 2002. *Functional Structure in DP and IP: The Cartgography of Syntactic Structures*, vol. 1. Oxford: Oxfrod University Press.

Cinque, Guglielmo. 2005. Deriving Greenberg's Universal 20 and its Exceptions. *Linguistic Inquiry* 36: 3, 315 – 332.

Cinque, Guglielmo & Luigi Rizzi. 2010. The cartography of syntactic structures. In Bernd Heine & Heiko Narrog (eds.), *The Oxford Handbook of Linguistic Analysis*, 51–66. Oxford: Oxford University Press.

Epstein, Samuel D., Erich M. Groat, Ruriko Kawashima, and Hisatsugu Kitahara. 1998. *A derivational approach to syntactic relations*. Oxford: Oxford University Press.

Gerner, Matthias. 2009. "Deictic features of demonstratives: A typological survey with special reference to the Miao group." Canadian Journal of Linguistics 54(1): 43-90.

Greenberg, Joseph. 1963. Some universals of grammar with particular reference to the order of meaningful elements. In *Universals of language*, ed. by Joseph Greenberg, 73–113. Cambridge, Mass.: MIT Press.

Grimshaw, Jane. 1991. Extended projections. Ms., Brandeis University, Waltham, Mass.
Guimarães, Maximiliano. 2000. In Defense of Vacuous Projections in Bare Phrase Structure. *University of Maryland Working Papers in Linguistics* 9:90-115.
Harley, Heidi, & Elizabeth Ritter. 2002. Structuring the bundle: a universal morphosyntactic feature geometry. In Horst J Simon and Heike Wiese, eds., *Pronouns: Grammar and Reference,* Linguistiks Aktuell/Linguistics Today v 52, John Benjamins, Amsterdam/Philadelphia, 23-62.
Heine, Bernd and Tania Kuteva. 2002. *World Lexicon of Grammaticalization*. Cambridge: Cambridge University Press.
Johnson, Kyle. 1991. Object Positions. *Natural Language & Linguistic Theory* 9, 577-636.
Kahnemuyipour, Arsalan, and Diane Massam. 2006. Patterns of phrasal movement: the Niuean DP. In Hans-Martin Gartner, Paul Law and Joachim Sabel, eds. *Clause Structure and Adjuncts in Austronesian Languages.* Mouton de Gruyter, 125-150.
Kayne, Richard. 1994. *The Antisymmetry of Syntax*. Cambridge, MA: MIT Press.
Kayne, Richard. 2008. Antisymmetry and the Lexicon. *Linguistic Variation Yearbook* 8 (1) 1-31.
Kratzer, Angelika. 1996. Severing the external argument from its verb. In Johan Rooryk and Laurie Zaring, eds, *Phrase Structure and the Lexicon*. Dordrecht: Kluwer. 109-37.
Larson, Richard. 1988. On the double object construction. *Linguistic Inquiry* 19: 335-91.
Miyagawa 2010 *Why Agree? Why Move? Unifying Agreement-based and Discourse-configurational Languages.* MIT Press, *Linguistic Inquiry Monograph* 54.
Oltra-Massuet, Maria & Karlos Arregi. 2005. Stress-by-Structure in Spanish. *Linguistic Inquiry* 36.1:43-84.
Pollock, Jean-Yves. 1989. Verb-movement, Universal Grammar, and the structure of IP. *Linguistic Inquiry* 20, 365-424.
Reinhart, Tanya. 1976. The Syntactic Domain of Anaphora. PhD dissertation, MIT.
Rizzi, Luigi. 1990. *Relativized Minimality*. Cambridge, MA: MIT Press.
Rizzi, Luigi. 1997. The fine structure of the left periphery. In Liliane Haegeman, ed., *Elements of Grammar*. Dordrecht: Kluwer.
Rizzi, Luigi, ed. 2004. *The Structure of CP and IP: The Cartography of Syntactic Structures*, Vol. 2. Oxford: Oxford University Press.
Shlonsky, Ur. 2010. The cartographic enterprise in syntax. Language and Linguistics Compass, Wiley online.
Svenonius, Peter. 2007. 1… 3-2. In Gillian Ramchand & Charles Reiss, (eds). *Oxford Handbook of Linguistic Interfaces*. Oxford: Oxford University Press, 239-288.
Svenonius, Peter. 2008. The position of adjectives and other phrasal modifiers in the decomposition of DP. *Adjectives and Adverbs: Syntax, Semantics, and Discourse*, eds. Louise McNally and Chris Kennedy. Oxford University Press.