Second-position clitics and the syntax-prosody interface: The case of Ancient Greek

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2P Behavior: A first illustration

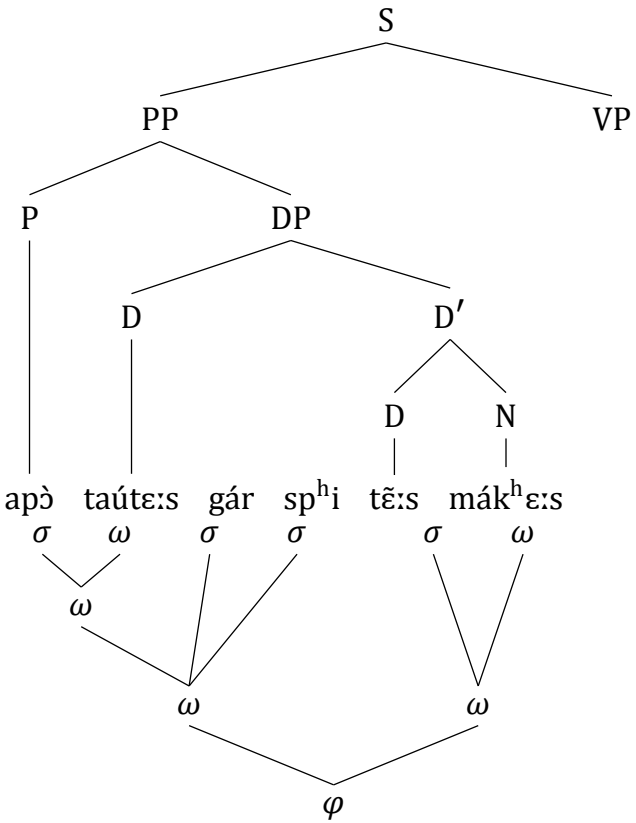
(1) (apὸ taútɛːs)$_{\omega}$=**gár=sp^{h}i** tɛ̃ːs mák^{h}ɛːs …
from MED.F.GEN.SG=EXPL=3PL.DAT ART.F.GEN.SG battle.F.GEN.SG
katɛúk^{h}ɛtai hɔ kɛ́ːryks hɔ
pray.PRES.IND.MP.3SG ART.M.NOM.SG herald.M.NOM.SG ART.M.NOM.SG
At^{h}ɛːnaĩɔs háma tɛ At^{h}ɛːnaíɔisi
Athenian.M.NOM.SG together.ADV CONJ Athenian.M.DAT.PL
lɛ́gɔːn gínɛst^{h}ai tà agat^{h}à
speak.PTCP.PRES.ACT.M.NOM.SG happen.INF.PRES.MP ART.N.ACC.PL good.N.ACC.PL
kaì Plataiɛũsi.
CONJ Plataean.M.DAT.PL

‘Since this battle..., the Athenian herald prays that good things befall the Athenians and Plataeans together, when the Athenians conduct their sacrifices at the festivals that occur every four years.’

Hdt. 6.111.2

Syntax-prosody mismatch

(2)



- Both clitics are hosted by the first prosodic word within S.

Existing LFG accounts of 2P behavior

- Second-position (2P) clitics have been a constantly challenging phenomenon to handle within LFG.
- The root of the problem is the ability of clitics to appear in surface positions where they cannot be assigned a GF.
- Existing accounts of 2P behavior either suffer from empirical shortcomings or rely on non-trivial departures from the core assumptions of LFG, such as:
  - pipeline architecture
  - non-standard constituents (CLCL) assigning GFs
  - optimality theory with cross-derivational comparison
  - c-structure/string mismatch
  - prosodic markers in the syntax

C- and F-structure

- There are both formal and linguistic differences between c- and f-structure
  - Formally, c-structure can only handle phenomena within the locality domain of a CFG, i.e. the one level tree corresponding to a rule whereas f-structure can handle phenomena at an unbounded distance.
  - Linguistically, c-structures deal with word order and constituency whereas f-structures deal with abstract syntactic relations.
- This translates into a claim that there are no non-local word order or constituency facts.
- However, second position clitics seem to involve exactly non-local constituents.
- This motivates a move to a richer c-structure, with an extended locality domain – concretely, a 2-MCFG.

Our Proposal

- We modify the division of labor between the c- and f-structures, so as to capture two crucial insights into the nature of 2P clitic behavior in AG.
- The role of syntax on our account is decidedly minimal compared to other models: all that matters is where the edges of large domains such as S and CP are.
- As prosodic constituency need not align with syntactic constituency, there is no dedicated c-structure position for 2P clitics.

Corpus

- Our study is based on the Ionic dialect of the classical period (5th c. BCE). We rely in particular on Herodotus *Histories*, a corpus of 189,489 tokens.

Roadmap

2P Behavior in AG

- The clitic lexicon of AG is larger than that of any other archaic IE language (and encompasses personal pronouns, verbs, conjunction, and discourse and modal particles).
- There is no single "second" position in which they all occur.
- Rather we have evidence that clitics subcategorize for particular (syntactic and prosodic) domains.

Clitic domains in Ancient Greek

Domain	Members
Sentence	{dé, mén}—gár—ɔ̃ːn—{déː, dɛ̃ːta}
Clause	án—{kɔtɛ, kɔu, kɔː, kɔːs, kɛː(i)}—ára—acc—dat—{ɛimí, p^hɛːmí}?
Phrase	tɛ—{dé, mén}—gɛ

Sentence clitics are invariably discourse connectives marking intersentential relationships: we assume they are $\widehat{\text{Adv}}$

Clausal clitics realize grammatical features of the clause: they can be $\widehat{\text{Adv}}$, $\widehat{\text{D}}$ and $\widehat{\text{V}}$

Phrasal clitics realize grammatical features of sub-clausal XPs (and will be ignored here)

Ancient Greek clitic patterns

AG displays a fairly complex array of clitic positioning patterns, so we will focus on the core generalizations:

- Clitic domains mirror clitic scope: CP for sentential clitics, S for clausal clitics
  - So we get "splaying" whenever there is material outside S
  - When there is no material outside S, sentential clitics directly precede clausal ones
- Clitics must have a prosodic host in their domain: clausal clitics require a prosodic word (PW), whereas sentential clitics can take a morphosyntactic word or a prosodic word
- Host + enclitics invariably project a recursive prosodic word

Splaying

(3) [tɛ̀ːn=**mɛ̀n**=**gàr** prɔtérɛːn hɛːmérɛːn]
ART.F.ACC.SG=PTCL=EXPL previous.F.ACC.SG day.F.ACC.SG
pánta=**sp^{h}i** kakà ék^{h}ɛin.
everything.N.ACC.PL=3PL.DAT bad.N.ACC.PL have.INF.PRES.ACT
[For on the previous day], everything was bad for them.

Hdt. 1.126.4

No splaying

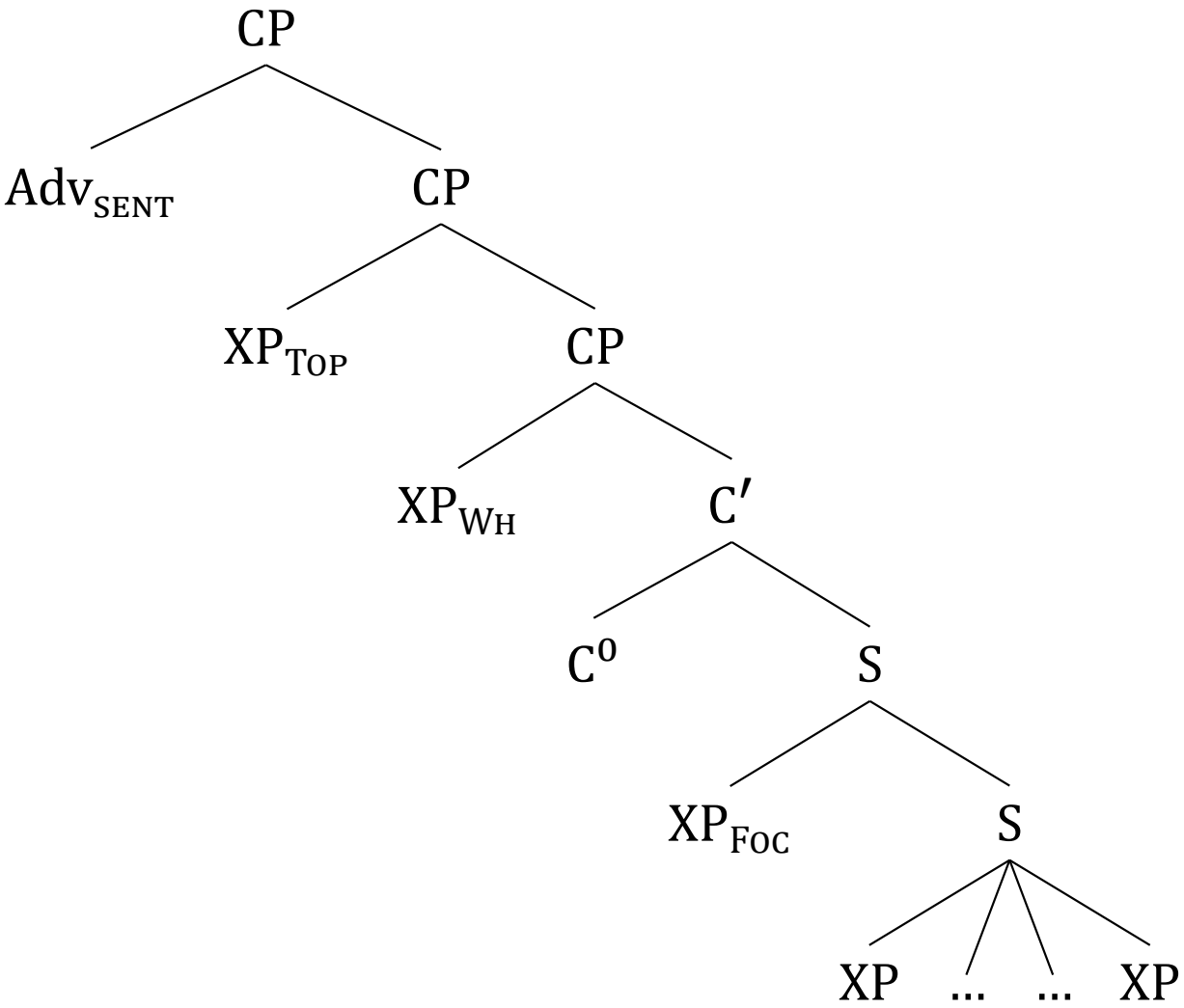
(4) hoi=gár=mɛ ɛk tɛ̃ːs kóːmɛːs
ART.M.NOM.PL=EXPL=1SG.ACC from ART.F.GEN.SG village.F.GEN.SG
paĩdɛs … ɛstɛ́ːsanto basiléa
child.C.NOM.PL make.stand.PFV.IND.MID.3PL king.M.ACC.SG
'For the children from the village …, while playing, chose me as their king.'

Hdt. 1.115.2

Host variability

(5) tà toiaũta=**gàr** érga ou prὸs toũ
ART.N.ACC.PL such.N.ACC.PL deed.N.ACC.PL NEG by ART.M.GEN.SG
hápantɔs andrὸs nenómika gínesthai
all.C.GEN.SG man.M.GEN.SG think.1SG.PERF.ACT.IND happen.PRES.ACT.INF
'For I have thought that not each man is capable of such deeds, but ...'
Hdt. 7.153

Clause structure



C-structure rules

Clause-level rules

$$\begin{array}{lcll} \text{CP} & \rightarrow & \text{XP} & \text{C}' \\ & & (\uparrow \textsc{udf})=\downarrow & \uparrow=\downarrow \\ \text{C}' & \rightarrow & \text{C}^0 & \text{S} \\ & & \uparrow=\downarrow & \uparrow=\downarrow \\ \text{S} & \rightarrow & \text{XP}^* & \text{V}^* \\ & & (\uparrow \textsc{gf})=\downarrow & \uparrow=\downarrow \end{array}$$

Adjunction to clausal categories

$$\begin{array}{lcll} \text{CP} & \rightarrow & \text{AdvP} & \text{CP} \\ & & \uparrow=\downarrow & \uparrow=\downarrow \\ \text{CP} & \rightarrow & \text{XP} & \text{CP} \\ & & (\uparrow(\textsc{gf}))=\downarrow & \uparrow=\downarrow \\ & & (\uparrow_\sigma \textsc{df}) = \textsc{topic} & \\ \text{S} & \rightarrow & \text{XP} & \text{S} \\ & & (\uparrow(\textsc{gf}))=\downarrow & \uparrow=\downarrow \\ & & (\uparrow_\sigma \textsc{df}) = \textsc{focus} & \end{array}$$

Lexical phrases

$$\begin{array}{lcll} \text{PP} & \rightarrow & \text{P} & \text{DP} \\ & & \uparrow=\downarrow & (\uparrow \textsc{obj}) =\downarrow \\ \text{DP} & \rightarrow & \begin{pmatrix}\text{D} \\ \uparrow=\downarrow\end{pmatrix} & \text{NP} \\ & & & \uparrow=\downarrow \\ \text{NP} & \rightarrow & \text{A}^* & \begin{pmatrix}\text{N} \\ \uparrow=\downarrow\end{pmatrix} \\ & & (\uparrow \textsc{adj}) \in \downarrow & \\ \text{AdvP} & \rightarrow & \text{Adv} & \\ & & \uparrow=\downarrow & \end{array}$$

Multiple context free grammars

- MCFG dissociate category formation and computation of yield
- Category formation is expressed as ordinary CFG productions
- A yield function makes explicit how to compute the yield of the mother node from that of its daughters
- If the only yield functions are concatenations, we get a CFG

More complex yield functions: split

- The yield of a non-terminal can be a string tuple rather than a string
- DP $\rightarrow s_1(DNP), s_1 = [\langle 1,1\rangle][\langle 2,1\rangle]$
- $[\langle x,y\rangle]$ denotes the y'th component of the x'th argument
- In this case, then, the DP may be split between the first (and only) component of the first argument and the first (and only) component of the second argument, i.e. between D and NP
- The idea is familiar from Pollard's head grammar where a string has a distinguished word (head) after which it can be split

More complex yield functions: propagation

- If a daughter node is discontinuous, that discontinuity may be propagated to the mother node
- PP $\rightarrow p_2$(P DP), $p_2 = [\langle 1,1\rangle; \langle 2,1\rangle][\langle 2,2\rangle]$
- This means the PP is discontinuous at the point where its object DP is discontinuous
- Again, this is similar to head grammar, where the concatenation operation selects the head of one daughter node as the head of the mother
- Notice that discontinuities (unlike reentrancies) do not embed recursively, so the most complex rule bounds the complexity of the grammar

More complex yield fuctions: resolution

- A discontinuous node may resolve its discontinuity by hosting a contiguous set of sister nodes
- S $\rightarrow r_2(\widehat{\text{V}}\ \text{PP}\ \text{V})$, $r_2 = [\langle 2,1\rangle; \langle 1,1\rangle; \langle 2,2\rangle; \langle 3,1\rangle]$
- The PP is wrapped around the clitic $\widehat{\text{V}}$
- This is like the wrap operation of head grammar: $w(\alpha\hat{x}\beta, \gamma\hat{y}\delta) = \alpha\hat{x}\gamma\hat{y}\delta\beta$
- We also need a variant that hosts without resolving the discontinuity: $h_2 = [\langle 2,1\rangle][\langle 1,1\rangle; \langle 2,2\rangle; \langle 3,1\rangle]$

Combining LFG and MCFG

- Functional annotations on productions work in the usual way
- The yield (c-structure string) is computed using the yield functions
- Yield functions combine freely with productions, except that h_n/r_n can only apply to productions where the $n-1$ first daughters are nonprojecting, i.e. only nonprojecting words can break up the yield of another node
- This move does not alter the complexity of the LFG formalism

The syntax-prosody interface

- We adopt Dalrymple and Mycock's analysis of the syntax-prosody interface
- Syntactic and prosodic trees are built in tandem and must simultaneously satisfy the relevant syntactic and prosodic constraints
- The interaction is confined to the lexicon, where the terminals of the prosodic and the syntactic trees meet
- The lexicon specifies both syntactic constraints (category, functional annotations) and prosodic ones
- We handle prosodic constraints for clitics via a HOST-feature at χ-structure

Prosodic incorporation

- There are two types of prosodic interaction between host and enclitic.
- First pattern: Secondary stress is determined by an accent calculus that differs somewhat from the primary stress calculus (these are called *enclitics* in the philological literature; we abstract away from the details of secondary stress assignment here).
- Second pattern: The enclitic itself bears secondary stress (these are called *postpositives* in the philological literature).
- Secondary stress assignment reflects the presence of recursive prosodic words.

Secondary stress assignment

(6) i. *No secondary stress (via calculus)*

(pánta)$_{\omega}$+sphi → ((pánta)$_{\omega}$=sphi)$_{\omega}$

ii. *Secondary stress (via calculus)*

(ánt^{h}rɔːpɔi)$_{\omega}$+tinɛs → ((ánt^{h}rɔːpɔí)$_{\omega}$=tinɛs)$_{\omega}$

iii. *Fixed secondary stress (postpositive)*

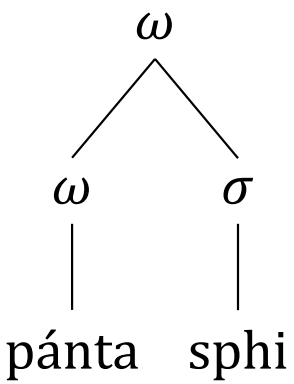
(taútɛːs)$_{\omega}$+gár → ((taútɛːs)$_{\omega}$=gár)$_{\omega}$

iv. *Fixed secondary stress (postpositive with sub-PW)*

hoi+gár → (hoi=gár)$_{\omega}$

- Domain-selection (sentence, clause, phrase) and incorporation pattern (enclitic, postpositive) appear to be independent properties.
- Proclitics show neither of these patterns, as far as we know.

Prosodic incorporation: Enclitics

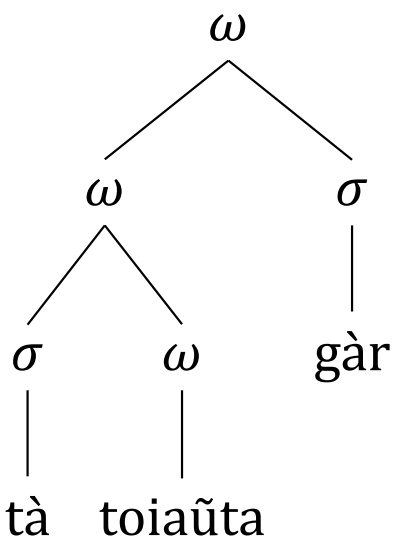


- Host + clitic form a recursive PW
- We assume this is created through σ-adjunction

$$\omega \rightarrow \begin{array}{cc} \omega & \sigma \\ (\uparrow_\chi \mathrm{L}) \sqsubseteq (\downarrow_\chi \mathrm{L}) & (\uparrow_\chi \mathrm{R}) \sqsubseteq (\downarrow_\chi \mathrm{R}) \\ \omega \in (\downarrow_\chi \mathrm{L}) & \omega \in (\downarrow_\chi \mathrm{R}) \\ \mathrm{IntP} \in_c (\downarrow_\chi \mathrm{L}) & (\downarrow_\chi \textsc{host}) = \omega \end{array}$$

- clitic hosting via σ-adjunction is only licensed at the left edge of an IntP

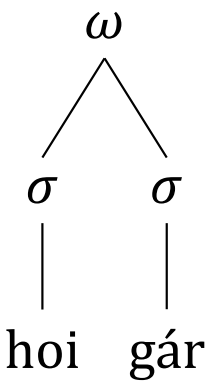
Prosodic incorporation: Postpositive hosted by PW



- A sentential clitic can be hosted by a PW, forming a recursive PW
- The same rule applies

$$\omega \quad \rightarrow \quad \begin{array}{cc} \omega & \sigma \\ (\uparrow_\chi \mathrm{L}) \sqsubseteq (\downarrow_\chi \mathrm{L}) & (\uparrow_\chi \mathrm{R}) \sqsubseteq (\downarrow_\chi \mathrm{R}) \\ \omega \in (\downarrow_\chi \mathrm{L}) & \omega \in (\downarrow_\chi \mathrm{R}) \\ \mathrm{IntP} \in_c (\downarrow_\chi \mathrm{L}) & (\downarrow_\chi \textsc{host}) = \omega \end{array}$$

Prosodic incorporation: Postpositives hosted by PW



- A sentential clitic also be hosted by a sub-PW and the result is a PW
- Details unclear, we assume stray adjunction

$$\omega \rightarrow \sigma^{+} \quad \sigma$$

$$(\uparrow_{\chi} \text{L}) \sqsubseteq (\downarrow_{\chi} \text{L}) \qquad (\uparrow_{\chi} \text{R}) \sqsubseteq (\downarrow_{\chi} \text{R})$$

$$\omega \in (\downarrow_{\chi} \text{L}) \qquad \omega \in (\downarrow_{\chi} \text{R})$$

$$\text{IntP} \in_{c} (\downarrow_{\chi} \text{L}) \qquad (\downarrow_{\chi} \textsc{host}) = \sigma$$

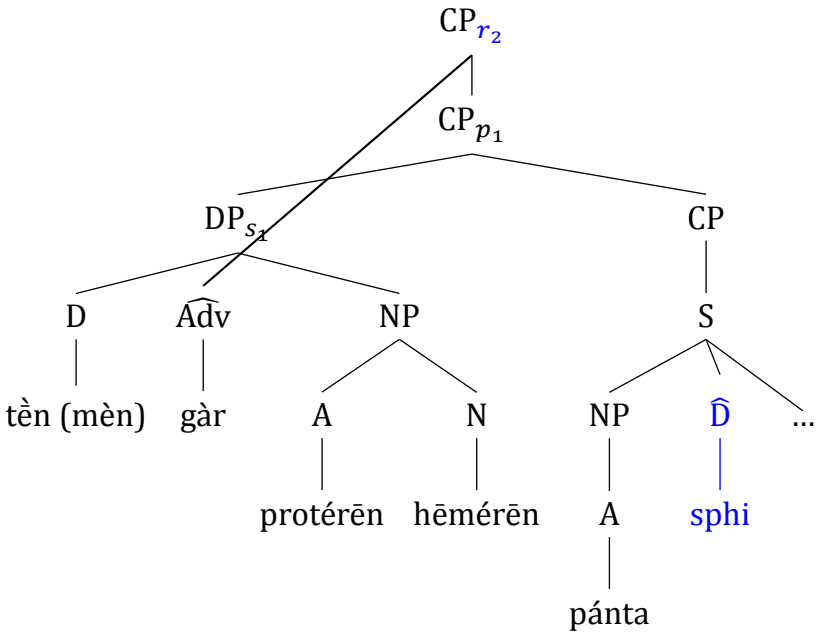
- Again, this operation is only licensed at the left edge of an IntP
- The host is marked as syllabic

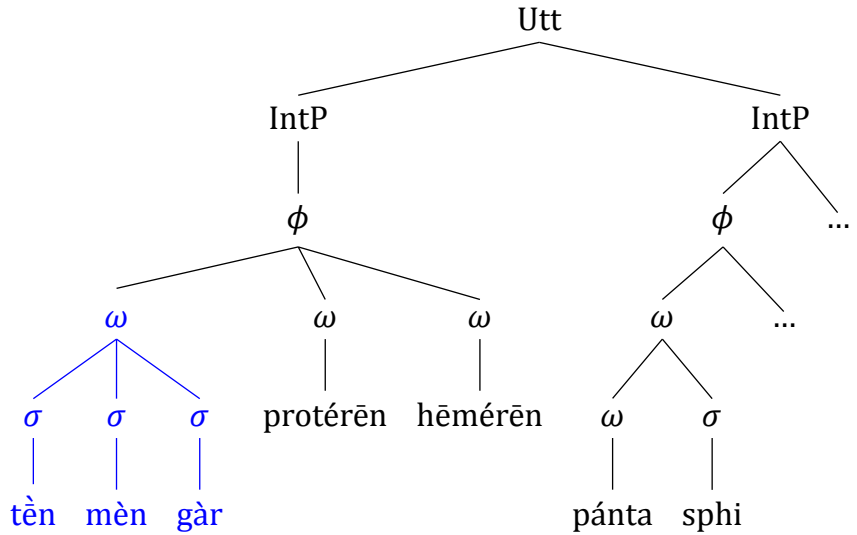
Lexical entries for enclitics and postpositives

gár	$\widehat{\text{Adv}}$	$(\uparrow_\chi \text{HOST})$
		⋮
me	$\widehat{\text{D}}$	$(\uparrow_\chi \text{HOST}) =_c \omega$
		$(\uparrow \text{PRED}) = \text{‘PRO’}$
		$(\uparrow \text{CASE}) = \text{ACC}$
		⋮

- *gár* is marked as accepting any host, while *me* requires a full PW
- By virtue of being non-projecting words they are allowed to exploit the complex yield function to get a host while still getting their GF correctly assigned

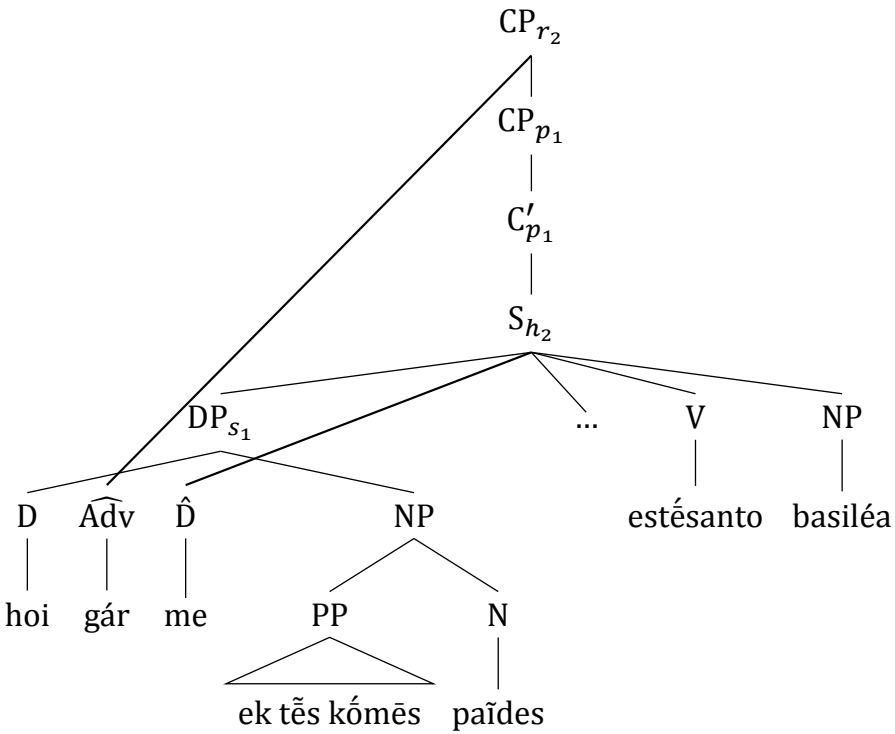
Splaying revisited

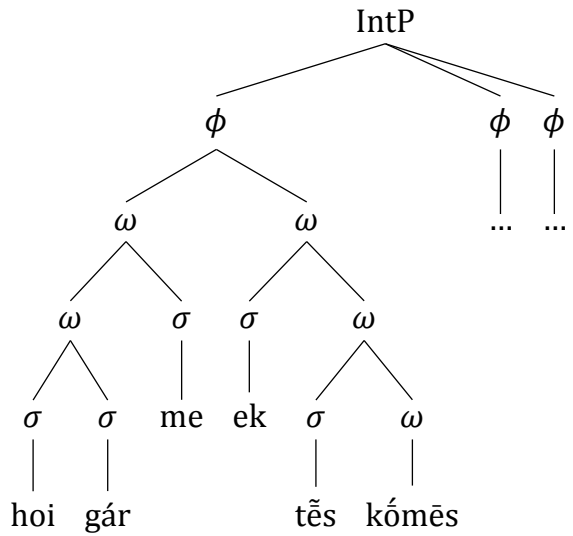




- *gàr* gets its prosodic host via the r_2 yield function
- *sphi* is simply treated *in situ*; no need to motivate/stipulate a particular syntactic position
- *gár* could also go after the first PW, as predicted by our underspecified HOST requirement

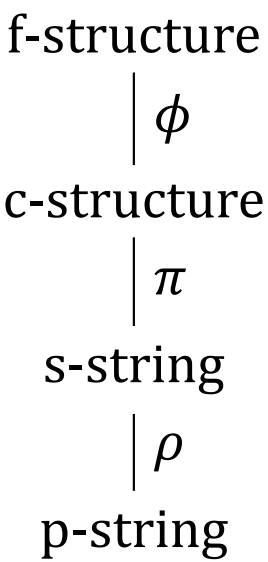
No splaying





- *gár* and *me* get hosts via r_2 and h_2 respectively
- Notice that *hoi* alone would not be a licit host for *me*, as it is not a PW

Clitics in the LFG architecture



- All approaches try to put clitics in the right position in the c-structure so as to get the right function in the f-structure
  - Lowe (2015) displaces the clitics in the π-projection
  - Bögel (2015) displaces the clitics in the ρ-projection
- This creates the need to motivate a non-surface position in the c-structure
- And a means of enforcing it: CL/CLC
- Both are problematic

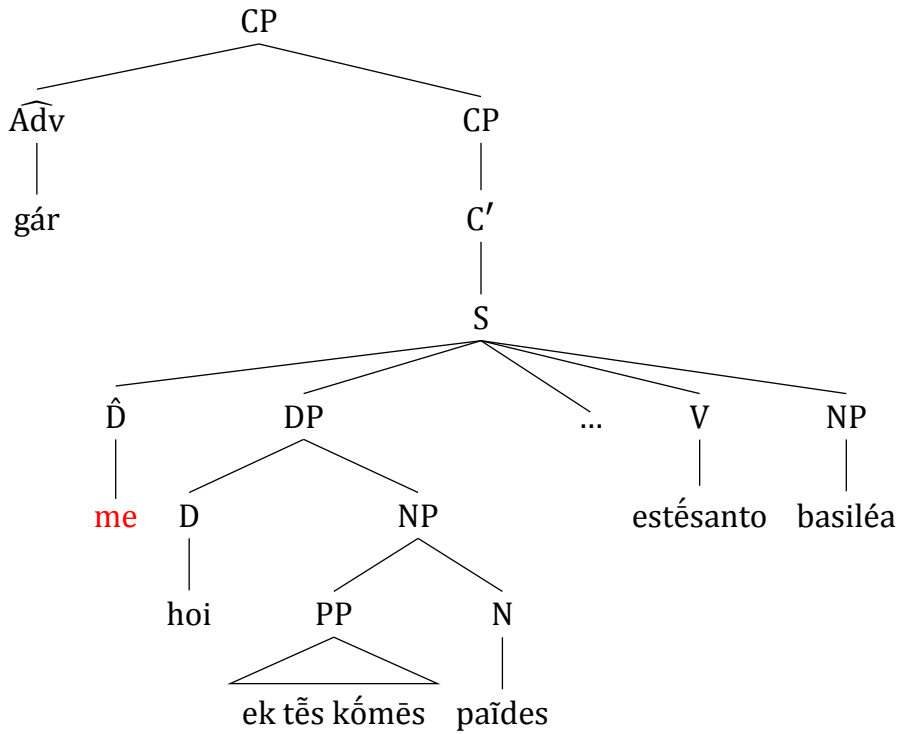
Problems with the CCL

Earlier approaches typically use a CL/CCL constituent to make sure clitics appear at the left edge of the clause, but

- Clitic chains are not syntactic constituents.
- CL is a syntactic category whose defining property is prosodic.
- Clitic chains are not prosodic constituents (Bögel 2015, 207).

Underlying positions

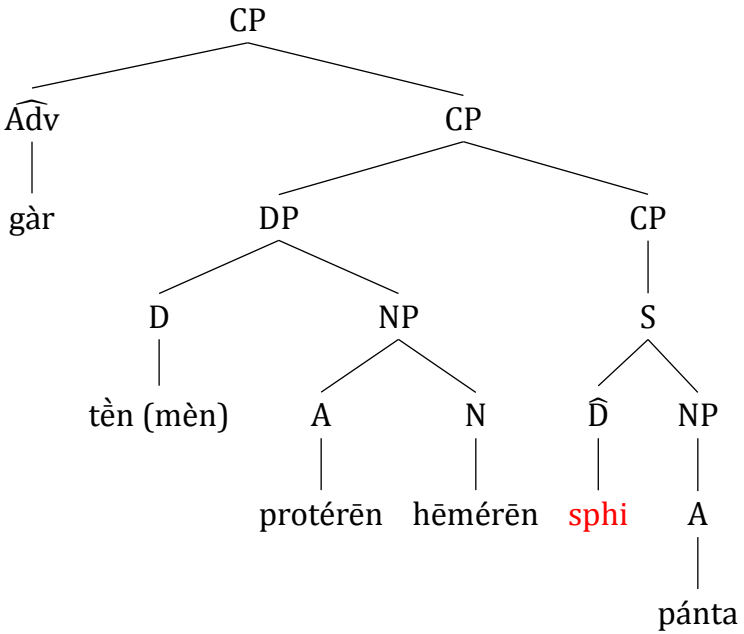
- How do we know where the clitic goes?
- Giving up the c-structure/string isomorphisms requires rethinking criteria for c-structure analysis



- What is the evidence that *me* is initial in S?

Underlying positions

- How do we know where the clitic goes?
- Giving up the c-structure/string isomorphisms requires rethinking criteria for c-structure analysis



- What is the evidence that *sphi* precedes *pánta*?

Doing away with non-surface positions

- Once we dissociate category formation and yield calculation, we don't need a syntactically motivated position in which the clitic can never actually surface
- Instead, we only need the actually observed position, which is prosodically motivated
- As far as syntax is concerned, the clitic can go wherever a maximal *D* projection can go
- There is evidence for this from metrical texts

Verse-initial host

(7) hɔ́t-an d’ hí:kɛ:tai, tɛ:nikaũt’ egɔ̀:
when-MOD PTCL come.PRES.SBJV.MP.3SG, then 1SG.NOM
kakɔ̀s
remiss.M.NOM.SG

(mὲ: drɔ̃:n)$_{\omega}$=**àn** é:ɛ:n pánt^{h}’
NEG do.PTCP.PRES.ACT.M.NOM.SG=MOD be.PRES.OPT.ACT.1SG all.N.ACC.PL
hɔ́s’ àn dɛ:loĩ t^{h}ɛɔ̀s
so.much.REL.N.ACC.PL MOD indicate.PRES.OPT.ACT.3SG god.M.NOM.SG

‘When he gets here, I would be remiss
if I didn’t do whatever god indicates.’

Soph. *OT* 76–77

Summing up and looking ahead

- It is not that the syntactic behavior of 2P clitics is “normal” in that they behave like non-2P elements.
- Instead, syntax simply plays a reduced role in the distribution of 2P clitics.
- It assigns domains to 2P clitics; prosody does the rest.
- 2P clitics are special to the extent that they are defective: they cannot show up everywhere their non-clitic counterparts can.
- Some of this is prosodically motivated, and some of it is syntactic.
- The MCFG approach models this without cross-derivational comparison and without relying on syntactic non-surface positions

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Complexity issues

- LFG handles non-local dependencies with reentrancies (multiple nodes mapping to the same f-structure)
- MCFG handles non-local dependencies with non-contiguous yields
- The LFG formalism is more powerful because it interacts with recursion in the c-strucure rules, making it possible to write grammars that do not give an upper bound on reentrancies, while in an MCFG, the yield functions will bound the non-local dependencies
- But LFG grammars that do bound the number of reentrancies ("finite copy"-LFGs) *can* be translated into weakly equivalent MCFGs and vice versa

Translating between LFG and MCFG

S →	$r_2(\widehat{\text{V}}$	PP	V)	$r_2 = [\langle 2,1\rangle; \langle 1,1\rangle; \langle 2,2\rangle; \langle 3,1\rangle]$
	↑=↓	(↑OBL)=↓	↑= ↓	
PP →	p_2(P	DP)		$p_2 = [\langle 1,1\rangle; \langle 2,1\rangle][\langle 2,2\rangle]$
	↑=↓	(↑OBJ)=↓		
DP →	f (D	NP)		$s_1 = [\langle 1,1\rangle][\langle 2,1\rangle]$
	↑=↓	↑=↓		

S →	PP_1	$\widehat{\text{V}}$	PP_2	V
	(↑OBL)=↓	↑=↓	(↑OBL)=↓	↑=↓
PP_1 →	P	DP_1		
	↑= ↓	(↑OBJ)=↓		
PP_2 →	DP_2			
	(↑OBJ)=↓			
DP_1 →	D			
	↑=↓			
DP_1 →	NP			
	↑=↓			