Intermediate Phonology

Part 7: Prosodic phrase and intonation phrase

Caroline Féry (caroline.fery@gmail.com)
Frankfurt

CreteLing23

Contents of the class

1. Prosodic hierarchy; Phonemes, segments, and distinctive features
2. Segmental allophonies
3. Syllables
4. Moras, weight and time slots

5. Feet and lexical stress
6. Prosodic words
7. **Prosodic phrases**
8. Tones and intonation

Prosodic hierarchy

Prosodic structure is crucial to understand phonology

Prosody		Morphosyntax
ι	**Intonation phrase**	**Clause**
φ	**Prosodic Phrase**	**Syntactic phrase**
ω	Prosodic word	Grammatical word
F	Foot	Stress unit
σ	Syllable	–
μ	Mora	–

ω, φ and ι : interface constituents

Introduction

Mapping between syntax and prosody takes place at the higher-level prosodic constituents: ideally, a syntactic phrase is mapped to a prosodic phrase (φ-phrase), and a clause is mapped to an intonation phrase (ι-phrase).

ι	Intonation phrase	Clause
φ	Prosodic Phrase	Syntactic phrase

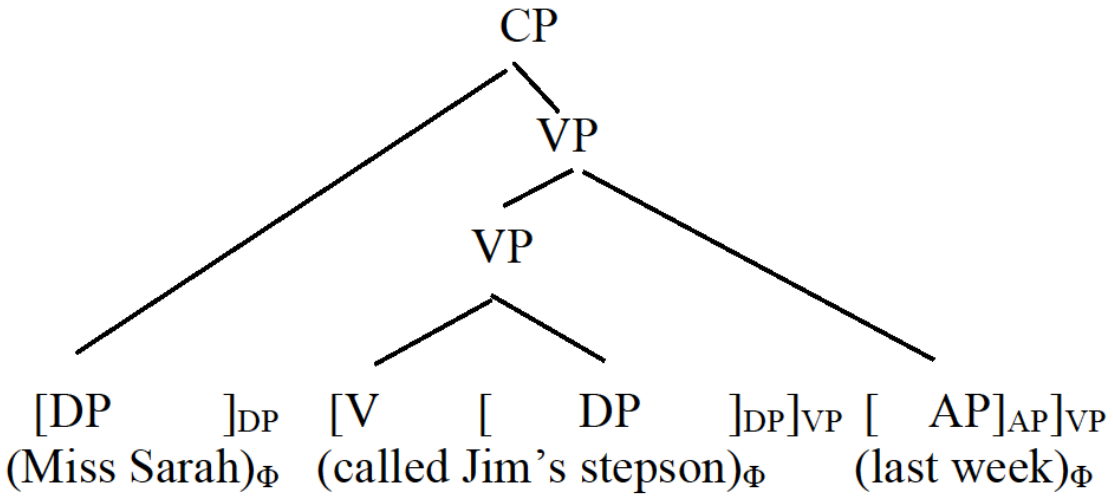
In an all new utterance, only syntax is active in the mapping to prosodic structure.

Information structure, i.e., focus, givenness and topic, can have an influence not only on the syntactic structure of sentences, but also on the prosody. For instance, the placement of "nuclear" accents can be determined by focus structure.

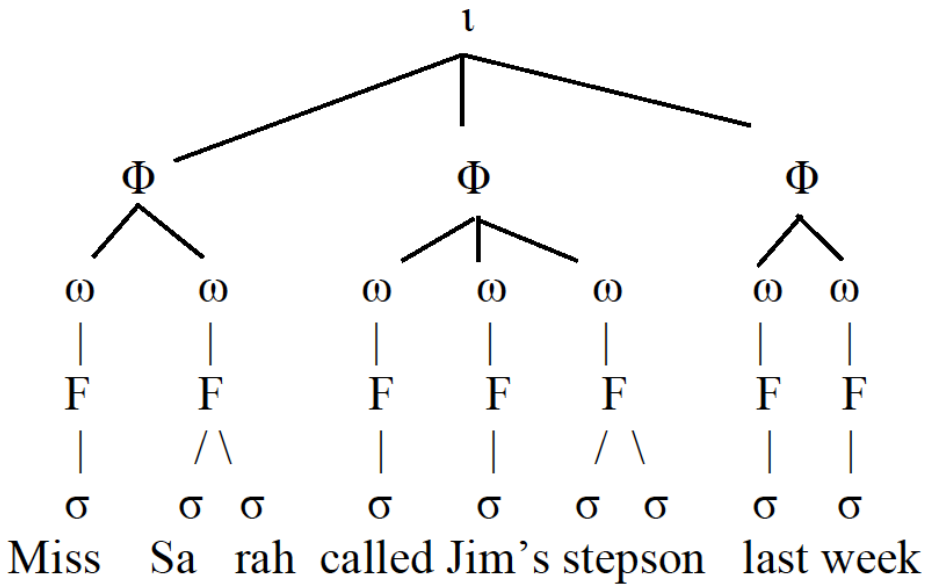
Prosodic phrasing in English

An example of mapping between syntax and prosody in an all-new sentence

Syntactic structure



Prosodic structure



Prosodic phrasing in English

Two main models of syntax-prosody interface:

1. Alignment model (there are equivalent constraints for the left side of syntactic phrases)

a. ALIGN-XP,R: ALIGN(XP, R; φ, R)

For each XP there is a φ such that the right edge of XP coincides with the right edge of φ.

b. ALIGN-XP,L: ALIGN(XP, L; φ, L)

For each XP there is a φ such that the left edge of XP coincides with the left edge of φ.

2. Match model

(i) MATCH Phrase

A phrase in syntactic representation must be matched in phonological representation by a constituent of type φ.

(ii) MATCH Clause

A clause in syntactic representation must be matched in phonological representation by a constituent of type ι.

Prosodic phrasing in English

In principle, both ALIGN and MATCH allow recursive structures. In practice, only MATCH allows recursivity.

In ALIGN, one edge of syntactic constituents, left **or** right, is aligned with a φ-phrase or an ι-phrase.

Predictions of ALIGNR

a. Miss Martin)$_{\varphi}$ went to the market)$_{\varphi}$ with a basket full of eggs)$_{\varphi}$)$_{\varphi}$)$_{\iota}$

b. Miss Sarah)$_{\varphi}$ called Jim's stepson)$_{\varphi}$ last week)$_{\varphi}$)$_{\iota}$

The other edge (the left one here) is also present because prosodic phrasing should be exhaustive.

In MATCH, both edges of syntactic constituents, left **and** right, are aligned with a φ-phrase or an ι-phrase at once.

Predictions of MATCH for English (more φ-phrases because of recursivity)

a. ((Miss Martin)$_{\Phi}$ (went (to (the market)$_{\Phi}$)$_{\Phi}$)$_{\Phi}$ (with a basket (full (of eggs)$_{\Phi}$)$_{\Phi}$)$_{\Phi}$)$_{\iota}$

b. ((Miss Sarah)$_{\Phi}$ (called (Jim's (stepson)$_{\Phi}$)$_{\Phi}$)$_{\Phi}$ (last week)$_{\Phi}$)$_{\iota}$

Selkirk, Elisabeth O. 2011. The syntax–phonology interface. In: Goldsmith, John A., J. Riggle & A. Yu (eds.). *The handbook of phonological theory* 2. Oxford: Blackwell. 435-484.

Prosodic phrasing in English

Faithfulness constraints: ALIGN constraints or MATCH constraints

Markedness constraints (sometimes called “Wellformedness constraints”) for higher-level prosodic constituents (φ-phrases and ι-phrases) account for Binarity (a φ-phrase consists of two ω-words), Exhaustivity (no level of the prosodic hierarchy is skipped), Layeredness (lower constituents do not dominate higher constituents), Culminativity, location of nuclear accent, …

The wellformedness constraints can overwrite the effects of the interface constraints:

Even though they are XP, pronouns are too weak to form their own φ-phrase and are cliticized to the adjacent φ-phrase, resulting in a mismatch between syntax and prosody (see also Elfner 2015 and colleagues for Irish clitics and further mismatches).

Elfner, Emily. 2015. Recursion in prosodic phrasing: Evidence from Connemara Irish. *Natural Language and Linguistic Theory*.

Prosodic phrasing in English

Kratzer & Selkirk (2020) propose a stratal derivation of the syntax-prosody interface

Three distinct levels of grammatical representation: (a) is the morphosyntactic output (MSO) representation of an all-new declarative sentence; (b) is the phonological input (PI) representation of the sentence resulting from the MATCH constraints; (c) is the phonological output (PO) representation, which is submitted to the wellformedness constraints and the phonetic interpretation.

Morpho-Syntactic Output Representation (MSO)

↓ Spellout (gives phonological expression to MSO)

Phonological Input Representation (PI)

↓ Phonology (determines optimal PO on basis of PI)

Phonological Output Representation (PO)

↓

Phonetic Interpretation

Kratzer, Angelika and Elisabeth Selkirk. 2020. Deconstructing information structure. Glossa: a journal of general linguistics 5(1): 113. 1–53.

Prosodic phrasing in English

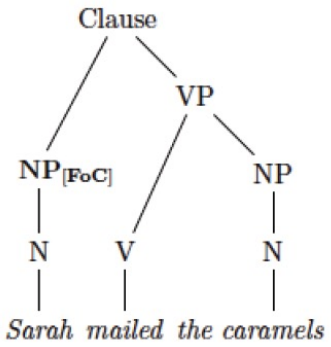
Sarah mailed the caramels

a. Morphosyntactic output representation (MSO):
[[[*Sarah*]$_{N}$]$_{NP}$ [[*mail-ed*]$_{V}$ [*the* [[*caramel-s*]$_{N}$]$_{NP}$]$_{DP}$]$_{VP}$]$_{Clause}$

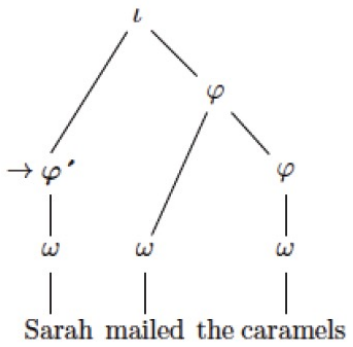
b. Phonological input representation (PI):
(((Sarah)ω)φ ((mailed)ω (the ((caramels)ω)φ)φ)φ)ι

c. Phonological output representation (PO):
(((Sár.ah)ω′)φ (((máiled)ω the)ω ((cár.a.mèls)ω′)φ′)φ)ι
H L ~H H L

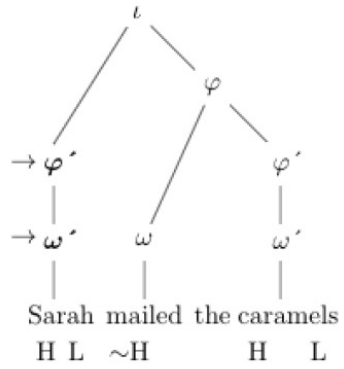
a. Morphosyntactic Output[39]



b. Input phonological representation (PI)



c. Output phonological representation (PO)



Prosodic phrasing in English

The unmarked position of nuclear stress is on the head of the last φ-phrase, usually an argument or an adjunct:

((Sarah)$_{\varphi}$ (mailed (the CARAMELS)$_{\varphi}$)$_{\varphi}$)$_{\iota}$
((Miss Martin)$_{\varphi}$ (went (to (the market)$_{\varphi}$)$_{\varphi}$)$_{\varphi}$ (with a basket (full (of EGGS)$_{\varphi}$)$_{\varphi}$)$_{\varphi}$)$_{\iota}$

In an argument predicate sequence, the argument gets the nuclear accent, even if it is not the last element of the sentence.

a. What did Mary do?/Whom did Mary praise?
b. She praised her BROTHER
c. She had her HAIR done.
d. She wants the WALL painted.

e. Which BOOKS did you read?

Prosodic phrasing in English

The main effect of information structure is to add a nuclear accent on the focused constituent and to deaccent given constituents.

(1) a. What did John's mother do?

b. She $[[\text{PRAISED}]_F$ him$]_F$

(2) a. I know that John drove Mary's red convertible. But what did Bill drive?

b. He drove [her $\text{BLUE}]_F$ convertible$_G]_F$.

(3) a. Why did John buy bananas?

b. Because $[[\text{SARAH}]_F$ [bought bananas$]_G]_F$

(4) a. Sarah said the American president drinks. What did Lisa say about the French president?

b. She said $[[$[the French president drinks$]_G$ $[\text{TOO}]_F]_F$

Schwarzschild, Roger (1999) GIVENness, AvoidF and Other Constraints on the Placement of Accent. Natural Language Semantics 7. 141-177.

Féry, Caroline & Vieri Samek-Lodovici (2006) Focus projection and prosodic prominence in nested foci. Language 82.1. 131-150.

Prosodic phrasing in English

Kratzer & Selkirk do not consider all-new sentences, such as (1) as focused. Only a narrow focus is a focus (2) and (3).

(1)
Me: Did anybody eat the clementines? I can't find them in the pantry.
You: (I think) Paula might [have eaten the clementines]$_{G}$.

(2)
Me: Sarah mailed the caramels.
You: (No), [Eliza]$_{FoC}$ [mailed the caramels]$_{G}$.
Aunt: (Yes, and) [Ewan]$_{FoC}$ [mailed]$_{G}$ [the chocolates]$_{FoC}$

(3)
Me: Jane's lost her keys and is really upset.
You: It was her phone that Jane lost.

Kratzer, Angelika and Elisabeth Selkirk. 2020. Deconstructing information structure. *Glossa: a journal of general linguistics* 5(1): 113. 1–53.

Summary for English

The mapping can be symmetrical on both sizes (MATCH), or it can take place first on one side only (ALIGN).

Boundaries between φ-phrases are “asymmetric”. They often much more audible on one side than on the other. Compare the English sentences (1) and (2):

(1) (Anna thinks $_{\varphi}$(her cat is a lion $_{\varphi}$)$_{\iota}$

(2) ((That the temperature is so high)$_{\varphi}$ (is a problem for all of us)$_{\varphi}$)$_{\iota}$

The right boundary is more prominent in (2) than the left one in (1). The location of nuclear stress correlates with the prominent boundary.

MATCH disregards this difference, ALIGN emphasizes it.

Ito & Mester (2019) and Myrberg & Ishihara (2023) propose extensions and changes to Kratzer & Selkirk (2020) to acount for the “asymmetry problem” in Japanese.

The discussion around Align and Match is unresolved so far.

Ito, Junko & Armin Mester. 2019. Match Theory and prosodic well-formedness constraints. In Hongming Zhang & Youyong Quian (eds.). *Prosodic Studies: Challenges and prospects.* 252–274. London: Routledge.

Myrberg, Sara & Shinichiro Ishihara. 2023. Match Theory and the Asymmetry Problem: An example from Stockholm Swedish. In *Languages* 6: 65.

Prosodic phrase in Greek

In Greek as well, prosodic phrasing is tightly related to syntactic phrasing.

Word order is free up to a certain point: VSO and SVO are the most frequent word orders for all-new information, elicited when preceded by, e.g., “Have you heard the news?”

VSO: Συνάντησε ο Γιάννης τη Μαρία Siná(n)dise o Giánnis ti María ‘John met Mary’

SVO: Ο Γιάννης συνάντησε τη Μαρία O Giánnis siná(n)dise ti María ‘John met Mary’

In both cases, the object *Μαρία* ‘Mary’ gets the nuclear stress and is accented because it is the last word of the last φ-phrase. In SVO, the subject is preferably a topic, i.e., the referent about which the remainder of the sentence makes a comment.

The presence of overt Case marking enables word order flexibility: nominative = subject, accusative = direct object, genitive = indirect object

Holton, David, Peter Mackridge, Irene Philippaki-Warburton & Vassilios Spyropoulos. 2012. *Greek: A Comprehensive Grammar*. London: Routledge.

Prosodic phrase in Greek

Stavros Skopeteas (p.c) proposes different prosodic phrasings for the two most natural word orders: SVO and VSO

(S)(VO) is the most natural realization in an all-new context

enas eléfadas sina(n)dái mia kamilopárdali

‘An elephant meets a giraffe.’

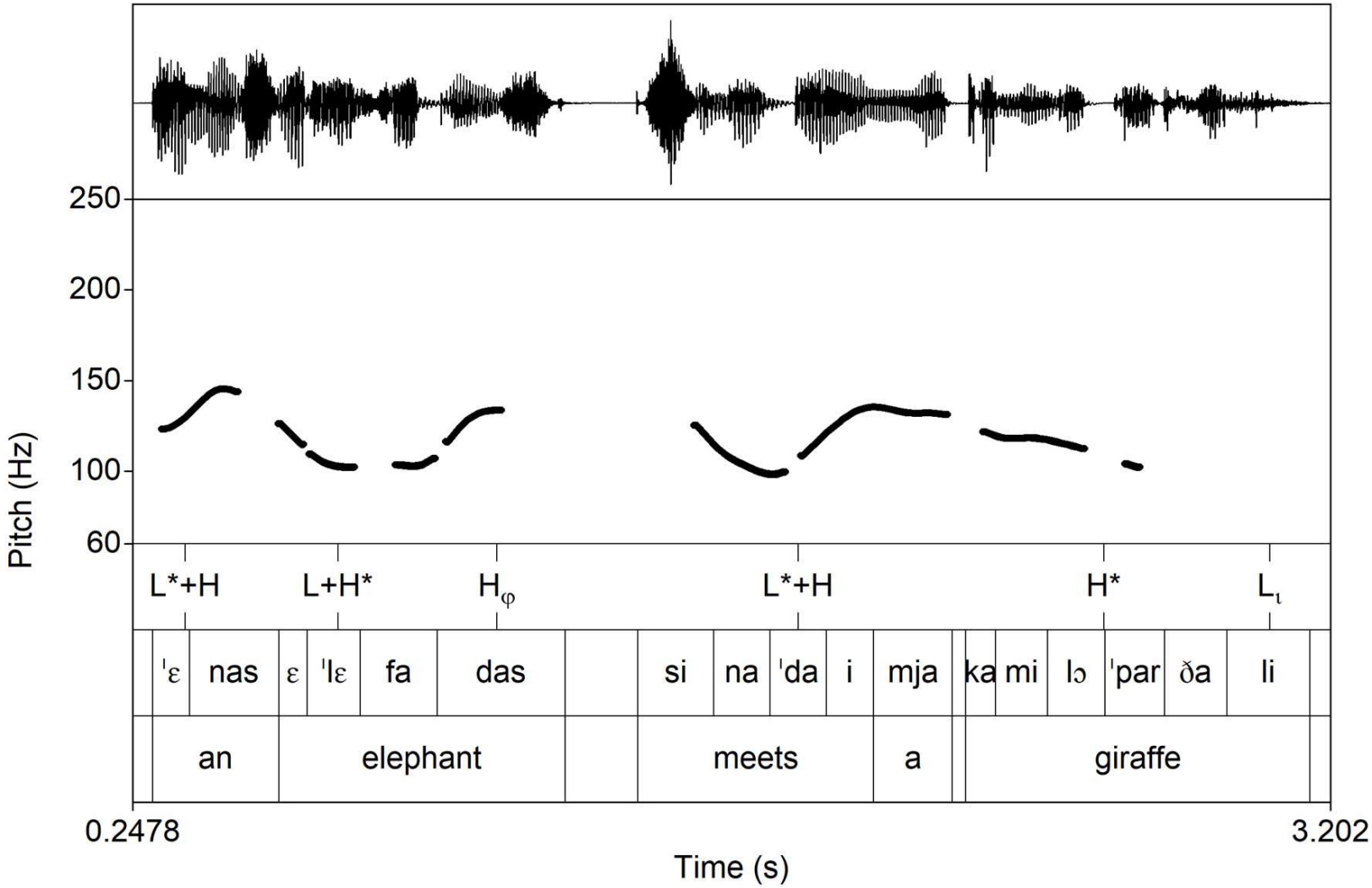
(VS)(O): VS is not a syntactic constituent but this phrasing seems to be the best one for this word order.

Sina(n)dái enas eléfadas mia kamilopárdali

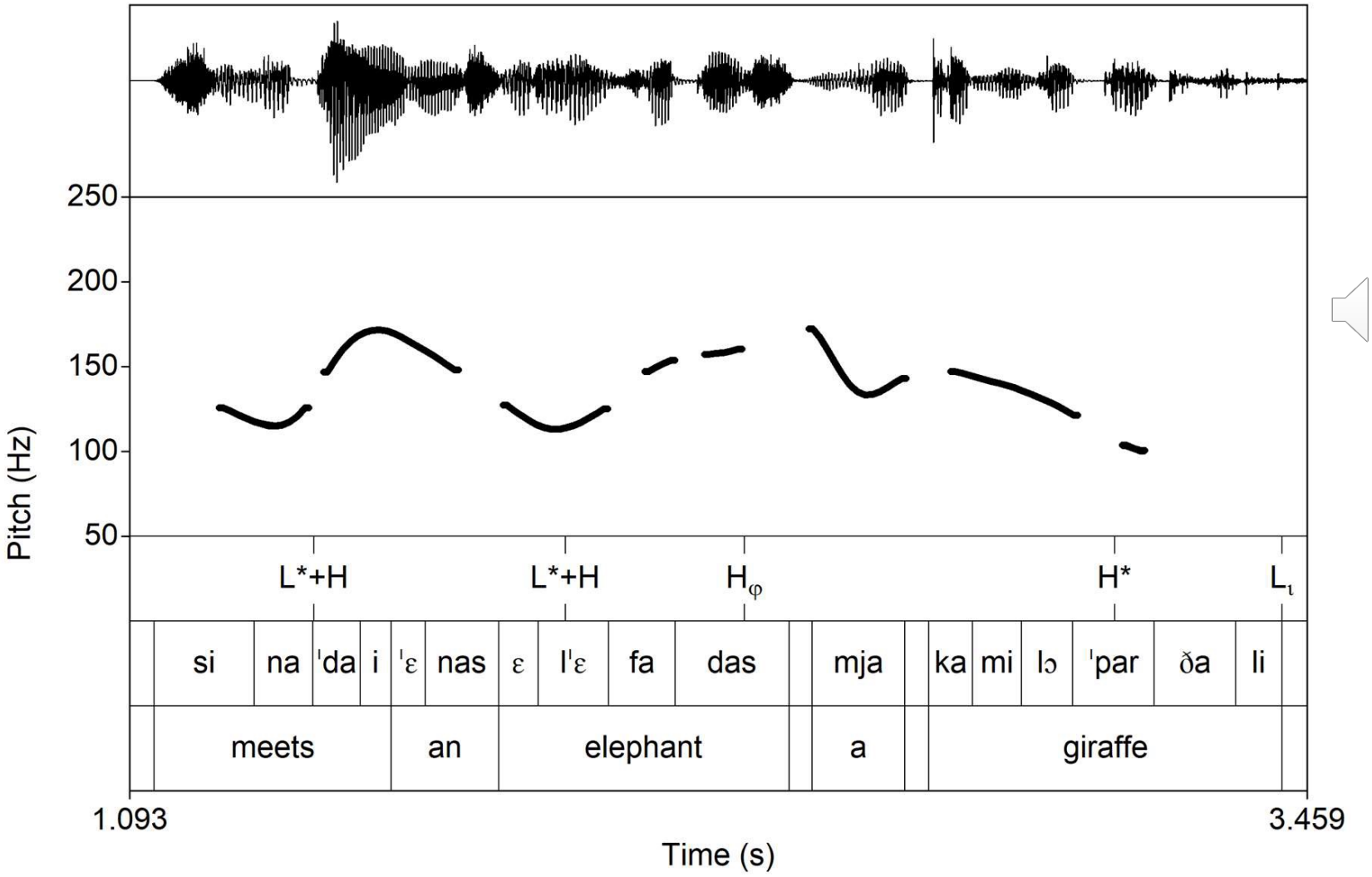
meets an elephant a giraffe ‘An elephant meets a giraffe.’

In this case, the accent on O is clearly highlighted by the boundary between subject and object.

Prosodic phrase in Greek: (S)(VO)



Prosodic phrase in Greek: (VS)(O)



Prosodic phrase in Greek

A spevial case of prosodic phrasing: Syntactic islands are also prosodic islands.

Revithiadoui & Spyropoulos (2009) show that clitic-doubled DP-objects, such as *to axláði* in (1), are syntactic islands; prosodically the preverbal constituent also forms its own φ-phrase. The same constituent appears as preverbal clitic *to* in the VP.

(1)

to	*axláði*	to	éfaɣe	o	kóstas
the	pear-ACC	it-ACC	eat-PAST.3SG	the	Kostas-NOM

'As for the pear, Kostas ate it.'

Such sentence initial clitic-doubled DP-objects are typically left-dislocated topics. They are base-generated peripheral elements. They are coindexed with the clitic in order to license their features and theta-role. In other words, the nominal phrase referring to the pear is uttered twice, but in different ways.

Revithiadou, Anthi & Spyropoulos, Vassilios. 2009. A Dynamic Approach to the Syntax-Phonology Interface: A Case Study from Greek In Grohmann, Kleanthes (Ed.) Phase-Theoretic Investigations of Linguistic Interfaces. Oxford University Press.

Prosodic phrase in Greek: Clitic-doubled DP-objects

Clitic-doubled DP-objects form separate φ-phrases, and sandhi rules, such as s-voicing, vowel deletion and nasal-stop assimilation, do not apply with following constituents. Tomorrow we will see that the tonal structure is also important.

s-voicing

s → z / [… ___ C[+cont, +voi], m, n]ϕ

e.g. /meɣálos máɣos/ → [meɣálozmáɣos] 'big magician.'

No s-voicing between the clitic-doubled object and the following DP-indirect object

tis	*próves*	mas/sas	tis	klíni
the	rehearsal-ACC.PL	us/you-ACC.PL	them-ACC.PL	arrange-3PL
o	pános			
the	Panos-NOM			

[tis próves]ϕ [mas/sas tis klíni o pános]ϕ

'As for the rehearsals, Panos arranges them for us/you.'

Prosodic phrase in Greek: Clitic-doubled DP-objects

Clitic-doubled DP-objects form separate φ-phrases, and vowel deletion, here degemination (or glide strengthening?) does not apply with following constituents.

V-degemination

$V_i \rightarrow \emptyset$ / [… […___]PrW [V_i…]PrW]ϕ

e.g. /káni italiká/ → [kánçitaliká] ‘(s/he) learns Italian.’

No V-degemination between the clitic-doubled object and the following DP-subject

tin ániksi	i	kátja	tin	aγapá
the spring-ACC	the	Katia-ACC	it-ACC	love-3SG

[tin ániksi]ϕ [i kátça tin aγ apá]ϕ

‘As for the spring, Katia loves it.’

Prosodic phrase in Greek: Clitic-doubled DP-objects

Clitic-doubled DP-objects form separate φ-phrases, and nasal-stop assimilation does not apply with following constituents.

nasal-stop assimilation
[+nas] → [α p.a.] / [… ____ C[-cont, α p.a.]…]ϕ
[− cont] → [+voi] / [… [+nas] ___…]ϕ
e.g. /éxun palépsi/ → [éxu***mb***alépsi] '(they) have wrestled.'

No nasal-stop assimilation between the clitic-doubled object and the following object clitic

tus	*amán*	tus	parakoluθún	ta	peðjá
the	A.M.A.N.	them-ACC.PL	watch-3PL	the	kid-NOM.PL

[tus amán]ϕ [tus parakoluθún ta peðjá]ϕ
'As for the A.M.A.N. (group), the kids watch them.'

Prosodic phrase in Greek: cliticVO

In VOS order, the object is phrased together with the verb, and the phonological processes take place The object is phrased differently in VOS: nasal-stop assimilation applies between the verb *éfaɣan* 'they ate' and its complement to *axláði* 'pear' in a., indicating that the two constituents are phrased together (a').

a. éfaɣa***n*** ***d***o axláði TA PEÐJÁ
eat-PAST.3PL the pear-ACC the kid-NOM.PL
'THE KIDS ate the pear.'

a'. [éfaɣa***n*** ***d***o axláði]$_\phi$ [TA PEÐJÁ]$_\phi$

In clVOS order in b. there is not assimilation: the cvVerb and the object NP are phrased separately. In this word order the noun *to axláði* cannot be focused

b. to éfaɣan to axláði TA PEÐJÁ
it-ACC eat-PAST.3PL the pear-ACC the kid-NOM.PL
'As for the pear, THE KIDS ate it.'

b'. [to éfaɣan]$_\phi$ [to axláði]$_\phi$ [TA PEÐJÁ]$_\phi$

c. * to éfaɣe [TO AXLÁÐI]$_{FOC}$ o kóstas

Prosodic phrase in Greek: Clitic-doubled DP-objects

As in English, the right boundary of a φ-phrase is more prominent than the left boundary:
ALIGN-XP-φ-R >> ALIGN-XP-φ-L

There is a well-formedness condition on φ-phrasing called Binarity expressing a preference for φ-phrases to be binary :

BINARITY(φ): a φ-phrase contains two ω-words.

Binarity is often fulfilled, especially when the subject is short, and the VP is long: in b. binarity is fulfilled and s-voicing applies

[$_{DP}$ Det N] [$_{IP}$ V [$_{VP}$ t_V [$_{DP}$ Det N] [$_{PP}$ P DP]]]

to	fós	ðíni	isxí	sti	mixaní
the	light-NOM	give-3SG	power-ACC	to-the	machine-ACC

'The light gives power to the engine.'

a. [to fós]ϕ [ðínØ *i*sçí]ϕ [sti mixaní]ϕ *end-based mapping*

b. [to fó*z* ðíni]ϕ [isçí sti mixaní]ϕ *binarity-based mapping*

Prosodic phrase in Greek: Clitic-doubled DP-objects

BINARITY(φ) does not apply to clitic-doubled DP-object: the topicalized constituent obligatorily appears in a separate prosodic phrase:

ALIGN-XP-φTOPIC-R >> BINARITY(φ)

a. *to axláði* to éfaγe o kóstas tis
the pear-ACC it-ACC eat-PAST.3SG the Kostas-NOM the
ánas
Anna-GEN
'As for the pear, Anna's Kostas ate it.'

a′. [to axláði]$_\phi$ [to éfaje o kóstas tis ánas]$_\phi$

a″. *[to axláði do éfaje]$_\phi$ [o kóstas tis ánas]$_\phi$

Conclusion

In English word order is not flexible, there is no Case marking. Prosodic structure is mapped to syntactic structure, although well-formedness constraints and information structure sometimes interfere with the mapping constraints.

Two mapping models make predictions about the interface φ-phrases, ALIGN and MATCH. In ALIGN, one edge of syntactic constituents, left **or** right, is aligned with a φ-phrase or an ι-phrase, whereas in MATCH, both edges of syntactic constituents, left **and** right, are aligned with a φ-phrase or an ι-phrase simultaneously.

Boundaries between φ-phrases are "asymmetric", one is more prominent than the other depending on the right or left branching syntax and the position of the nuclear stress. In English, the right boundary is more prominent than the left one. MATCH disregards this difference, ALIGN emphasizes it.

Phonological and phonetic evidence for prosodic phrasing is largely confined to tonal effects.

Conclusion

In Greek, the interface constraints ALIGN and MATCH also predict a strict mapping between syntax and prosody, modulo the effects of well-formedness constraints and information structure.

Greek has flexible word order, a fact that is facilitated by overt Case marking. There are thus more options for phrasing than English, a language with rigid word order. The two main word orders phrase the verb with the object or with the subject: (S)(VO) but (VS)(O).

Clitic-doubling constituents and discontinuous nominal phrases create a separate φ-phrase. The now well-known phonological sandhi rules: s-sonorization, post-nasal voicing and hiatus resolution optionally apply inside a φ-phrase. They are blocked across φ-phrase boundaries.

to	ómorfo	aγóri	
the	handsome-NOM.SG	boy-NOM.SG	'the handsome boy'

Possible outputs (variation): *to ómorfo aγóri* (uttered in careful speech)

b. (tómorfo aγóri)$_{φ}$ or (tómorfaγóri)$_{φ}$ (uttered in normal to fast speech rate)

Appendix: Discontinuous NP in Greek

Discontinuous nominal phrases are especially productive in Greek: the extensive inflectional and pronominal system can facilitate their emergence. Adjectives, quantifiers, numerals modifying a noun, can be placed sentence initially or finally or at special places sentence medially. And the noun can also be topicalized or otherwise displaced.

a. Hierarchy-inverting word order: the canonical word order is not preserved

kókkina éxi δi i María tría vívlia

red.ACC.PL.N has seen the.NOM.SG.F Maria three.N book.ACC.PL.N

'Mary has seen three red books.'

The determiner can be doubled or not:

b. To kókkino iδa to forema. Androutsopoulou (1998:2)

the red saw-1SG the dress.ACC

'It is the red dress that I saw.'

c. to aftokínito éxi to vromiko

the.ACC.SG.N car.ACC.SG.N has-3SG the.ACC.SG.N dirty.ACC.SG.N

'S/he has a dirty car.'

Discontinuous NP in Greek

Ntelitheos (2004) compares elliptical constructions and discontinuous NPs in Greek, and concludes that they have many things in common: “nominal ellipsis and discontinuous DPs share the same type of modifiers and the form of these participating modifiers is identical in both phenomena.”

Discontinuous NPs involve syntactic movement of one (or both) parts of the DNP to discourse related projections. However, no constituent is deleted, but constituents can be repeated.

English does not allow any type of discontinuous NPs

*Red I saw a dress. or *Dress I saw a red. *how many do you have books etc., all constructions that are well-formed in Greek.

Androutsopoulou, Antonia. 1998. Split DPs, Focus, and Scrambling in Modern Greek, WCCFL 16, 1-16.
Ntelitheos, Dimitrios. 2004. Syntax of Elliptical and Discontinuous Nominals: MA UCLA.

Discontinuous NP in Greek

Discontinuity in NPs with numerals and quantifiers.

a. δío γátes éxi δío mávre
two cat.ACC.PL.F has two black.ACC.PL
'S/he has two cats.'

b. Hierarchy-preserving word order: the canonical word order is preserved
Poles aγórase karekles i María
Many.ACC.PL.F buy PAST.PFV.3SG chair.ACC.PL.F the.NOM.SG.F Mary
'Mary bought many chairs.'

The noun can also appear sentence-initially

c. to fústáni kérδise to akrivo
the skirt won the expensive
'S/he won the expensive shirt.'

In the last sentence *to fustani* may be topical, and *to akrivo* focal, with a phrase boundary after *fustani:* this is the typical information structure of such a sentence. More marginally, *to fustani* can be a corrective focus, and the remainder of the sentence is then given and unaccented (Stavros Skopeteas, p.c.).

Discontinuous NP in Greek

Canonical word order of wh-word + N

Poses	karekles	vrice	xtes	o Petros
How-many.ACC.PL.F	chair.ACC.PL.F	found	yesterday	the Peter

'How many chairs did Peter find yesterday?'

Non-cohesive and hierarchy-inverting discontinuous noun phrase with a postponed wh-word

O Petros	vrice	karekles	xtes	poses
The Peter	found	chairs	yesterday	how-many.ACC.PL.F

'How many chairs did Peter find yesterday?'