Intermediate Phonology

Part 1: Prosodic hierarchy; Phonemes and segments

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Content of the class and theoretical framework

Comparison between the phonology of Greek and English, in all aspects, i.e., their segmental, allophonic, metrical, tonal properties, based on the prosodic constituents.

The phonology of a language is an integrated system. Part of the differences between the two systems is random, but other differences reflect a deeper pattern.

Theoretical framework is Optimality Theory (OT)

• OT is a generative constraint-based framework that compares and evaluates candidates generated from an input.

• All constraints are universal but ranked, and they are in principle violable.

• OT does not have rules or derivations: the constraints eliminate the non-optimal candidates until only the single optimal candidate remains.

• The version of OT used here (for the sake of this course) is kept simple, as a parallel correspondence one.

Prince, Alan & Paul Smolensky. 1993/2004. *Optimality Theory: Constraint Interaction in Generative Grammar*. Malden, MA, & Oxford: Blackwell.

English and Greek

English because it is the world's *lingua franca*, the language of this summer school and the native tongue of many students. It is also the best studied language from a linguistic and phonological perspective. Both British English (RP, received pronunciation) and General American (GA) will be considered.

Greek because we are in Greece, Greek is the native tongue of many CreteLing's students. In 1976, the official Standard Greek has become the dialect spoken in Athens. It is a colloquial version of Greek, called *Dimotiki* or Demotic. It has borrowings from the "Puristic" literally "(the) purifying (language)" – a high-style archaizing variety from Classical Greek called *Katharevusa* – involving the lexicon, the grammar (morphology and syntax) and pronunciation.

For nearly each topic, English will be discussed first, since I assume that most students have a basic knowledge of English phonology. Then Greek, and finally a summarizing comparision.

Joseph, Brian D. & Tserdanelis, Georgios. 2003. Modern Greek. In Roelcke, Thorsten (ed.). *Variation Typology. A Typological Handbook of European Languages*. de Gruyter: 823–836.

Content of the class

The prosodic hierarchy will guide the overview, first starting with the segments – consonants and vowels – acknowledging the notion of phoneme in both languages.

	Prosody	Morphosyntax
ι	Intonation phrase	Clause
φ	Prosodic Phrase	Syntactic phrase
ω	Prosodic word	Grammatical word
F	Foot	Stress unit
σ	Syllable	Sequence of segments
μ	Mora	Weight unit

F, σ and μ: rhythmical constituents

ι, φ and ω: interface constituents

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 constituents

μ Mora:

A mora is a weight unit of syllables, especially in so-called quantity-sensitive languages, i.e., languages that have a weight-sensitive lexical stress. Only the syllable's rime (nucleus and coda) can be moraic.

Both English and Greek have lexical stress, and only English is quantity-sensitive and counts moras.

σ Syllable:

Syllables organize sequences of consonants and vowels into groups of segments, according to Sonority Sequence Principle and phonotactic rules.

Syllabification takes place inside (Enlish) and also across words (Greek) and morphemes (both languages) and is the most important domain of allophonies.

Prosodic constituents

F Foot:

Feet are trochaic or iambic

Moraic trocheed are important in English: its lexical stress is based on trochaic feet that are themselves based on weight of syllables, thus moras.

In Greek, syllable weight does not play a crucial role, if at all. Morphology is more important for lexical stress.

ω Prosodic word:

From the prosodic word on, all higher prosodic constituents are formed at the interface with morpho-syntax.

In both languages, lexical words such as nouns, adjectives and verbs are prosodic words

Complex words can also be prosodic words.

English has different kinds of affixes for the division into prosodic words.

No such division in Greek, but clitics can be independent prosodic words.

In both languages, prosodic words are recursive.

Prosodic constituents

φ Prosodic phrase:

Prosodic phrase correspond to syntactic constituents. The correspondence or mapping is regulated by Match or Align constraints in English. However, mismatching is also frequent.

Not much literature for Greek, but Match or Align constraints probably apply in a similar way to English. Prosodic phrase is recursive.

ι Intonation phrase:

Intonation phrase is first of all a prosodic constituent corresponding to a clause or to an illocutiory act. It is the domain of intonation, i.e., tonal structure, or tone sequences.

Both languages have pitch accents, phrasal tones and boundary tones that are assigned in a certain order and that define the melody of language.

Phonemes

Sounds that are used distinctively or contrastively are called phonemes (not a prosodic constituent). In this sense, a phoneme is a **functional unit**, making distinctions among segments:

English minimal pairs:

cat/bat	→	/k/ and /b/ are phonemes
road/load	→	/ʁ/ and /l/ are phonemes
pain/main	→	/p/ and /m/ are phonemes
pit/ bit	→	/p/ and /b/ are phonemes
pit/pot	→	/o/ and /i/ are phonemes

etc.

Greek minimal pairs:

[ˈpiɾa] πήρα ‘I took’	[ˈbiɾa] μπύρα ‘beer’	→	/p/ and /b/ are phonemes
[ˈfasi] φάση ‘phase’	[ˈvasi] βάση ‘base’	→	/f/ and /v/ are phonemes
[ˈtino] τείνω ‘to tend’	[ˈdino] ντύνω ‘to dress’	→	/t/ and /d/ are phonemes
[ˈθema] θέμα ‘topic’	[ˈðema] δέμα ‘parcel’	→	/θ/ and /ð/ are phonemes
[ˈsoa] σώα ‘safe-FEM’	[ˈzoa] ζώα ‘animals’	→	/s/ and /z/ are phonemes
[ˈɾima] ρήμα ‘verb’	[ˈlima] λίμα ‘nail-file’	→	/ɾ/ and /i/ are phonemes
[ˈxoma] χώμα ‘soil’	[ˈɣoma] γόμα ‘rubber’	→	/x/ and /ɣ/ are phonemes

etc.

Phonemes and segments

Standard definition of phoneme:

The phoneme is the smallest distinctive unit in a language.

'Smallest' is not correct: distinctive feature is smaller and also distinctive.

The functional concept makes only sense for a specific language.

Phoneme: Unit of phonological description

Allophone: Realization variant of a phoneme

Phone: Unit of phonetic description

A second definition of the phoneme:

A phoneme is a class of phonetically similar phones, e.g. allophones, in complementary distribution.

Phoneme as **psychological** (or mental) unit: a thought sound; a sound idea (Trubetzkoy); a psychological equivalent of an empirical sound. (Nice idea, but difficult to use.)

Dresher, B. Elan. "The Phoneme." 2011. *The Blackwell Companion to Phonology*. van Oostendorp, Marc, Colin J. Ewen, Elizabeth Hume and Keren Rice (eds). Blackwell Publishing.

Phonemes

Maddieson (1984) was the first to systematically list phoneme inventories of many languages. See UPSID.

Greek, Spanish

• [s] and [ʃ] are not distinctive (but they are in English)

Korean

• [r] and [l] are not distinctive, they are allophones of a single phoneme (but they are in Greek and English).

Spanish

[r] and [ɾ] (flap) are distinctive in *perro* 'dog' and *pero* 'but'

In English, [ɾ] is not distinctive: it is an allophone of /t/. Greek may have only [ɾ] in place of a rhotic.

Hindi

[p], [pʰ], [b], [bʰ] are distinctive. This is also true for coronal and dorsal stops.

The aspirated voiceless stops are allophones in English, not the voiced ones. No aspiration in Greek.

Ian Maddieson. 1984. *Patterns of sounds*. Cambridge: Cambridge University Press.

English and Greek /ð/ and /θ/

The phonemes /ð/ and /θ/ are distinctive in both English and Greek

English:

/ð/ *thy/thigh, the, that, this*, *bathe, leather, neither* etc.

/θ/ *think, thorough* etc.

Greek:

/ð/ έξοδος éxoδos ‘exit’, ποδόσφαιρο podósfero ‘soccer’, δίαιτες δíetes ‘diets’, Σύνδεση síndesi ‘connection’, δρόμος δromos ‘roads’, ογδόντα ογδό(n)da ‘eighty’ etc.

/θ/ βαθμοί vaθmi ‘degrees’ άνθρωπος ánθropos ‘person’, φθινόπωρο fθinóporos ‘fall/autumn’ εργαλειοθήκη erγaleoθíki ‘toolbox’, αριθμός ariθmos ‘number’ etc.

Despite these lists, ‘phoneme’ is an utterly fuzzy and variable concept. Native speakers do not agree about which segments are phonemic in their own languages: Some segments are rare or borrowed, or have allophonic variants with other segments, dialectal variation etc. Even though, it is a helpful notion, and each speaker can decide according to their own personal convictions.

Phonemic consonants of English

	labial	**coronal**	**dorsal**	**laryngeal**
Plosives **– voiceless** **– voiced**	 /p/ pin /b/ bin	 /t/ tin /d/ din	 /k/ kin /g/ gill	
Fricatives **– voiceless** **– voiced**	 /f/ fin /v/ vim	 /θ/ thin /ʃ/ shin /ð/ this /ʒ/ vision /s/ sin /z/ zip		/h/ hymn
Affricates		/tʃ/ chin /dʒ/ gin		
Nasals	/m/ mitt	/n/ nip	/ŋ/ sing	
Laterals		/l/ Lyn		
Approximants	/w/ win	/ɹ/ rim /j/ jing		

Hayes, Bruce (2009) *Introductory Phonology.* Oxford. Blackwell Publishing.

Phonemic vowels of English

	Front unrounded	Central unrounded	Back unrounded	Back rounded	Diphthongs
Upper high Lower high	/i/ *beat* /ɪ/ bit			/u/ boot /ʊ/ foot	/aɪ̯/ /aʊ̯/ /ɔɪ̯/ bite, bout, boy
Upper mid Lower mid	/eɪ/ bait /ɛ/ bet	/ə/ abbot	/ʌ/ but	/oʊ/ boat /ɔ/ bought	Rhotacized upper central unrounded
Low	/æ/ bat		/ɑ/ father		/ɚ/ Bert

Hayes, Bruce (2009) *Introductory Phonology.* Oxford. Blackwell Publishing.

Phonemic diphthongs of English

Diphthongs in English

	closed syllables	open syllables
/aɪ̯/	bite pile dine like	shy buy nigh
/aʊ̯/	bout down fowl lout	vow now brow
/ɔɪ̯/	noise voice coin joist	coy boy joy
/ɪə/	beard weird fierce	beer feat idea
/ɛə/	Baird laird	bear fare hair
/ʊə/	gourd	

Giegerich, Heinz J. (1992) *English Phonology.* Cambridge. Cambridge University Press.

Phonemic consonants of Greek

	Bilabial		Labio-dental		Interdental		Alveolar		Velar	
Plosive	p	b					t	d	k	g
Fricative			f	v	θ	ð	s	z	x	ɣ
Nasal		m						n		
Tap								ɾ		
Lateral approx								l		

Affricates /t^{s}/ /d^{z}/

Arvaniti, Amalia. 2007. Greek Phonetics: The State of the Art. *Journal of Greek Linguistics:* 97-208.

Non-phonemic consonants of Greek

	Bilabial	Labio-dental	Dental	Alveolar	Retracted Alveolar	Post-alveolar	Alveolo-palatal	Retracted Palatal	Velar
Plosive	p b			t d ts dz				c ɟ	k g
Fricative		f v	θ ð		s z			ç ʝ	x ɣ
Nasal	m	ɱ	n̪	n			ɲ		ŋ
Tap					ɾ				
Trill					r				
Approximant					ɹ				
Lateral approx.				l		ʎ			

Arvaniti, Amalia. 2007. Greek Phonetics: The State of the Art. *Journal of Greek Linguistics:* 97-208.

Non-phonemic consonants of Greek

	Bilabial		*Labiodental*		*Dental*		*Alveolar*		*Palatal*		*Velar*	
	VL	VD	VL	VD	VL	VD	VL	VD	VL	VD	VL	VD
Plosive	p	b					t	d	c	ɟ	k	g
Nasal		m		ɱ				n		ɲ		ŋ
Trill/flap								r				
Fricative			f	v	θ	ð	s	z	ç	ʝ	x	ɣ
Approximant		w								j		
Lateral								l		ʎ		
Affricate							ts	dz				

VL: voiceless VD: voiced

Holton, Mackridge & Philippaki-Warbuton. 2012 *Greek: A Comprehensive Grammar*. London & New York: Routledge.

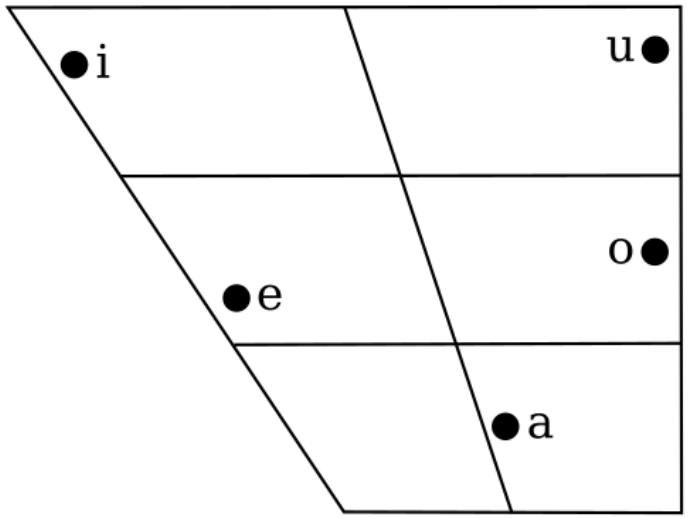
Greek affricates

Status of [ts] and [dz] is not clear: it could be affricates, thus complex segments or a sequence of two segments. [t] and [s] in [ts] are shorter than in [t] or [s] alone.

[ps] and [ks] are spelled <ψ> and <ξ> and are often felt as monosegmental by native speakers. These cannot be affricates because they are heterosyllabic.

Arvaniti, Amalia. 2007. Greek Phonetics: The State of the Art. *Journal of Greek Linguistics. **8**: 97–208.*

Phonemic vowels of Greek



	Front		*Back*
High	/i/		/u/
Mid	/e/		/o/
Low		/a/	

πας	/pas/	'you go' subj.
πες	/pes/	'say' imper.
πεις	/pis/	'you say' subj.
πως	/pos/	'that' conj.
πού	/pu/	'where'

Arvaniti, Amalia. 2007. Greek Phonetics: The State of the Art. *Journal of Greek Linguistics:* 97-208.
Holton, Mackridge & Philippaki-Warbuton. 2012 *Greek: A Comprehensive Grammar*. London: Routledge.

Diphthongs of Greek

Holton et al. (2012) lists the following optional and non-phonemic diphthongs formed by the combination of any vowel adjacent to a non-syllabic allophone [j] or [w] of the phonemes /i/ and /u/ respectively:

ej	[kléj] κλαίει 's/he is crying'
aj	[tsáj] τσάι 'tea'
oj	[bój] μπόι 'height'
uj	[akúj] ακούει 's/he listens'
iw	[sciwráci] σκιουράκι 'little squirrel'
aw	[fráwla] φράουλα 'strawberry'
ow	[krówl] κρόουλ 'front crawl (swimming style)'

Holton, Mackridge & Philippaki-Warbuton. 2012 *Greek: A Comprehensive Grammar*. London: Routledge.

Phonemic speech sounds of Greek

ω

Language Greek (000)	bilabial	labio-dental	dental	dental/alveolar	alveolar	palatal	velar
voiceless plosive	p			"t"			k
voiced plosive	b			"d"			g
vl. sibilant affricate					ts		
vd. sibilant affricate					dz		
vl. nonsibilant fricative		f	θ				x
vd. nonsibilant fricative		v	ð				ɣ
vl. sibilant fricative					s		
vd. sibilant fricative					z		
voiced nasal	m			"n"			
voiced flap				"ɾ"			
vd. lateral approximant				"l"			
vd. central approximant						j	

Vowels

high	i		u
lower mid		ɛ ɔ	
low		ɑ	

Maddieson, Ian (1984) *Pattern of Sounds*. Cambridge. Cambridge University Press

Sound inventories in English and Greek: summary

• Fricative inventory contains one additional pair that is dorsal in Greek (x, ɣ) and coronal in English (ʃ, ʒ). In terms of distinctiveness or "phonetic dispersion", the Greek solution is better than the English one.

• Allophonies in consonants

Aspiration in the English stops, voicing in the Greek ones

Palatalization and glide strengthening in Greek

Place assimilation in the two languages

• Vowels and diphthongs

Tense/lax distinction in English correlates with length and the number of moras: tense are bimoraic and long, lax vowels are monomoraic and short. No tense/lax distinction or in length or in the number of moras in Greek.

Diphthongs are very common in English but rare and probably not underlying in Greek.

Reduction to schwa in English unstressed vowels, no reduction to schwa in Greek.

Distinctive features

1. Grouping: Phoneme inventories are best understood in terms of contrastive feature specifications that define natural classes of speech sounds.
2. Distinguishing: Features divide the inventory recursively into smaller subsets until each phoneme has a distinct and unique feature representation.

Major class features specify three categories of sounds

The class of consonants are [+consonantal, –vocalic]

The class of vowels are [–consonantal, +vocalic]

The class of glides are [+consonantal ,+vocalic]

The feature [±sonorant] makes a division between obstruents and sonorants

The class of obstruents are [– sonorant].

The class of sonorants are [+sonorant].

The features are divided into those that specify articulation in the mouth (Supralaryngeal) and those that specify a laryngeal specification (Laryngeal).

The feature [nasal] specifies that the velum is involved in the articulation: nasal sounds are [nasal].

Distinctive features for consonants

Further features are grouped according to their Articulator (active articulator)

The class of labial consonants are [Labial], the class of coronal consonants are [Coronal] and the class of dorsal consonants are [Dorsal].

Places of articulation (passive articulator) is refined by specialized features: [±anterior], [±back] …

Manner of articulation is also accounted for by specialized features:

[±continuant] makes a distinction between segments that have a continuing oral articulation [+continuant], i.e., fricatives, and those whose articulation involves a total closure in the mouth [–continuant], i.e., stops. Nasals are [–continuant].

Distinctive features for vowels

Features for vowels partly differ from those for consonants because vowels are articulated in a different way from consonants (All vowels are [+vocalic, –consonantal, + sonorant]):

• The natural class of high vowels are captured by the feature [+high] (all high tense and high lax in the table on the following slide).

• The natural class of non-high vowels are captured by the feature [–high] (all other vowels)

• Same for [±low], [±tense] (except for the low vowels that lack the distinction tense/lax), [±front], [±back] and [±round].

The class of back vowels share the feature [+back]; the class of front vowels share the feature [–back].

• [+front, +round] also defines a class: [y, ʏ , ø, œ, œ] (not relevant for Greek and English).

An example of feature system for vowels

Hayes' proposal for vowels' distinctive features (he also proposes tables for consonants). Major class features are not shown.

	high tense						high lax			mid tense						mid lax						low				
	i	y	ɨ	ʉ	ɯ	u	ɪ	ʏ	ʊ	e	ø	ɘ	ɵ	ɤ	o	ɛ	œ	ə	ɞ	ʌ	ɔ	æ	ɶ	a	ɑ	ɒ
[high]	+	+	+	+	+	+	+	+	+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
[low]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	+	+	+	+	+
[tense]	+	+	+	+	+	+	–	–	–	+	+	+	+	+	+	–	–	–	–	–	–	0	0	0	0	0
[front]	+	+	–	–	–	–	+	+	–	+	+	–	–	–	–	+	+	–	–	–	–	+	+	–	–	–
[back]	–	–	–	–	+	+	–	–	+	–	–	–	–	+	+	–	–	–	–	+	+	–	–	–	+	+
[round]	–	+	–	+	–	+	–	+	+	–	+	–	+	–	+	–	+	–	+	–	+	–	+	–	–	+

- The natural class of high vowels are captured by the feature [+high] (all high tense and high lax in the table),
- The natural class of non-high vowels are captured by the feature [–high] (all other vowels)
- Same for [±low], [±tense] (except for the low vowels that lack the distinction tense/lax), [±front], [±back] and [±round].

The class of back vowels share the feature [+back]; the class of front vowels share the feature [–back].

- [+front, +round] also defines a class: [y, ʏ , ø, œ, ɶ] (not relevant for Greek and English).

Requirements of the feature representation

The components of segments are features that can be binary (+F and –F) or privative (F).

Classes of features of the same type form natural classes, e.g., all voiced obstruents or all nasals.

The segments may be *underspecified*: some features are lacking or are first both [+F] and [–F], thus [±F], as for instance affricates and diphthongs.

1) All and only the existing phonemic oppositions are represented.

2) The natural classes are represented as such.

3) Allophony and other alternations should be representable.

Features are subject to change by assimilation or by default.

Features can be cancelled or deleted, in which case neutralization may be the result.

An example of feature representation for vowels

The less features, the more segments are contained in the natural class accounted for by the features.

In a language in which the only high vowels are [i], [ɪ], [y], [ʏ], [u] and [ʊ]:

[i] is the only vowel that is [+high], [+tense], [–back] and [–round] (it is also [+vocalic, –consonantal, + sonorant]).

Without [±round] – thus [+high], [+tense] and [–back] – we have a natural class containing [i] and [y].

Without [±back] – thus [+high] and [+tense] – we have a natural class containing [i], [y] and [u].

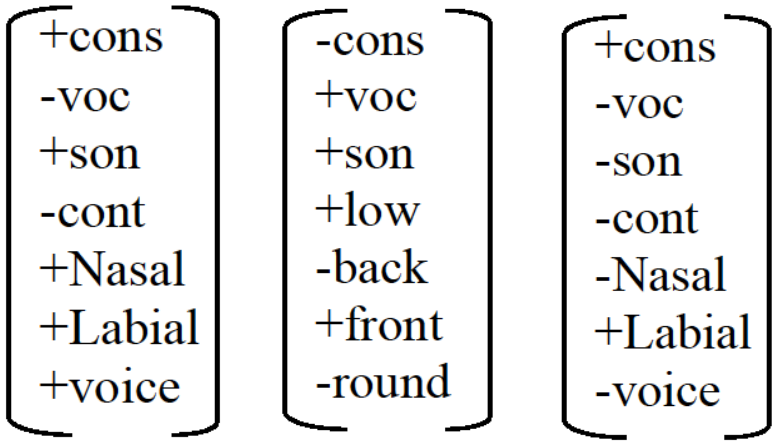
Without [±tense] – thus only [+high] – we have a natural class containing all (and only) high vowels: [i], [ɪ], [y], [ʏ], [u] and [ʊ].

No possible natural class can exist containing segments with contradictory features.

Linear feature representation

Jakobsonian and early generative phonologists, like Chomsky & Halle (1968), considered the segments to be *bundles* of features without any internal structure: the so-called *linear feature representation.*

map [mæp]



Drawbacks of the linear feature representation:

1) The feature bundles have no internal structure.

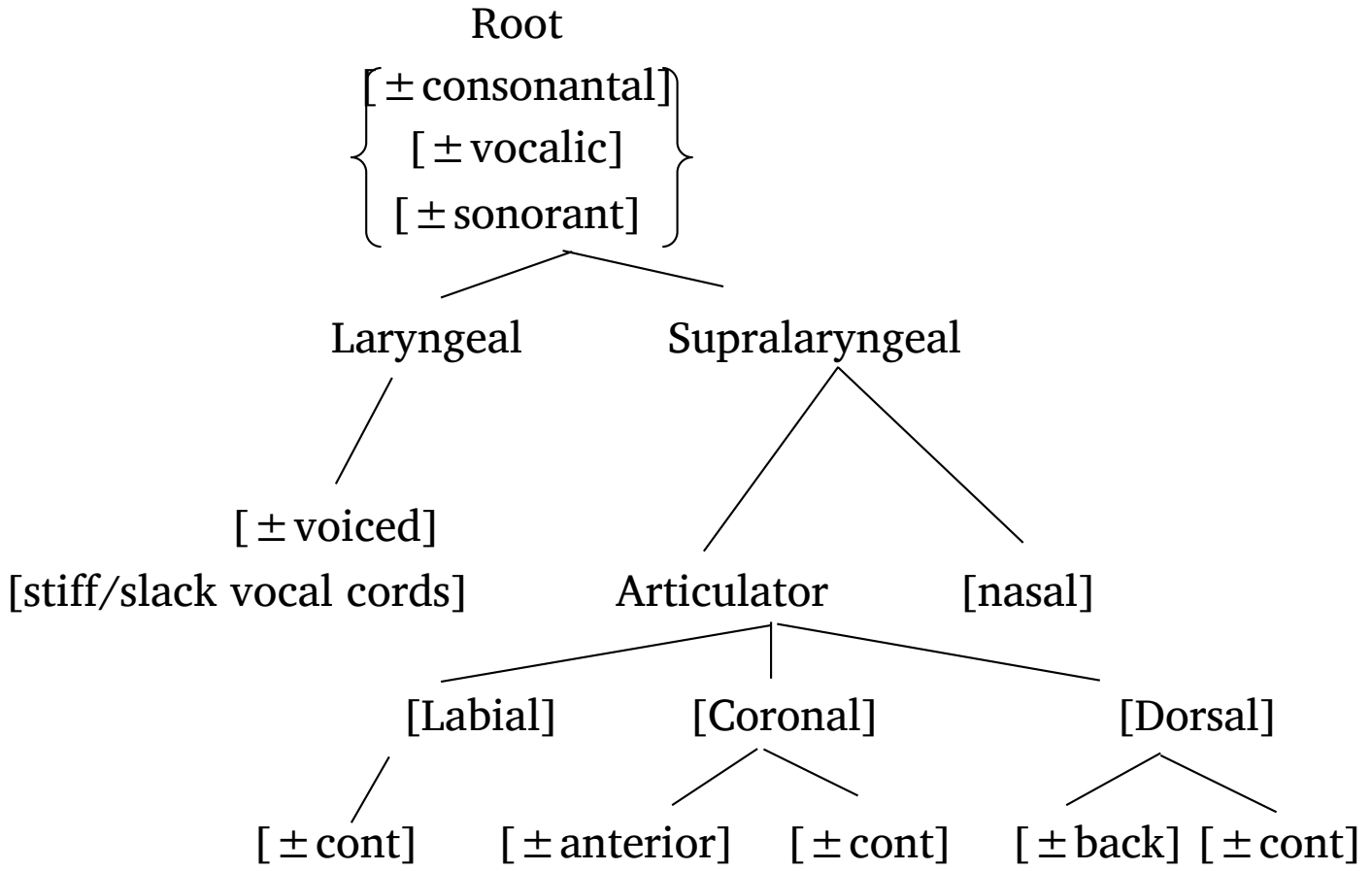
2) The features stand in a one-to-one relation to the segments. Each feature characterizes exactly one sound and each sound is defined by exactly one value of each category: no feature sharing.

3) All features are present in the feature bundle of each segment.

Non-linear feature representation: feature geometry

Feature geometry is a non-linear representation of features. Features are organized in a hierarchical structure with Class Nodes distributing them in kinds or classes of features. In other words, feature geometry allows features, and segments, to be organized in (natural) classes.

Feature geometry for Greek consonants

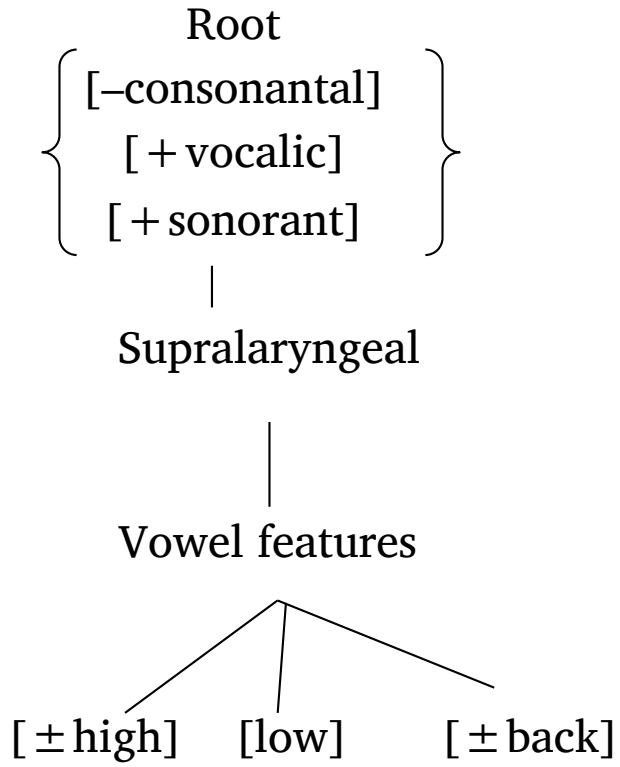


Articulator (or Place of articulation) = oral articulation [nasal] = state of the velum

[±continuant] refers to the stricture at the place of articulation (Padgett 1991)

Padgett, Jaye. 1991. Stricture in Feature Geometry. Doctoral Dissertation. Amherst: University of Massachusetts.

Feature geometry for Greek vowels



No need for [tense] [front], [round] and [nasal]: the back vowels are round.

	i	u	e	o	a
high	+	+	–	–	–
low	–	–	–	–	+
back	–	+	–	+	+

Administration

There will be three optional assignments:

1. The first assignment is available today (Tuesday 18th) and it is due on July 20th (Thursday): this one is online. Please download it and write your answers as you want: electronically or on paper. You can send your assignments by email or hand them to me or Trevor.
2. The second assignment will be available on Friday 21stand will be due on Monday 24th
3. The third assignment will be available on Tuesday 25th and is due on 27th

If you would like to talk with me, please make an appointment by email: caroline.fery@gmail.com.

I am happy to know you better and discuss with you what you are working on, or any topic that you are interested in.

The TA for this class is Trevor Driscoll. You can also make appointments with him as well, and also give him your assignments.

The material for this class is online. I will upload the papers that are especially relevant.

Phoneme inventories in OT

In Prince and Smolensky (1993/2004) segment inventories result from interactions between faithfulness and markedness constraints.

Markedness constraints

Markedness constraints say something about the form of the outputs (candidates) regardless of the form of the input, for instance [y] is [+front, +round] which is marked in all languages.

OT constraint *[+front, +round] is high ranking in English and Greek, above the faithfulness constraint, but lower in French, Turkish and German.

Faithfulness constraints compare inputs and outputs (IO) (or outputs and inputs (OI)).

DEP-IO (No epenthesis)

MAX-IO (No deletion)

IDENT-IO (No change in feature)

Faithfulness constraints predict the existence of all possible segments in the two languages.

Markedness constraints penalize marked segments.

Prince, Alan & Paul Smolensky. 1993/2004. *Optimality Theory: Constraint Interaction in Generative Grammar*. Malden, MA, & Oxford: Blackwell

Phoneme inventories in OT

Marked segments need more (marked) features than unmarked ones.

[x] and [ɣ] are phonemic [+back] dorsal fricatives

[ç] and [ʝ] are non-phonemic [–back] dorsal fricatives in Greek. They are allophones of [x] and [ɣ].

The feature [±back] is needed in Greek for the distinction, but it is not be needed in English, a language without the distinction.

[s] and [z] are [–anterior] phonemic coronal fricatives (only in English)

[θ] and [ð] are [+anterior] phonemic coronal fricatives (in both languages)

Alveopalatal fricatives /ʃ/ and /ʒ/ have an added markedness relative to languages that only have /s/ and /z/: [±anterior] (or [±distributed]).

Tense vs. lax vowels also need an added feature distinction, [±tense], compared to languages that do not make the distinction, as in Greek.

Phoneme inventories in OT

Prince & Smolensky (1993/2004) propose universal rankings for markedness constraints governing articulators and other features, see also Kager (1999) for an overview.

Marked segments are lower ranking, and thus eliminated earlier by markedness constraints than unmarked ones. The ranking of constraints that govern markedness relations along a single dimension (such as articulators) is universally fixed.

Markedness relations are organized in a scalar fashion, as in the 'harmony scale' Cor > Dors (Coronal is more harmonic than Dorsal), translating into the constraint ranking

*[DORS] >> *[COR]

The constraints governing the relative markedness of dorsals and coronals are intrinsically ranked and the universal ranking leads to the relative markedness of segment types.

Markedness is motivated by typological, articulatory, perceptive and acquisitional properties.

Prince, Alan & Paul Smolensky. 1993/2004. *Optimality Theory: Constraint Interaction in Generative Grammar*. Malden, MA, & Oxford: Blackwell.

Kager, René. 1999. *Optimality Theory. A Textbook*. Cambridge: Cambridge University Press.

Phoneme inventories in OT

Interaction of markedness scales and faithfulness constraints:

IDENT-IO(PLACE): The specification for place of articulation of an input segment must be preserved in its output correspondent.

This faithfulness constraint is satisfied by (a) but violated by (b)

a. /s/ Input (coronal)
|
[s] Output (coronal)

b. /x/ Input (dorsal)
|
[s] Output (coronal)

One grammar that is maximally faithful to place of articulation ranks IDENT-IO(PLACE) above both markedness constraints:

IDENT-IO(PLACE) >> *[DORS] >> *[COR]

The other grammar is less faithful to place of articulation:

*[DORS] >> IDENT-IO(PLACE) >> *[COR]

The featural content of epenthetic segments and other unspecified segments is fully determined by markedness factors.

Phoneme inventories in OT

First grammar (Greek): a dorsal place of articulation that is specified at the lexical level will reach the surface level. Accordingly, the segment inventory of this language will allow dorsal fricatives.

/x/	IDENT[PoA]]	*[+cont, Dorsal	*[coronal]
☞ a. [x]		*	
b. [s]	*!		*

The other grammar is less faithful to its input place features. It blocks the surfacing of any dorsal fricative in the input since the markedness constraint against them outranks IDENT-IO(Place of Articulation). The repair can be [s] or another segment such as [k].

/x/	*[+cont, Dorsal]	IDENT[PoA]	*[coronal]
a. [x]	*!		
☞ b. [s]		*	*

Phoneme inventories in OT

In the same way, adding [±anterior] or [±tense] amounts to adding a complexity rendering the segments that need the features more marked than those that do not need them.

The choice of the features is guided by natural classes plus other principles such as phonetic naturalness which have an impact in the language under consideration.

Understanding phoneme inventories in terms of contrastive hierarchies of features has consequences for what kinds of typological generalizations can meaningfully be made about them.

Such hierarchies of features also limit what kinds of assimilations are possible.