

## *Today's topics:*

- **Allophones in OT, part 1**
- **Strengthening the OT grammar with 'Richness of the Base'**

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### *Background preparation:*

- *PP: Greek*
- *PP: A CVCV language*

# 0. Today's objectives

After today's class, you should be able to:

- Start using phonological factors that predict allophone distribution to define, rank OT constraints
- Explain the principle of Richness of the Base, why it makes the OT grammar stronger, and how to use it when modeling predictable information in OT
- Apply the principle of Richness of the Base to our analysis of allophone distribution, and discuss the implications for phoneme URs → next time!

# 1. An OT model of the phonological grammar

- When we propose a phonological grammar model for a given language, **what kinds of phenomena should this grammar be able to predict (make happen) in the language?**

# 1. An OT model of the phonological grammar

- When we propose a phonological grammar model for a given language, **what kinds of phenomena should this grammar be able to predict (make happen)** in the language?
  - Account for the phonological behavior of a speaker of the language!
  - **Enforce predictable patterns:**
    - Syllable structure ( ← our focus in OT so far)
    - Allophone distribution
    - Morpheme alternations

## 2. Allophone distribution in OT (part 1)

Data set: [Greek](#) | [k], [x], [ç] — *from last time*

- What are the facts in this data set?
  - In what **environments** do these sounds occur?
  - Which sounds are in **contrastive** (unpredictable) vs. **complementary** (predictable) distribution?
  - What are the “**elsewhere**”/default allophones?

## 2. Allophone distribution in OT (part 1)

- In what **environments** do these sounds occur?
  - The palatals [c], [ç] occur only \_\_[-bk]
  - The velars [k], [x] occur \_\_[+bk] *and* \_\_[+cons]
- Which sounds are in **contrastive** (unpredictable) vs. **complementary** (predictable) distribution?
  - Velars and palatals are in complementary dist.
  - Dorsal stops contrast with dorsal fricatives
- What are the “**elsewhere**”/default allophones?
  - The velars [k], [x] (because the palatals are what have a specific, easily statable environment)

## 2. Allophone distribution in OT (part 1)

Data set: [Greek](#) | [k], [x], [c], [ç]

- In what **environments** do these sounds occur?
  - The palatals [c], [ç] occur only \_\_[-bk]
  - The velars [k], [x] occur elsewhere
- If we were doing rule-based phonology, what **rule** would we write for this pattern? — *from last time*
  - Remember that palatals are [COR, DORS]

$$\left[ \begin{array}{c} \text{DORS} \\ \text{-son} \end{array} \right] \rightarrow [ \text{COR} ] / \text{__} [-bk]$$

## 2. Allophone distribution in OT (part 1)

Data set: [Greek](#) | [k], [x], [c], [ç]

- But our current model of the phonological grammar **does not include rules!**
- What do we need in order to model allophone (predictable) distribution in terms of **OT**?

## 2. Allophone distribution in OT (part 1)

- What do we need in order to model allophone (predictable) distribution in terms of **OT**?
  - Constraints and a ranking that let the grammar **choose** the right allophones in the right environments

## 2. Allophone distribution in OT (part 1)

Data set: [Greek](#) | [k], [x], [c], [ç]

### Discussion

- Getting started on an OT analysis
  - Find a **surface form** that **differs** from (what we would propose as) its UR
  - What **constraint** does this form violate **by** being different from its UR?

## 2. Allophone distribution in OT (part 1)

Data set: [Greek](#) | [k], [x], [c], [ç]

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## 2. Allophone distribution in OT (part 1)

Data set: [Greek](#) | [k], [x], [c], [ç]

- Find a **surface form** that **differs** from (what we would propose as) its UR
  - If the “elsewhere allophone” is the UR, what’s a surface form that *differs* from its UR?

Example: **[ceri]** ‘candle’ — UR would be **/keri/**

## 2. Allophone distribution in OT (part 1)

Data set: [Greek](#) | [k], [x], [c], [ç]

- What **constraint** does this form violate **by** being different from its UR? — Make the definition **formal** by referring to entities in our phonological model!
  - What's different?
  - How is this difference **represented** in our mental grammar?
  - What **kind** of constraint would assign \* for this?

## 2. Allophone distribution in OT (part 1)

Data set: [Greek](#) | [k], [x], [c], [ç]

- What **constraint** does this form violate **by** being different from its UR? — Make the definition **formal** by referring to entities in our phonological model!
  - What's different? | [c] (palatal) vs. [k] (velar)
  - How is this difference **represented** in our mental grammar? | [c] has [COR]; [k] does not
  - What **kind** of constraint would assign \* for this?
    - A **faithfulness** constraint

## 2. Allophone distribution in OT (part 1)

Data set: [Greek](#) | /keri/ → [ceri] ‘candle’

- We can define **faithfulness constraints** that penalize **changes in feature values**
  - These are called  $\text{IDENT}[F]$  constraints (“Identity”)
  - There is one for each feature  $[F]$  in the model

$\text{IDENT}[\text{COR}]$ : Assign one \* for any output segment that differs from its corresponding input segment with respect to  $[\text{CORONAL}]$

## 2. Allophone distribution in OT (part 1)

Data set: [Greek](#) | [k], [x], [c], [ç]

### Discussion

- Continuing our OT analysis
  - What is the most important **informative loser** (considering allophone distribution)?
  - What **phonological factor** makes this candidate lose? Can you use it to **propose a constraint**?

## 2. Allophone distribution in OT (part 1)

Data set: [Greek](#) | /keri/ → [ceri] 'candle'

- What is the most important **informative loser** (considering allophone distribution)?

## 2. Allophone distribution in OT (part 1)

Data set: [Greek](#) | /keri/ → [ceri] ‘candle’

- The **faithful candidate** as informative loser (\*[keri])

/keri/ ‘candle’	IDENT[ <small>COR</small> ]
→ (a) [ceri]	*
(b) [keri]	L

- The actual winner violates a constraint
- The faithful candidate (b) didn’t win — why not? (What’s our next step in the analysis?)

## 2. Allophone distribution in OT (part 1)

Data set: Greek | /keri/ → [ceri] 'candle'

/keri/ 'candle'	??	IDENT[ <small>COR</small> ]
→ (a) [ceri]		*
(b) [keri]	* W	L

- Propose and define a constraint that makes the [ke] candidate **lose** (by preferring the winner)
- Base this constraint on your understanding of *what matters in this allophone pattern*

## 2. Allophone distribution in OT (part 1)

Data set: [Greek](#) | /keri/ → [ceri] ‘candle’

- What is “wrong” with \*[keri]?
  - It has a velar obstruent before a front vowel
  - > This is what our new constraint needs to assign a violation for

## 2. Allophone distribution in OT (part 1)

Data set: [Greek](#) | /keri/ → [ceri] ‘candle’

- What is “wrong” with \*[keri]?
  - It has a velar obstruent before a front vowel
- In general: When we have complementary distribution, we can define a **markedness constraint** that captures what is “wrong” with the **default allophone** in the **specific environment**  
NoVELAR+FRONTVOWEL: Assign one \* for any sequence of segments [DORS] [-bk] in which the [DORS] segment is not also [COR]

## 2. Allophone distribution in OT (part 1)

Data set: [Greek](#) | /keri/ → [ceri] ‘candle’

- What is “wrong” with \*[keri]?
  - It has a velar obstruent before a front vowel

/keri/ ‘candle’	NoVELAR+FRV	IDENT[ <small>COR</small> ]
→ (a) [ceri]		*
(b) [keri]	* W	L

- What ranking can we prove here?

## 2. Allophone distribution in OT (part 1)

Data set: [Greek](#) | [k], [x], [c], [ç]

- Before we can finish a complete OT analysis of allophones in complementary (predictable) distribution, we need to discuss another key idea:  
how to make an OT grammar **enforce predictable information**

# 3. Predictable information in OT

## Discussion

Data set: [A CVCV language](#)

- Using the forms in this data set, what rankings can we prove among the following constraints?
  - ONSET
  - NoCODA
  - NoEPENTHESIS
  - NoDELETION

### 3. Predictable information in OT

Data set: A CVCV language

- Can we rank  $\text{ONSET}$  and  $\text{NoCODA}$  with respect to  $\text{NoEPENTHESIS}$  and  $\text{NoDELETION}$ ?

### 3. Predictable information in OT

Data set: [A CVCV language](#)

- Can we rank  $\text{ONSET}$  and  $\text{NoCODA}$  with respect to  $\text{NoEPENTHESIS}$  and  $\text{NoDELETION}$ ?
  - Not with morphemes from the lexicon as inputs!  
There will **never** be any constraint conflict to provide a ranking argument, because the winners are all **perfect** on these constraints

### 3. Predictable information in OT

Data set: [A CVCV language](#)

- Can we rank  $\text{ONSET}$  and  $\text{NoCODA}$  with respect to  $\text{NoEPENTHESIS}$  and  $\text{NoDELETION}$ ?
  - Not with morphemes from the lexicon as inputs!
- BUT: What do you think will happen if this language **borrow**s a word with the shape /CVC/? How do you think the loanword will surface?

### 3. Predictable information in OT

Data set: [A CVCV language](#)

- BUT: What do you think will happen if this language **borrow**s a word with the shape /CVC/? How do you think the loanword will surface?
  - Most languages that never have codas also **avoid** codas when they **borrow** words (at least at first—prolonged borrowing can change this pattern)
  - Hawai'ian is one example:  
English *wine* [wain̩] → [wai.na̩]

### 3. Predictable information in OT

- If the language **adds vowels to avoid codas** in borrowed words, what *should* we conclude about NoEPENTHESIS, NoDELETION, and NoCODA?

/CVC/	NoEPEN	NoDEL	NoCODA
→ (a) [CV.C <u>V</u> ]			
(b) [CV_]			
(c) [CVC]			

### 3. Predictable information in OT

- If the language **adds vowels to avoid codas** in borrowed words, what *should* we conclude about NoEPENTHESIS, NoDELETION, and NoCODA?

/CVC/	NoEPEN	NoDEL	NoCODA
→ (a) [CV.C <u>V</u> ]	*		
(b) [CV_]	L	* W	
(c) [CVC]	L		* W

- { NoCODA, NoDELETION } » NoEPENTHESIS

### 3. Predictable information in OT

- If a language only has morphemes with the shape /CV/, /CVCV/, /CVCVCV/, etc. ...
  - There is **no way to prove any rankings** among (for example) NoCODA, NoEPENTHESIS, and NoDELETION using *existing morphemes* of the language
  - And yet, native speakers of such a language typically **will not allow** (for example) **codas** in loanwords
- How can we reconcile these two facts?

### 3. Predictable information in OT

- More generally:
  - We need a way to make an OT grammar **predict** that something is **ungrammatical** in a language, when it simply **never arises**
  - No tableau for any morpheme of the language will ever lead to constraint conflict, so there is **no direct evidence** for the constraint ranking we would need

## 4. The OT principle of “Richness of the Base”

- Quick OT concept check:

### **Markedness** or **faithfulness**?

- Which type of constraint (if ranked high enough) can **enforce predictable patterns** in a language *by requiring surface forms to have particular properties*?
- Which type of constraint (if ranked high enough) can ensure that **unpredictable information** *stored in URs will survive (=be **contrastive**)* in surface forms in a language?

## 4. The OT principle of “Richness of the Base”

- Quick OT concept check:

### **Markedness** or **faithfulness**?

- Which type of constraint (if ranked high enough) can **enforce predictable patterns** in a language by *requiring surface forms to have particular properties*? | **markedness**
- Which type of constraint (if ranked high enough) can ensure that **unpredictable information** stored in URs will survive (=be **contrastive**) in surface forms in a language? | **faithfulness**

## 4. The OT principle of “Richness of the Base”

- If we are serious about the idea that **predictable** patterns are driven by **markedness** constraints, we must conclude that NoCODA » *Faithfulness* in our CVCV language exercise
  - NoCODA must dominate either NoDEL or NoEPENTH, although **we don't know which one** (if we don't know about loanwords)
  - Why don't we know?  
*Existing words in a CVCV language never show either epenthesis or deletion*

## 4. The OT principle of “Richness of the Base”

- If we are serious about the idea that **predictable** patterns are driven by **markedness** constraints, we must conclude that NoCODA » *Faithfulness* in our CVCV language exercise
- If we have NoCODA » *Faithfulness*, we have a grammar with the **power** to get rid of codas
  - Even if we give the grammar an input with a final consonant, the output will still have no coda

## 4. The OT principle of “Richness of the Base”

- But...how can we give the grammar an input with a final consonant, if there is no evidence that any morpheme ends in a consonant?
  - Here is where *input and UR are not the same*
  - We can give the grammar a **hypothetical** input (not a real word) and consider *what it would do*
  - In a way, this is like “giving the grammar a loanword”
- Handout - Predictable information in OT and ‘Richness of the Base’

## 4. The OT principle of “Richness of the Base”

- What this means:

A grammar with NoCODA » *Faithfulness* will

**productively** get rid of codas, even if no existing morphemes show this alternation

## 4. The OT principle of “Richness of the Base”

- This example illustrates a key OT principle:
  - **Richness of the Base (ROTB):** There are no language-particular restrictions on input forms (Prince & Smolensky 1993)
  - We can’t “explain” why there are no codas simply by saying that the language has no inputs with final consonants
  - Instead, we have to **make the grammar robust enough** to cause candidates with codas to lose
    - We do this by using a hypothetical input — making sure its output wouldn’t be faithful

## 5. Putting the pieces together

- Next time:
  - We will return to the Greek allophones problem and combine our **description** of the allophone distribution with this new idea of **Richness of the Base** to develop an approach to **complementary distribution** in OT
  - Then we will apply the concept of **factorial typology** (from last week) to see what other language patterns our allophone analysis predicts should exist!