Today's objectives:

- **Replace *rules* with *goals*: Intro to Optimality Theory**

Background preparation:
- *Think about child phonology in terms of "goals"*

0. Course registration for fall!

- A list of LING courses offered for fall

- Flyers / more information about selected courses

0. Today's plan

- Recap: Key ideas in OT

- How to determine priorities

- Goals and priorities: Cairene Arabic vs. English

- OT as part of our phonological model

  - Formalizing "goals" as constraints
  - Formalizing "priority" as constraint ranking
  - Preview: More about constraints and candidates

- Discussion: Midterm exam

1. Phonology with "goals" instead of rules

- An alternative model of the mental grammar has **no phonological rules**

- Instead, we can propose:
  - A universal set of **goals** that all languages share
  - A way for each language to **prioritize** conflicting goals (this allows languages to be different)

Group discussion:

- What "**goals**" can we identify in the child phonology data set from last time?

1. Phonology with "goals" instead of rules

- Under this approach, what we need to propose in analyzing a language's phonology is not a set of rules, but a **prioritization of the universal goals**

- The goal-based phonological model we will pursue is known as **Optimality Theory (OT)**

- Imagine: Some TV psychologist proposes that there are five basic drives that explain all human behavior

  LOVE   MONEY   FAME

  EXCITEMENT   POWER

  - This psychologist argues that different people's behavior is explained by how they each prioritize these basic drives

- *Disclaimer:* This example is very, very fake, but we're using it to illustrate how we're going to **construct arguments** about goals in phonology

2. How to determine priorities

- How could we figure out what a given individual prioritizes?

  - Example: Does Pat prioritize Lᴏᴠᴇ or Mᴏɴᴇʏ?

- Let's ask Pat to choose between these two job offers

	LOVE	MONEY
Job #1: Same city as SO | $45,000		
Job #2: Far from SO | $125,000		

- What can we learn about LOVE vs. MONEY from what Pat picks?

- Notation: **Dashed** line between goals means no claim about priority is being made

- Let's ask Pat to choose between these two job offers

	LOVE	MONEY
Job #1: Same city as SO | $125,000		
Job #2: Far from SO | $45,000		

- What can we learn about LOVE vs. MONEY from what Pat picks?

2. How to determine priorities

- Let's ask Pat to choose between these two job offers

	LOVE	MONEY
Job #1: Same city as SO | $45,000 | Chapel Hill, NC		
Job #2: Far from SO | $125,000 | Paris, France		

- What can we learn about LOVE vs. MONEY if Pat picks Job #1?
- How about Job #2?

2. How to determine priorities

- What we've noticed so far:

  If we want to test the relative importance of Love vs. Money...

  - The two scenarios need to **conflict**, such that one wins on Love and the other wins on Money

  - We need to be sure there isn't some **third factor** that we aren't thinking about that's really the reason for the choice being made

- Here's a place where our metaphor breaks down…

	Love	Money
Job #1: Same city as SO | $45,000		
Job #2: Far from SO | $45,001		

- What does the theory predict that Pat will pick **if Money » Love**?
- Is this plausible human behavior?
- This is, in fact, what Optimality Theory predicts will happen in a phonological goals scenario!

3. Trying this out in actual phonology

- Data sets: English vs. Cairene Arabic

  - When we analyzed English before, what syllable structure did we assign to this form? (Why?)

    /æklejm/ → [əkʰlejm] 'acclaim'

  - When we analyzed Cairene before, what syllable structure did we assign to this form? (Why?)

    /Raɡleːn/ → [RAGleːn]   'two men'

- Data sets: <u>English</u> vs. <u>Cairene Arabic</u>
  - English

    /æklejm/ → [ə.kʰlejm] 'acclaim' (V.C̲C̲V)

  - Cairene

    /ʀagleːn/ → [ʀaɡ.leːn]   'two men' (VC̲.C̲V)

Group discussion

- What **goal** does English seem to be prioritizing? What about Cairene?
  - Hint: Cross-linguistic patterns in σ structure?

3. Trying this out in actual phonology

- Data sets: English vs. Cairene Arabic

  - English: Goal seems to be "Don't have a coda"

  - Cairene: Is the goal more likely to be "Have a coda" or "Don't have an onset cluster"?

  How can we tell?

3. Trying this out in actual phonology

- Cairene: Is the goal more likely to be "Have a coda" or "Don't have an onset cluster"?

    How can we tell?

- The goals are **universal** (=present in *all* languages)
    - What would a language look like if "Have a coda" were its **top goal**?
    - What would a language look like if "Don't have an onset cluster" were its **top goal**?
    - Which of these two hypothetical language patterns is more plausible?

- The goals are **universal** (=present in *all* languages)
  - What would a language look like if "Have a coda" were its **top goal**?

    → All syllables would always have codas

  - What would a language look like if "Don't have an onset cluster" were its **top goal**?

    → No syllables would ever have onset clusters

  - Which of these two hypothetical language patterns is more plausible?
    (Hint: Are codas ever *required*?)

4. Formalizing goals as constraints

- The following discussion is summarized in:

  Handout - "[OT fundamentals: Constraints and constraint tableaus](#)"

- Remember our discussion about how "[m] is voiced" and "[m] is [+voice]" do not mean the same thing?
  - "Voiced" is a fact about the physical world
  - [+voice] is a claim about the mental grammar

- Similarly, we need to incorporate the ideas of a phonological "goal," and "priorities" among goals, into our model of the mental grammar

4. Formalizing goals as constraints

- "Goals" are formalized in OT as **constraints**

    - To propose a constraint, we need to give it a **formal definition** stating the conditions under which that constraint assigns a **violation** ('*')

    - Constraint definitions refer to the entities in our model of phonological representations, such as features, word boundaries, syllable structure, ...

    - It is useful to give the constraint a convenient **name**, and provide a paraphrase of what goal it represents, but the **definition is key**

4. Formalizing goals as constraints

- "Goals" are formalized in OT as **constraints**
    - Ideally, each constraint formalizes one **simple** goal

    - Complicated patterns should come from the **interaction** of simple constraints, not from constraints that are themselves complex

4. Formalizing goals as constraints

- Let's try it with the two "goals" we have been discussing

  How would we make a precise statement of the conditions under which each of these constraints assigns a violation?

  - NoCoda

    Assign one * for every...

  - NoOnsetCluster (hint: what is a "cluster"?)

    Assign one * for every...

4. Formalizing goals as constraints

- Let's try it with the two "goals" we have been discussing

  How would we make a precise statement of the conditions under which each of these constraints assigns a violation?

  - NoCoda

    Assign one * for every syllable that has a coda

  - NoOnsetCluster (hint: what is a "cluster"?)

    Assign one * for every syllable that has more than one segment in the onset

4. Formalizing goals as constraints

- How does the mental grammar **use constraints** to get from a UR to the appropriate surface form?

  Here's a big change from rule-based phonology:
  - In OT, the grammar **does not** turn URs into SRs by changing them step-by-step
  - Instead, the grammar…
    - takes a **UR**
    - generates a **set of potential SRs**
    - **picks the best SR** (according to the **constraints** and how they are **prioritized**)

- What is "a set of potential surface forms?"
  - For now, we'll start from this simplified position:
    - *English could have been like Cairene, but it isn't*
    - *Cairene could have been like English, but it isn't*

    Each language's **real** surface form is a "potential" one for the other language

Language	Real (winning) SR	Potential (losing) SR
English	[ə.k<u>ʰ</u>lejm]	[ə<u>k.l</u>ejm]
Cairene	[RA<u>ɢ.l</u>eːn]	[RA.gleːn]

4. Formalizing goals as constraints

- How does the grammar use constraints to pick the "best" SR for a given UR?

- For each **input** (think UR for now), the grammar creates a **constraint tableau**, which contains:
  - All the **candidate output** forms, including the **winning**, or **optimal**, output (SR)
  - All the **constraints**
  - **Violation marks** assigned by each constraint to every candidate

4. Formalizing goals as constraints

- Here is our mini-example from English

  - Input in the top left corner
  - Constraints across the top
  - Output candidates down the side
  - The winning candidate is indicated with '→' (another common notation is '☞', a pointing finger)

/æklejm/	NoCoda	NoOnsetCluster
(a) [ək.lejm]		
→(b) [ə.kʰlejm]		

4. Formalizing goals as constraints

- Here is our mini-example from English
  - How do these constraints assign violations here?

/æklejm/	NoCoda	NoOnsetCluster
(a) [ək.lejm]		
→ (b) [ə.kʰlejm]		

4. Formalizing goals as constraints

- Here is our mini-example from English
  - How do these constraints assign violations here?

/æklejm/	NoCoda	NoOnsetCluster
(a) [ək.lejm]	**	
→(b) [ə.kʰlejm]	*	*

4. Formalizing goals as constraints

- Here is our mini-example from Cairene

  - How do these constraints assign violations here?

/Ragleːn/	NoCoda	NoOnsetCluster
→ (a) [RAG.leːn]		
(b) [RA.gleːn]		

4. Formalizing goals as constraints

- Here is our mini-example from Cairene

  - How do these constraints assign violations here?

/Ragleːn/	NoCoda	NoOnsetCluster
→ (a) [RA**G**.leːn]	**	
(b) [RA.**gle**ːn]	*	*

5. Formalizing priority as constraint ranking

- Informally, we said that all languages share the **same phonological goals**, but these are **prioritized differently** in different languages

- We **formalize** these ideas (=incorporate them into our **model** of the mental grammar) as follows:

  - "Goals" are **constraints** with explicit definitions that refer to syllable structure, features, sonority and other elements in the mental grammar

  - "Priorities among goals" are …

5. Formalizing priority as constraint ranking

- We **formalize** these ideas (=incorporate them into our **model** of the mental grammar) as follows:

  - "Goals" are **constraints** with explicit definitions that refer to elements in the mental grammar

  - "Priorities among goals" are formalized as a **ranking** among the constraints

  - Example: C<small>ONSTRAINT</small>1 » C<small>ONSTRAINT</small>2

    - The symbol ' » ' (or '>>') means 'dominates, outranks'

5. Formalizing priority as constraint ranking

- How does the grammar use constraints to pick the best SR (**optimal candidate**) for a given UR (**input**)?

- For each **input**, the grammar creates a **constraint tableau**, which contains:
    - All the **candidate output** forms
    - All the **constraints**
    - **Violation marks** assigned by each constraint

- The grammar uses the language-specific constraint **ranking** to decide which output is best
    - Start with the highest-ranked constraint first

- But! Usually, as linguists, our job is to figure out what the grammar of a language is…

  How does this work in OT?

  - In OT, there are *no rules* in the mental grammar
  - Instead, our job is to figure out **how the constraints are ranked** in a given language
    - Remember "Love vs. Money"? That's our strategy
  - At the same time, we are also still refining our understanding of what the universal set of constraints actually is

5. Formalizing priority as constraint ranking

- Here is our mini-example from English

  - How must these constraints be ranked for the grammar to choose the right syllable structure?

/æklejm/	NoCoda	NoOnsetCluster
(a)　[ək.lejm]	**	
→(b)　[ə.kʰlejm]	*	*

5. Formalizing priority as constraint ranking

- Here is our mini-example from **English**

  - How must these constraints be ranked for the grammar to choose the right syllable structure?

/æklejm/	NoCoda	NoOnsetCluster
(a) [ək.lejm]	**	
→(b) [ə.kʰlejm]	*	*

  - NoCoda » NoOnsetCluster is the necessary ranking: NoOnsetCluster would pick the wrong candidate, so we need NoCoda to choose first

- Here is our mini-example from **Cairene**

  - How must these constraints be ranked for the grammar to choose the right syllable structure?

/Ragleːn/	NoCoda	NoOnsetCluster
→ (a) [RAG.leːn]	**	
(b) [RA.gleːn]	*	*

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5. Formalizing priority as constraint ranking

- Here is our mini-example from Cairene

  - How must these constraints be ranked for the grammar to choose the right syllable structure?

/Ragleːn/	NoCODA	NoONSETCLUSTER
→(a) [RAG.leːn]	**	
(b) [RA.gleːn]	*	*

  - NoONSETCLUSTER » NoCODA is the necessary ranking: NoCODA would pick the wrong candidate, so we need NoONSETCLUSTER to choose first

- Once we have finished our analysis of Cairene, we should reorder our tableau so that the **constraints are shown from left to right in rank order**

/Ragleːn/	NoOnsetCluster	NoCoda
→ (a) [RAG.leːn]		**
(b) [RA.gleːn]	*	*

- Remember — notation in tableaus:
  - **Dashed** line = no ranking claimed
  - **Solid** line = (left) » (right)

5. Formalizing priority as constraint ranking

- Summary: The two languages have the same constraints, but in a different ranking

  - English: N_OC_{ODA} » N_OO_{NSET}C_{LUSTER}
  - Cairene: N_OO_{NSET}C_{LUSTER} » N_OC_{ODA}

- Different constraint rankings are why different languages build syllable structure differently

6. More about constraints and candidates

- Next time, we will consider:

  - What are some of the other ways that English /æklejm/ 'acclaim' could have avoided violating NoCoda, other than by violating NoOnsetCluster?

  - *What constraints do we need in the grammar so that these other output candidates do not win?*

- This is a typical research strategy for both…

  - determining **how constraints are ranked** in a given language
  - determing **what the set of constraints** itself is