Today's objectives:

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

Background preparation (optional):

- *Think about child phonology in terms of "goals"*

0. Today's plan

- Recap: Key ideas in OT
- How to determine priorities: Conflict
- Goals and priorities: Cairene Arabic vs. English
- OT as part of our phonological model
  - Formalizing "goals" as constraints
  - Getting from UR to surface form
  - Formalizing "priority" as constraint ranking
  - Preview: More about constraints and candidates

0. Course registration for fall!

- A list of LING courses offered for fall
- Flyers / more information about selected courses

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)

Quick 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)**

2. How to determine priorities

- 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 LOVE or MONEY?

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		
Job #2: Far from SO | $125,000		

  - What can we learn about Pat's priorities for Love vs. Money?

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

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	*better*	*worse*
Job #2: Far from SO | $125,000	*worse*	*better*

  - What can we learn about Pat's priorities?
    - If Pat picks Job #1: LOVE » MONEY
    - If Pat picks Job #2: MONEY » LOVE

- Notation: **»** means "has priority over"

2. How to determine priorities

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

	Love	Money
Job #3: Same city as SO | $125,000		
Job #4: Far from SO | $45,000		

  - What can we learn about Pat's priorities for Love vs. Money?

2. How to determine priorities

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

	Love	Money
Job #3: Same city as SO | $125,000	*better*	*better*
Job #4: Far from SO | $45,000	*worse*	*worse*

  - What can we learn about Pat's priorities?
    - Job #3 is better for both Love and Money
    - So we know Pat will pick Job #3
    - But we **don't know** anything about Pat's **priorities**, because there is **no conflict**

2. How to determine priorities

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

	LOVE	MONEY
Job #5: Same city as SO | $45,000 | Chapel Hill, NC		
Job #6: Far from SO | $125,000 | Paris, France		

  - What can we learn about Pat's LOVE vs. MONEY...
    - if Pat picks Job #5?
    - if Pat picks Job #6?

2. How to determine priorities

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

	Love	Money	Excitement
Job #5: Same city as SO | $45,000 | Chapel Hill, NC	*better*	*worse*	*worse*
Job #6: Far from SO | $125,000 | Paris, France	*worse*	*better*	*better*

  - What can we learn about Pat's Love vs. Money...
    - if Pat picks Job #5? | Love » Money
    - if Pat picks Job #6? | we can't tell!

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 set up a **conflict**, so that one wins by LOVE and the other wins by 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 (EXCITEMENT)

2. How to determine priorities

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

	LOVE	MONEY
Job #7: Same city as SO | $45,000		
Job #8: 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?)

    /Ragleːn/ → [RAGleːn] 'two men'

3. Trying this out in actual phonology

- Data sets: English vs. Cairene Arabic
  - English

    /æklejm/ → [ə.kʰlejm] ‘acclaim’ (V.CCV)
  - Cairene

    /Ragleːn/ → [RAG.leːn] ‘two men’ (VC.CV)

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?

3. Trying this out in actual phonology

- 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

5. Constraint tableaus: UR to surface form

- 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

5. Constraint tableaus: UR to surface form

- 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 surface forms by *changing* them step-by-step
  - Instead, the grammar…
    - takes a **UR**
    - generates a **set of potential surface forms**
    - **picks the best option** (according to the **constraints** and how they are **prioritized**)

5. Constraint tableaus: UR to surface form

- 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) SF*	*Another potential SF*
English	[ə.k^{h}lejm]	[ək.lejm]
Cairene	[RAG.leːn]	[RA.gleːn]

5. Constraint tableaus: UR to surface form

- How does the grammar use constraints to pick the "best" surface form 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 (surface form)
  - All the **constraints**
  - **Violation marks** assigned by each constraint to every candidate

5. Constraint tableaus: UR to surface form

- 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.k^{h}lejm]		

5. Constraint tableaus: UR to surface form

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

/æklejm/	NoCoda	NoOnsetCluster
(a) [ək.lejm]		
→ (b) [ə.k^{h}lejm]		

5. Constraint tableaus: UR to surface form

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

/æklejm/	NoCoda	NoOnsetCluster
(a) [ə**k**.lej**m**]	**	
→ (b) [ə.**k^{h}l**ej**m**]	*	*

5. Constraint tableaus: UR to surface form

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

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

5. Constraint tableaus: UR to surface form

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

/Ragleːn/	NoCoda	NoOnsetCluster
→ (a) [RA**G**.leː**n**]	**	
(b) [RA.**g**l**e**ː**n**]	*	*

- Once we have our constraint tableau with:
  - the input (UR)
  - a set of candidates for the output (surface form)

  the constraints can pick the surface form

6. 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 …

6. 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: CONSTRAINT1 » CONSTRAINT2
    - The symbol ' » ' (or '>>') means 'dominates, outranks, has higher priority than'

6. Formalizing priority as constraint ranking

- How does the grammar use constraints to pick the *best* SF (**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

6. Formalizing priority as constraint ranking

- 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

6. 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.k^{h}lejm]	*	*

6. 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]	** *(worse)*	*(better)*
→ (b) [ə.k^{h}lejm]	* *(better)*	* *(worse)*

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

6. 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]	*	*

6. 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]	** *(worse)*	*(better)*
(b) [RA.gleːn]	* *(better)*	* *(worse)*

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

6. Formalizing priority as constraint ranking

- 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)

6. Formalizing priority as constraint ranking

- Summary: The two languages have the same constraints, but in a different ranking
  - English: NoCoda » NoOnsetCluster
  - Cairene: NoOnsetCluster » NoCoda

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

7. 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