Class 20: Retrospective and prospective course wrap-up

Overview: Some summarizing, some stock-taking, some prospect, a little synthesis.
"☼" means you're likely to learn more about the topic if you take 201A.

1.   Learnability
- Review of the Chomskyan basics:
  - an <u>observationally adequate grammar</u> labels the utterances that a typical learner would encounter as grammatical (perhaps trivially, e.g. by listing them)
  - a <u>descriptively adequate grammar</u> captures the psychologically real generalizations—this could be operationalized as 'treats novel utterances the same way real speakers do'
  - the real prize, an <u>explanatorily adequate theory</u>, is a function that, given typical learning data, returns a descriptively adequate grammar

- Achieving an explanatorily adequate theory is going to have to involve ☼**learning algorithms**.
  - Interestingly, there was never a good learning algorithm that could induce an ordered list of rules from surface forms, or even from underlying-surface pairs.
  - By contrast, there's a big literature on learning algorithms in OT.

- In OT, *under the assumption of a finite, universal constraint set...*
  - ...and *given input-output pairs*, it's easy
    - You do it in your head or on paper all the time
    - see Tesar & Smolensky 2000, Riggle 2004
  - ...and given inputs and just the audible portion of the outputs (e.g., no syllable boundaries): it's harder.
    - see Tesar 2000, Jarosz 2013.
  - ...and given just outputs (with or without their inaudible parts): it's a lot harder
    - see Tesar et al. 2003, Jarosz 2006, Jarosz 2015.
    - A fair amount of phonotactic learning can be accomplished, which could later be used to learn alternations, though that second step remains largely unimplemented (see Hayes 2004).

- There are also learning algorithms for ☼**variable/probabilistic constraint rankings**:
  - Gradual Learning Algorithm: Boersma 1998, Boersma & Hayes 2001, Magri 2012
  - Maximum Entropy OT: Goldwater & Johnson 2003
  - Noisy Harmonic Grammar: Pater, Potts, & Bhatt 2007, Boersma & Pater 2008, Pater 2009
  - You can try these out (plus some non-variable algorithms) by downloading OTSoft or MaxEnt Grammar Tool from Bruce Hayes's webpage

- What if the constraint set isn't universal, and constraints have to be constructed by the learner?
  - This is still fairly uncharted territory—see Heinz 2007, Hayes & Wilson 2006.

1.1   When multiple grammars are consistent with data, which one does learner select?

- This is the evaluation-metric problem that we've seen since the beginning of the course—solving it is part of developing an explanatorily adequate theory.

- The **subset problem**—say you are exposed to the following (fake) language:

tagu	'goat'	tagune	'goats'	taguba	'my goat'
ale	'mango'	alene	'mangos'	aleba	'my mango'
siri	'corkscrew'	sirine	'corkscrews'	siriba	'my corkscrew'

  ❓ In a rule framework, what grammar would you learn?

  ❓ How do you think you would then react to the word *sirab*? Is this predicted by the grammar?

  ❓ Same question for OT—what ranking would you learn for the constraints NoCoda, Max-C, and Dep-V? What does this ranking predict for *sirab*?

- Some learning algorithms have addressed this question of how a learner knows that something they've never seen is forbidden, in the absence of helpful alternations (Prince & Tesar 2004, Hayes 2004).
  - The idea is, force markedness constraints to be ranked as high as is consistent with data.

1.2   Ranking bias *within* markedness or faithfulness constraints?

- Wilson 2006, drawing on Guion 1996: Cross-linguistically, velar palatalization (k→tʃ, g→dʒ) before one front vowel implies palatalization before a higher front vowel—that is, we see languages *ki, ke* and *tʃi, ke* and *tʃi, tʃe* but not *ki, tʃe*.
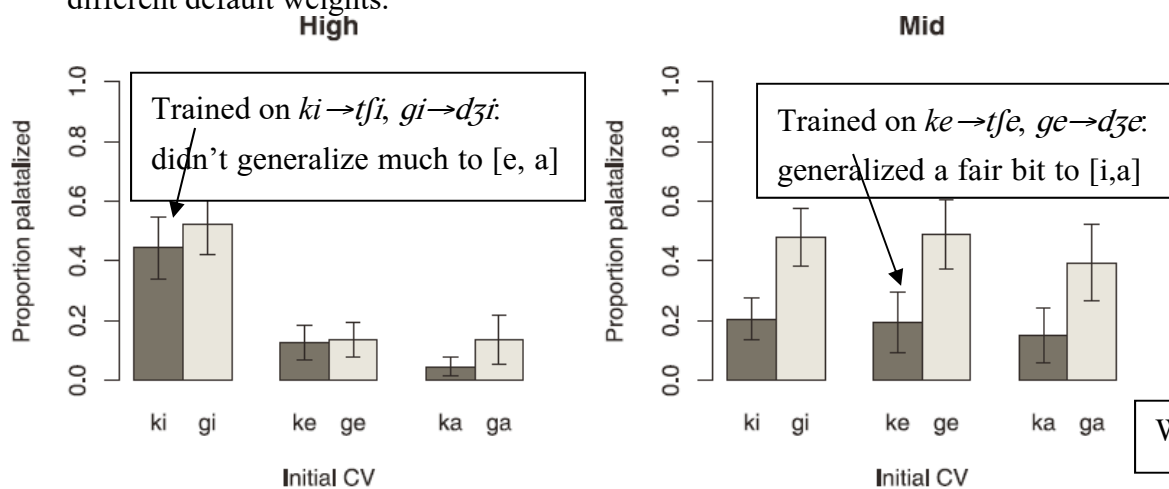
  ❓ If we simply have these three constraints, what's the predicted typology: *ki, *ke, IDENT(place) (I'm leaving out *ka to keep things simple)

  - One approach is to build more structure into the constraint inventory: *k[+hi], *k[–lo], IDENT(place).

⁂ What typology do we get now?

- Another approach, for which see Wilson (who has experimental evidence for it):
    ▪ In a ranking system where each constraint is associated with a weight (this is different from Classic OT's strict ranking), the learning problem involves discovering the weights.
    ▪ We can start with each weight at zero—that is, all constraints are without effect—and promote them in response to the data.
    ▪ Each constraint i is also associated with a value σ_i that determines how willing the constraint is to change its weight. (Wilson derives these from Guion's confusion rates.)
    ▪ If we give *ke a smaller σ than *ki, then the algorithm requires more evidence in order to promote *ke than *ki.
    ▪ So it's <u>possible</u> to learn the typologically anomalous *ki, tʃe* language, but it's a lot easier (requires less evidence) to learn the other possibilities.
    ▪ See White 2013, Hayes & White 2015 for an approach where constraints have same σ, but different default weights.

Trained on *ki→tʃi, gi→dʒi:* didn't generalize much to [e, a]

Trained on *ke→tʃe, ge→dʒe:* generalized a fair bit to [i,a]

Wilson, p. 966

1.3 Constraint learning

- What about constraints themselves?
  - If the learner has to construct constraints, are all possibilities equally good?
  - There might be a criterion of formal simplicity, but, as with rules, that's probably not enough.

    Compare $*\begin{bmatrix} \alpha\text{round} \\ -\alpha\text{back} \end{bmatrix}$ to $*\begin{bmatrix} \alpha\text{round} \\ -\alpha\text{voice} \end{bmatrix}$ –equally simple, but not equally attested

  - Same issue arises with rules: why [αround]→[αback] but not [αround]→[αvoice]?
- Along with constraint-learning itself, this is an open problem.

1.4 ☼The role of phonetics

- Well-known phonetic explanation for above round/back affinity:
  - lip rounding/protrusion and tongue backing, although articulatorily independent, share an acoustic effect (lower second formant).[1]
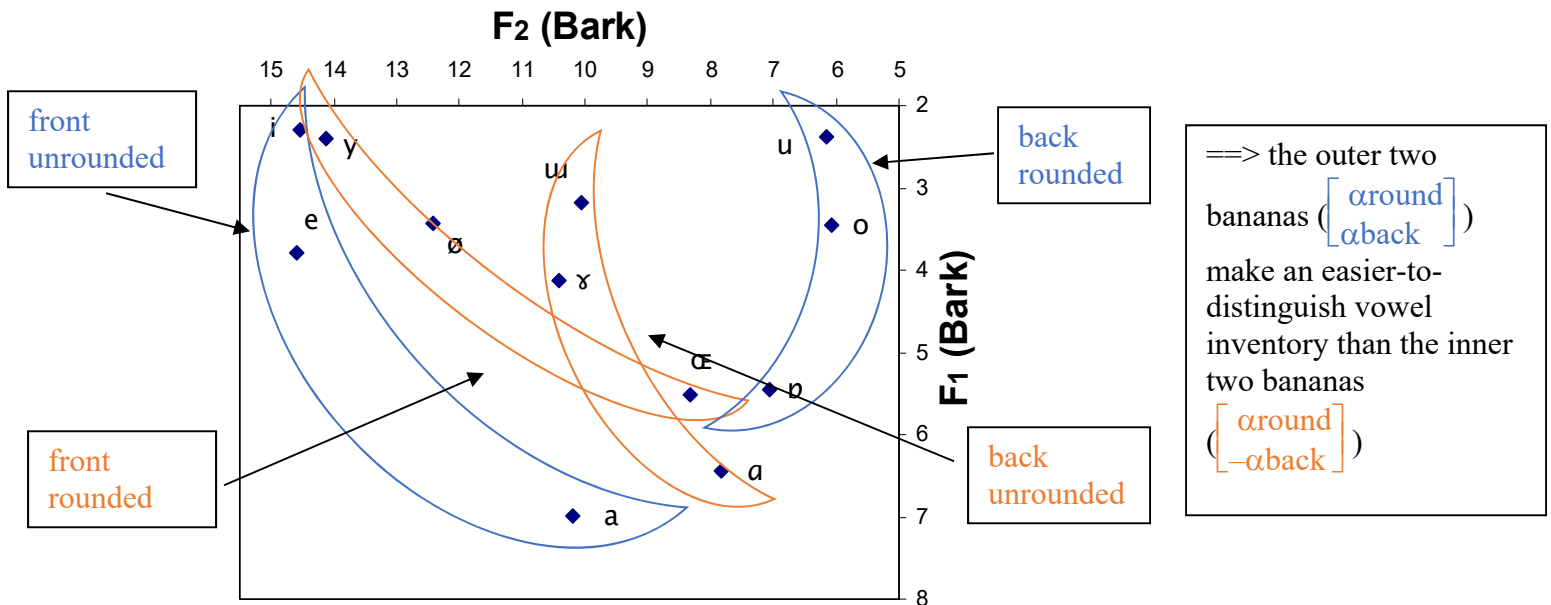
- Obviously phonetics explains a lot of observed phonology. But...
  - Does the explanatory mechanism lie in learner preferences (Hayes & Steriade 2004, Kawahara 2007) or in pathways of language change (Blevins 2003)?
  - Do grammars make literal reference to phonetic motivation ("don't have a contour tone if the vowel is shorter than 150 msec")
    - or do phonetic motivations get phonologized ("don't have a contour tone except in diphthongs and final syllables"), and if so how?
    - See Hayes 1999 for this question in general; Zhang 2007 for contour tones in particular.

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[1] Thanks to David Deterding's Excel template (http://videoweb.nie.edu.sg/phonetic/vowels/measurements.html)

2.   Process interaction: extrinsic ordering?

Feeding in Kalinga

	/sin+pajaw/	*o]$_\sigma$	MAX-V	AGREEPLACE	IDENT(place)
a	sin.pa.jaw			*!	
☞ *b*	sim.pa.jaw				*
	/d-in-opa/	*o]$_\sigma$	MAX-V	AGREEPLACE	IDENT(place)
c	di.no.pá	*!			
d	din.pá		*	*!	
☞ *e*	dim.pá		*		*

- We can't get both (b) and (d) [counterfeeding] to win, at least not with these constraints

Bleeding in English:

	/kæt+z/	OBSTRUENTSAGREEVOICE	IDENT(voice)
a	kætz	*!	
☞ *b*	kæts		*

	/bɹæntʃ+z/	OBSTRUENTSAGREEVOICE	*[+strid][+strid]	IDENT(voice)	DEP-V
c	bɹæntʃz	*!	*		
d	bɹæntʃs		*!	*	
e	bɹæntʃɪs			*!	*
☞ *f*	bɹæntʃɪz				*

- The counterbleeding candidate (e) can't win—with these constraints, it's harmonically bounded.

- Opacity is hard for standard OT to deal with, as we've seen! See McCarthy 2007b for a book-length discussion.
- You may see some ☼**proposals** in 201A for how to fix this—most of these proposals were developed for other reasons, but as a side effect predict some opacity:
  - containment (Goldrick & Smolensky 1999)
  - sympathy (McCarthy 2003)
  - candidate chains (McCarthy 2007b, Wolf 2008)
  - output-output correspondence (Crosswhite 1998; Benua 1997; Steriade 2000; Burzio 1998; Kenstowicz 1995 and others)
  - targeted constraints (Wilson 2001)
  - local constraint conjunction (Smolensky 1997, Lubowicz 2005, Kirchner 1996)
  - Stratal OT (Kiparsky 2000)
  - distantial faithfulness (Kirchner 1996)
  - *MAP constraints (Zuraw 2007, Zuraw 2013)
  - comparative markedness (McCarthy 2002)
  - harmonic serialism (McCarthy 2000, McCarthy 2010)
- Most don't capture all types of opacity, and whether all claimed types of opacity are learnable is debated in, (e.g., Sanders 2002).

3. Process application

3.1 Self-feeding and self-bleeding

- Recall Takelma[2] from Anderson 1974 (maybe we skipped this one before??):
  - [a] becomes [i] if followed by [i]:   /alxīx**a**mis/ → [alxīx**i**mis]   'one who sees us'
    - and any preceding [a]s follow suit: /ikūm**a**n**a**n**a**nink^h/ → [ikūm**i**n**i**n**i**nink^h] 'he will fix it for him' (unless a voiceless C intervenes)
    - This is expected in OT, where self-counterfeeding would be unexpected (Kaplan 2008).

- Recall French (optional) schwa deletion from Anderson, following Dell 1973:
  - ə → Ø / VC__C(r)V
    - /ty#dəvəne/ → [ty#dəvəne] or [ty#d_vəne] or [ty#dəv_ne]
  - but not *[ty#d_v_ne] 'you were becoming'
    - Again, expected in OT, where self-counterbleeding (Kikuyu??) would be unexpected.

3.2 Directional application

- If there is such a thing as directional rule application...
  - in the sense that the left/rightmost eligible site has priority for undergoing the rule, regardless of whether it's stressed/unstressed, word-initial/word-final...
    - then standard OT doesn't have much to say about it (see Hyman & VanBik 2004)

- **Hypothetical** case (pseudo-French—like real French except rule operates left-to-right):
  - *only one target*: /dəvəne/ → [dəv_ne]
  - *multiple targets:* /ty#dəvəne/ → [ty#d_vəne], *[ty#dəv_ne]
  - /...vudre#kə#sə#kə#lə#pɔlisje.../→[...vudre#k_#sə#k_#lə#pɔlisje],*[...vudre#kə#s_#kə#l_#pɔlisje]

- Eisner's (2002) directional constraint evaluation (proposed for computational reasons, not because of data like this):
  - Index a copy of *Sᴄʜᴡᴀ to each position (counting by segments, though other constraints might count differently) in the output string.

- ▪ Left-to-right version:

/ty#dəvəne/	*CCC	*ə-1	*ə-2	*ə-3	*ə-4	*ə-5	*ə-6	*ə-7	*ə-8
☞ a [ty#d_vəne]						*			
b [ty#dəv_ne]					*!				
c [ty#dəvəne]					*!		*		
d [ty#d_v_ne]	*!								

3.3 Modes of variation claimed to exist (see details and references in Class 12 handout)

- **Global**: in Warao, a word has either all [p]s or all [b]s—no mixing

- **Local**: Vaux's *[maɹkətʰəbɪlətʰi] ~ [maɹkərəbɪləri] ~ [maɹkətʰəbɪləri] ~ [maɹkərəbɪlətʰi]*

- **Iterational**: Vata */ɔ́ ká zā pī/ → ɔ́ ká zā pī ~ ɔ́ ká zā̄ pī ~ ɔ́ kʌ́ zā̄ pī ~ ɔ́ kʌ́ zā̄ pī*

- **At-most-one-target**: Dominican Spanish *hablar fisno* style *as.bo.ga.do ~ a.bos.ga.do ~ a.bo.gasdo ~ a.bo.ga.dos*, but **as.bo.gas.do*, (*a.bos.ga.dos*), etc.

- **At-least-one-target**: Munro & Riggle 2004

  - ▪ Akimel O'odham, aka Pima
    - ▪ closely related to Tohono O'odham
    - ▪ Uto-Aztecan language of Arizona and northwestern Mexico

Dougls Miles, founder
of Apache Skateboards

Russell Moore, jazz
trombonist

language specialist Annette Rave
teaching at Salt River Elementary[3]

▪ Reduplication marks plurality, but in compounds plurality is expressed by reduplicating <u>any non-empty subset of the conjuncts</u>:

(5)

gloss and etymology	singular	plural forms
'bridge' (tree-road)	*'ùs-vóog*	*'ù'us-vópog, 'ù'us-vóog, 'ùs-vópog*
'church' (mass-house)	*mìish-kíi*	*mìmsh-kíik, mìmsh-kíi, mìish-kíik*
'dish' (baskety.thing-jar)	*hòas-há'a*	*hòahas-háha'a, hòahas-há'a, hòas-háha'a*
'onion soup' (onion-soup)	*sìvol-sóoba*	*sìsvol-sósba, sìsvol-sóoba, sìvol-sósba*
'peso' (Mexican-dollar)	*Jùukam-píish*	*Jùujkam-píipsh, Jùujkam-píish, Jùukam-píipsh*
'peyote' (coyote-plant.type)	*bàn-nód:adag*	*bàban-nónd:adag, bàban-nód:adag, bàn-nónd:adag*
'saltbush' (salt-grass)	*'ònk-váshai*	*'ò'onk-vápshai, 'ò'onk-váshai, 'ònk-vápshai*
'tamarack' (salt-tree)	*'ònk-'ús*	*'ò'onk-'ú'us, 'ò'onk-'ús, 'ònk-'ú'us*
'uvula' (throat-bell)	*bà'itk-kámpañ*	*bàba'itk-kákampañ, bàba'itk-kámpañ, bà'itk-kákampañ*
'wagon' (tree-car)	*'ùs-kálit*	*'ù'us-káklit, 'ù'us-kálit, 'ùs-káklit*

(3rd page of manuscript version)

4. Derivational look-ahead

- Nanti

  ▪ Arawakan language from Peru

Lev Michael with Nanti speakers Kisimina and Behatirisa[4]

- Crowhurst & Michael 2005:

  ▪ an iterative rule shifting stress within a "foot" (the two-syllable constituent in parentheses) can be triggered by a violation of *CLASH ("don't have two stressed syllables in a row):

  (o.kò)(ri.kʃì)(**tá**.ka) → (ò.ko)(**rì**.kʃi)(**tá**.ka)   'she wore a nose-disk'

  ▪ but stress can't shift to a less-prominent (e.g., higher) vowel:

  (i.kà)(tsi.**tò**)(**ká**.kse)   'he held (it) in his talons'

  ⸮ What do you think of this form? How could it be analyzed with rules? OT?

  (no.tà)(me.**sè**)(**tá**.kse)   'I scraped (it)'

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[4] http://linguistics.berkeley.edu/~levmichael/home.html

- OT may go too far with its look-ahead ability (see Kaplan 2011 for discussion)...
  - The problematic predictions usually seem to involve two different phenomena (instead of a single phenomenon, stress, as in Nanti)
    - e.g., does any language add or subtract syllables in order to get stress onto a more-prominent vowel??
  - The problem here may be not look-ahead, but which processes can solve which kinds of problems.
  - See Blumenfeld 2006 for examples and a theory.

5. Constraint violability

- In a rules+constraints analysis of Nanti, for instance, we could have *CLASH
  - it's frequently violated, though, so we have to restrict its power, either by giving it a limited set of rules to trigger, or by stipulating that some other constraint can block its triggered rules.
- In OT, at least the theory makes it clear how this kind of interaction works:

*CLASH >> RHTYPE=IAMB...

okorikʃitaka	DON'TSTRESS LASTSYLL	PROMINENCE INFOOT	*CLASH	STRESSLAST SYLLOFFOOT
a (o.kò)(ri.kʃì)(tá.ka)			*!	*
b (o.kò)(rì.kʃi)(tá.ka)			*!	**
☞ c (ò.ko)(rì.kʃi)(tá.ka)				***
d (o.kò)(ri.kʃì)(ta.ká)	*!			

...but PROMINENCEINFOOT >> *CLASH

nosamerejaka	DON'TSTRESS LASTSYLL	PROMINENCE INFOOT	*CLASH	STRESSLAST SYLLOFFOOT
e (nò.sa)(mè.re)(já.ka)		*!		***
f (no.sà)(mè.re)(já.ka)			*	**!
☞ g (no.sà)(me.rè)(já.ka)			*	*
h (no.sà)(me.rè)(ja.ká)	*!			

6. Issues in representation: skipped because of pandemic but probably be covered in 201A

6.1 ☼Autosegmentalism

- features (especially tone) can be independent entities, not just properties of segments
- makes it easier to account for long-distance interactions (e.g., sibilant harmony: sibilants within a word must be either all alveolar, or all post-alveolar)

6.2 ☼Metrical stress theory

- Treating stress as a feature—even an autosegmental one—ccauses a lot of difficulties
- Better dealt with through grouping syllables into feet, and/or the "grid"

6.3   ☼**Further hierarchical structure**

- feet groupd into prosodic words, then phonological phrases, then larger intonational phrases... (e.g., Selkirk 1978; Nespor & Vogel 1986; Hayes 1989; (Jun 1993).

7.   **The role of morphology**

We looked at matters like...

- **Cyclicity**: derived words sometimes retain characteristics of their morphological predecessors
- **Non-derived environment blocking**: some processes apply only when triggered by morphology or (perhaps) other phonology
- **Levels**: within a language, subsets of the phonological processes are associated with subsets of the word-formation rules
- and relatedly, **Lexical vs. post-lexical**: there seem to be two syndromes—productive vs. not as much, gradient vs. categorical, carrying over into L2 vs. not, applying across word boundaries vs. not...

8.   ☼**The role of syntax—which we didn't talk about**

8.1   **Syntax influencing phonology**

- Chimwiini, aka Bravanese
    - Variety of Swahili from Barawa, Somalia
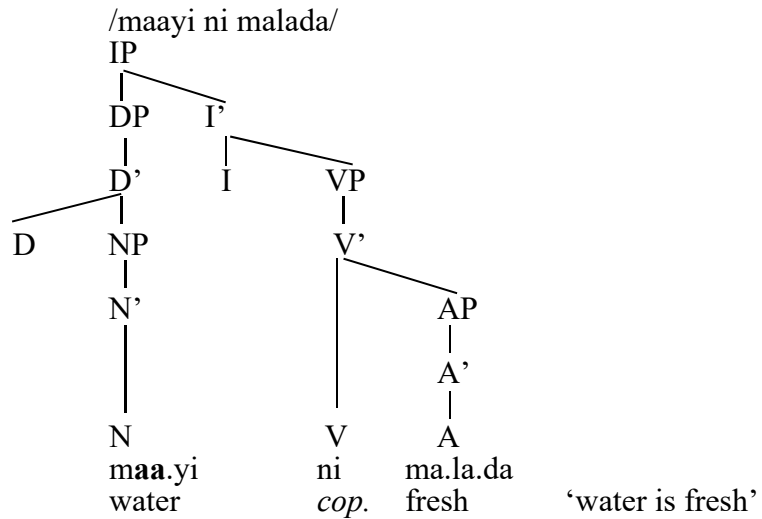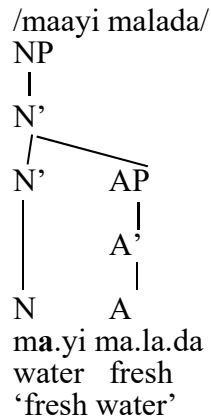   - Civil war has driven most speakers out to Kenya, UK, USA

Barawa seafront

FIGURE 5   *First page of Dada Masiti's poem 1, "After life comes death"*
SOURCE: MANUSCRIPT M.2.1.

Poem by mystic Dada Masiti
(Vianello, Kapteijns & Kassim 2018)

Kisseberth 2000:

- Long vowels allowed only in the penult and antepenult of a "phonological phrase".
- Under Kisseberth's analysis, in Chimwiini the end of an XP (DP, NP, AP, VP...) ends a phonological phrase (but the beginning of an XP is irrelevant): ALIGN(XP,R,PPhrase,R)

⁇ Why is the vowel of /maayi/ short in the first tree but long in the second?

/maayi malada/
NP
|
N'
┌──┴───┐
N'   AP
| |
| A'
| |
N   A
m**a**.yi ma.la.da
water fresh
'fresh water'

/maayi ni malada/
IP
┌──┴───┐
DP   I'
| ┌──┴───┐
D'   I   VP
┌──┴─┐ |
D   NP   V'
| | ┌──┴───┐
| N'   V   AP
| | | |
| N | A'
| m**aa**.yi | |
| water   ni   A
| *cop.* ma.la.da
| fresh   'water is fresh'

- Most approaches to syntax's influence on phonology focus on how syntactic structure defines domains like the phonological phrase, which phonology then refers to.

8.2   Phonology influencing syntax? Or at least word order...

- Embick & Noyer 2001, Latin: the clitic –*que* 'and', attaches after 1st word of 2nd conjunct:

  [bonī puerī] [bonae–**que** puellae]
   good boys   good–and   girls   'good boys and good girls'   (p. 575)

- But when the second conjunct begins with a preposition, its syllable count matters:

  circum–**que** ea   loca   in rēbus–**que**
  around-and those places   in things-and

  contrā–**que** lēgem   dē   prōvinciā–**que**
  against-and law   from province-and   (p. 576)

- For more cases, and reviews of the large literature, see Schütze 1994, Shih et al. 2015

9.   Some of my favorite things to think about in phonology, besides the above

- ☼What is stored in the lexicon and what is computed online?
- ☼How detailed is the lexical representation (Bybee 2001; Pierrehumbert 2002; Gahl 2008)? Can it contain redundant information?
- What is the phonology-processing interface like?
  - How does lexical retrieval for production influence pronunciation
    - e.g. whole word vs. concatenation of morphemes (Hay 2003, but see Fiorentino 2006)
    - priming and competition from other words (Baese-Berk & Goldrick 2009 and refs. therein, Martin 2007, (Smolensky, Goldrick & Mathis 2014)?
  - How does word recognition influence perception and lexicalization?

- What are the limits of learnability? Within the learnable, are some patterns more learnable than others?
- How can we get good data about competence? Especially, how can we tell what's lexicon and what (if anything) is grammar?

10. Phonological things you can do after this course

- Take Ling 201A (Phonological Theory II) with Claire Moore-Cantwell next quarter
  - New: there is a 2-unit option, most likely where you don't do the final project
- Check the phonology seminar (261ABC) schedule and feel free to drop in for whatever talks interest you, even if not enrolled: *linguistics.ucla.edu/events/*
  - Journal club (happens once per quarter) is a great way to find out about a lot of research in a short time
- Courses with a big phonological element that are offered this year, but not every year (so take advantage)
  - Ling 205, Morphological Theory
  - Ling 211, Intonation, an in-depth look at the higher levels of the prosodic hierarchy
- Courses not offered this year that you can look out for in future
  - Ling 202, Language Change
  - Ling 217, Experimental Phonology
  - Ling 219, Phonological Theory III
  - Ling 236, Computational Phonology
- Look out for phonetics and phonology proseminars (251A/B). These are courses that focus on a special topic
  - Winter: Claire Moore-Cantwell and Matt Faytak each have one
  - Spring: I have one (topic TBA but possibly phonetics and phonology of code-switching)

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