**Class 15: Multisite variation**

**Small announcement:** tomorrow (Wed.) my student hours will be only 2:00-3:00, not 2-4.

## 1 Preamble: harmonic bounding

- The simplest type is like this:

| /input/ | CONSTRAINTA | CONSTRAINTB |
|---|---|---|
| [output1] | | * |
| [output2] | | ** |

Call this "simple harmonic bounding"

- But there are also subtler cases:

| /input/ | CONSTRAINTA | CONSTRAINTB |
|---|---|---|
| [output3] | ** | |
| [output4] | * | * |
| [output5] | | ** |

Call this "collective harmonic bounding"

  - Review: which constraint-based models of variation that we've seen can give only zero probability to the harmonically bounded candidate? Which can give non-zero probability?

Reminder of our models

| *probability distributions over Classic OT rankings* | *constraint weighting* |
|---|---|
| Anttilan Partial Ordering<br>Stochastic OT | MaxEnt<br>Noisy Harmonic Grammar |

Jesney 2007 has nice discussion of harmonic bounding in weighting models

- Is the inability to generate [output4] a good thing or a bad thing? What's a realistic situation where we could get a tableau like the above?
  - Suppose we observe the following variation:

| /oko/ | *V[-VOICE]V | IDENT(voice) |
|---|---|---|
| ☞ [oko] | * | |
| ☞ [ogo] | | * |

  - What about an input like /atapa/? This presents a case of **multisite variation**
  - As we just discussed, models make different predictions about which of these candidates are possible:

| /atapa/ | *V[-VOICE]V | IDENT(voice) |
|---|---|---|
| [atapa] | ** | |
| [adapa] | * | * |
| [ataba] | * | * |
| [adaba] | | ** |

## 2 Roadmap

- Kaplan's typology: 4 types of multi-site variation
- Models of multi-site variation, and the types they can capture
- Quantitative predictions of these models
- Which types really exist? What should we want a model to capture?

***Kaplan's typology of multisite variation***
Cases taken from Kaplan 2011, Riggle & Wilson 2005, Vaux 2008.

## 3 Global optionality: Warao

Language isolate of Venezuela, Guyana, and Suriname; 28,100 speakers [Lewis 2009]. From Osborn 1966.

- Little raw data, but Osborn is very definite about the generalization:
  > "/p/ has allophones [p b]. The voiced allophone [b] is heard more frequently than the voiceless [p] in most words. In every word, except for a few words noted below, alternation between [b] and [p] is presumably possible, since many alternations of this order have been heard. Thus in /paro+parera/ *weak*, both the initial and medial phoneme /p/ is heard as [b] generally, and as [p] infrequently. In words like the one cited, with two or more occurrences of /p/, **the allophones are consistently [b] or [p] for each utterance of the word**. If the first occurrence of /p/ in the word is [b], the following occurrence(s) will be [b]. If the first occurrence is [p], the following occurrence(s) will be [p]. The following are examples of words with two occurrences of /p/: poto+poto *soft*, apaupute *he will put them*, kapa+kapa *kind of banana*." (p. 109)

- I.e., [**p**aro-**p**arera] ~ [**b**aro-**b**arera], but not *[**p**aro-**b**arera] or *[**b**aro-**p**arera].
- Also, for a non-reduplicative case, [ha**p**isa**p**a] ~ [ha**b**isa**b**a] 'other side'

- Let's make a tableau with variable constraint ranking and see what happens.
- If you haven't seen this case before (or don't remember it), any ideas on additional constraints we might want?

## 4 Local optionality: English

- Vaux says that he can produce, for English *marketability* (Kaplan expresses data skepticism):
  [mɑɹkət$^{h}$əbɪlət$^{h}$i] ~ [mɑɹkərəbɪləɹi] ~ [mɑɹkət$^{h}$əbɪləɹi] ~ [mɑɹkərəbɪlət$^{h}$i]

- Again, let's make a tableau with variable constraint ranking and see what happens.

(Vaux calls this *iterative optionality*; Riggle & Wilson, Kaplan call it *local optionality*)

## 5 Iterative optionality: Vata

*Ethnologue* classifies as dialect of Lakota Dida, a Niger-Congo language of Côte d'Ivoire with 98,8000 speakers.
Data taken from Kaplan 2009; originally from Kaye 1982, which I didn't consult.

- The language has ATR harmony: [+ATR]: [i,u,e,o,ʌ] [–ATR]: [ɪ, ʊ, ɛ, ɔ, a]
- [+ATR] optionally spreads to the final syllable of a preceding word:
  /ɔ nɪ sáká **pì**/ → ɔ nɪ sáká **pì** ~ ɔ nɪ sák**ʌ́** **pì** 'he didn't cook rice'
  - - **-+** **+** → - - **-+** **+** ~ - - **-+** **+**
- If all the words are monosyllabic, this is potentially self-feeding. There are various options, all possible...
  /ɔ ká zā **pī**/ → ɔ ká zā **pī** ~ ɔ ká z**ʌ̄** **pī** ~ ɔ k**ʌ́** z**ʌ̄** **pī** ~ **ɔ́** k**ʌ́** z**ʌ̄** **pī** 'he will cook food'
  - - **-** **+** → - - **-** **+** ~ - **-** **+** + ~ **-** **+** + + ~ **-** **+** + +
  - Let's try a tableau for this one—we'll have to make a decision about what theory of harmony we use.

## 6 Unique-target optionality: hypercorrection in Popular Dominican Spanish

(Vaux calls this "Basic Optionality")

Data taken from Bradley 2006.

- /s/ typically absent in a syllable coda:

| *Popular Dominican Spanish* | *Conservative Spanish* | |
|---|---|---|
| **s**e.co | **s**e.co | 'dry' |
| ca.**s**o | ca.**s**o | 'case' |
| e.tú.pi.do | e**s**.tú.pi.do | 'stupid' |
| do | do**s** | 'two' (p. 3) |

- Hypercorrection can insert a coda [s] (in the "hablar fisno" speech style):[1]

| *Dominican* fisno | *Conservative* | |
|---|---|---|
| in.vi**s**.tado | in.vi.ta.do | 'guest' |
| co.mo**s** | co.mo | 'like' |
| e.tú**s**.pi.do | e**s**.tú.pi.do | 'stupid' |
| de.de**s** | de**s**.de | 'since' (p. 4) |

[1] though not before an otherwise intervocalic tap or trill, which would be phonotactically illegal, and not if it would create a closed penult in a word with antepenultimate stress.

- And there can be variation of where the [s] is inserted:

| *Dominican* fisno | *Conservative* | |
|---|---|---|
| a**s**.bo.ga.do ~ a.bo**s**.ga.do ~ a.bo.ga**s**do ~ a.bo.ga.do**s** | a.bo.ga.do | 'lawyer' (p. 4) |

- But, apparently there can only be one inserted *s*:[2] *a**s**.bo.ga.do**s**, etc.
- This claim is not really documented or discussed in the literature. Bradley cites personal communication with Núñez-Cedeño, the main describer of the phenomenon. (See more below.)

***Theories/models***

## 7 Vaux 2008's idea: diacritics on rules

- Rules can be tagged with the following two diacritics:

| | –iterative | +iterative |
|---|---|---|
| –optional | ▪ Presumably, non-self-feeding rules: e.g., delete last segment of word<br>▪ But it's not clear to me what should happen if the input form already contains multiple targets: e.g., unstressed Vs obligatorily reduce | ▪ Self-feeding rules: e.g., harmony that propagates through a word<br>▪ "Normal" phonology, probably (if >1 target in the word, rule applies to all those targets) |
| +optional | ▪ Global optionality: Warao | ▪ Local optionality: English tapping<br>▪ Unique-target optionality: hablar fisno<br>▪ Iterative optionality: Vata |

- o I'm not sure how the different types of [+optional, +iterative] rules would be distinguished—let's try writing some rules.

## 8 Riggle & Wilson 2005's theory: constraint cloning

- If two constraints are freely ranked, for each "position" in the input, make a copy of each constraint.
- These constraints are freely rankable. Sometimes, you'll get opposite rankings for different positions:

| /mɑɹkət$_6$əbɪlət$_{12}$i/ | *VTV@6 | IDENT(cont)@12 | IDENT(cont)@6 | *VTV@12 |
|---|---|---|---|---|
| [mɑɹkət$^h{}_6$əbɪlət$^h{}_{12}$i] | *! | | | * |
| [mɑɹkət$^h{}_6$əbɪlər$_{12}$i] | *! | * | | |
| ☞ [mɑɹkər$_6$əbɪlət$^h{}_{12}$i] | | | * | * |
| [mɑɹkər$_6$əbɪlər$_{12}$i] | | *! | * | |

- o Let's talk about how to turn this into quantitative predictions.

[2] See p. 24 for discussion of an apparent counterexample given by Harris.

## 9 Kaplan 2011's theory: markedness suppression

- Kaplan proposes another quantitative model of variation, designed for multi-site variation.
- If a markedness constraint is designated as <u>suppressible</u> ("⊙"), then each * is subject to being ignored, with some probability *p* that speakers have to learn.
- In this tableau, there are 4 *s under the ⊙ constraint, so there are $2^4 = 16$ possible tableaux. If no marks are suppressed, *cand2* wins:

| /mɑɹkətəbɪlətɪ/ | | ⊙*VTV | IDENT(cont) |
|---|---|---|---|
| *cand1* | [mɑɹkətʰəbɪlətʰi] | ** | |
| *cand2* | [mɑɹkəɾəbɪləɾi] | | ** |
| *cand3* | [mɑɹkətʰəbɪləɾi] | * | * |
| *cand4* | [mɑɹkəɾəbɪlətʰi] | * | * |

- Here's a tableau where *cand1* wins.
  - The ◦ indicates that the * has been suppressed
  - In terms of choosing the winner, ◦ is the same as nothing—it's just there to help the reader understand what's happening

| /mɑɹkətəbɪlətɪ/ | | ⊙*VTV | IDENT(cont) |
|---|---|---|---|
| *cand1* | [mɑɹkətʰəbɪlətʰi] | ◦◦ | |
| *cand2* | [mɑɹkəɾəbɪləɾi] | | ** |
| *cand3* | [mɑɹkətʰəbɪləɾi] | * | * |
| *cand4* | [mɑɹkəɾəbɪlətʰi] | * | * |

probability of this tableau: $p^2(1-p)^2$

- Here's one where *cand3* wins

| /mɑɹkətəbɪlətɪ/ | | ⊙*VTV | IDENT(cont) |
|---|---|---|---|
| *cand1* | [mɑɹkətʰəbɪlətʰi] | ◦* | |
| *cand2* | [mɑɹkəɾəbɪləɾi] | | ** |
| *cand3* | [mɑɹkətʰəbɪləɾi] | ◦ | * |
| *cand4* | [mɑɹkəɾəbɪlətʰi] | * | * |

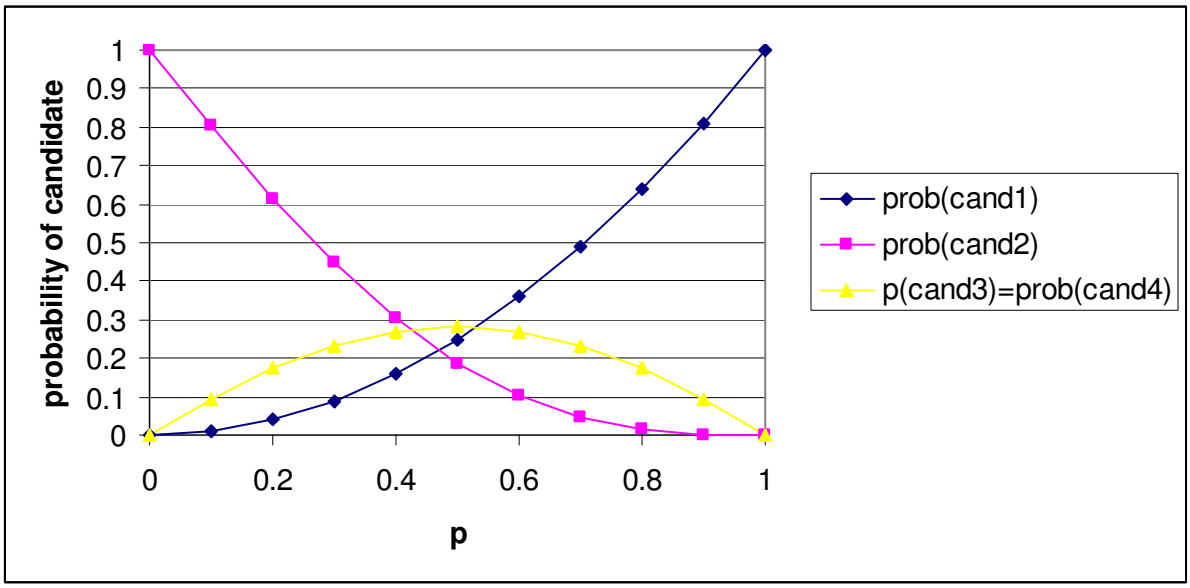
- To find out how probable each candidate is, we need to add up the probabilities of the tableaux that will choose them.
  - Here's a table of each possible suppression pattern for ⊙*t/V_V

| *cand1* | ** | ◦* | *◦ | ** | ** | ◦◦ | ◦* | ◦* | *◦ | *◦ | ** | ◦◦ | ◦◦ | ◦* | *◦ | ◦◦ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *cand2* | | | | | | | | | | | | | | | | |
| *cand3* | * | * | * | ◦ | * | * | ◦ | * | ◦ | * | ◦ | ◦ | * | ◦ | ◦ | ◦ |
| *cand4* | * | * | * | * | ◦ | * | * | ◦ | * | ◦ | ◦ | * | ◦ | ◦ | ◦ | ◦ |
| winner | 2 | 2 | 2 | 3 | 4 | 1 | 3 | 4 | 3 | 4 | 3/4 tie | 1 | 1 | 3/4 tie | 3/4 tie | 1 |
| prob. of tableau | $(1-p)^4$ | $p(1-p)^3$ | | | | $p^2(1-p)^2$ | | | | | | $p^3(1-p)$ | | | | $p^4$ |
| e.g., if $p$=0.2 | 0.410 | 0.102 | 0.102 | 0.102 | 0.102 | 0.026 | 0.026 | 0.026 | 0.026 | 0.026 | 0.026 | 0.006 | 0.006 | 0.006 | 0.006 | 0.002 |

- So, for *p*=0.2, the probabilities of the candidates are as follows (assume equal split when tied):

| | *probability* | |
|---|---|---|
| *cand1* | 0.026+0.006+0.006+0.002 | = 0.04 |
| *cand2* | 0.410+0.102+0.102 | = 0.61 |
| *cand3* | 0.102+0.026+0.026+(0.026/2)+(0.006/2)+(0.006/2) | = 0.17 |
| *cand4* | 0.102+0.026+0.026+(0.026/2)+(0.006/2)+(0.006/2) | = 0.17 |

- We can plot how the probabilities of the candidates change as *p* changes:



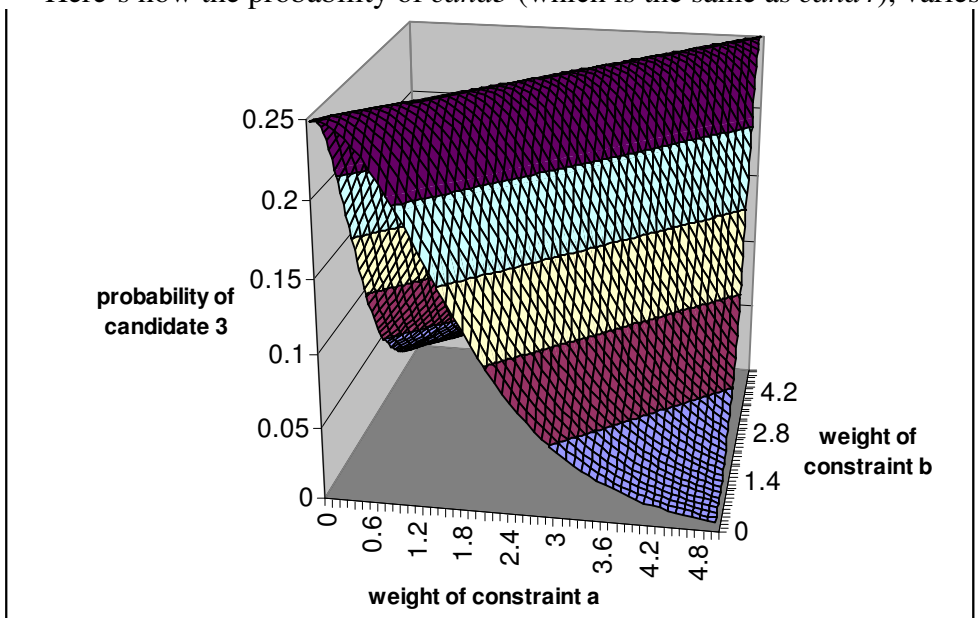

## 10 How about a MaxEnt model?

- See Adam Chong's 2012 201A paper on French schwa deletion (also looks at markedness suppression)!

| | /mɑɹkətəbɪləti/ | *t/V_V[3] weight = *a* | IDENT(continuant) weight = *b* | *probability* |
|---|---|---|---|---|
| *cand1* | [mɑɹkətʰəbɪlətʰi] | ** | | $(e^{-2a})/Z$ |
| *cand2* | [mɑɹkərəbɪləɹi] | | ** | $(e^{-2b})/Z$ |
| *cand3* | [mɑɹkətʰəbɪləɹi] | * | * | $(e^{-a-b})/Z$ |
| *cand4* | [mɑɹkərəbɪlətʰi] | * | * | $(e^{-a-b})/Z$ |

[3] big simplification

- Here's how the probability of *cand3* (which is the same as *cand4*), varies as *a* and *b* vary:




## 11 Kimper 2011: serial variation

- Harmonic Serialism with free ranking
  - At each step of derivation, GEN(*input*) can make at most one change to *input*.
  - The constraint ranking can vary at each step if grammar says so.
  - Derivation ends (converges) when input=output.

- To get global optionality, as in Warao:

if *VOICEDOBS >> *P, /ha**p**isa**p**a/ →[ha**p**isa**p**a]—convergence
elsif *P>>*VOICEDOBS, /ha**p**isa**p**a/ → [ha**p**isa**b**a] or [ha**b**isa**p**a] ([ha**b**isa**b**a] isn't a candidate)
if *P>>*VOICEDOBSP again, [ha**b**isa**b**a]
if *P>>*VOICEDOBS, [ha**b**isa**b**a]—convergence ✓
else go back to [ha**p**isa**b**a] or [ha**b**isa**p**a]
elsif *VOICEDOBS >> *P, back to [hapisapa]

Derivation converges on [...p...p...] or [...b...b...] as soon as same ranking occurs twice in a row.
Can't converge on [...p...b...], [...b...p...]

- We get global optionality here because the competing markedness constraints outrank IDENT(voice), so you won't get convergence until one or the other markedness constraint is totally satisfied.
- If IDENT(voice)'s ranking varied, we'd get local optionality—the derivation can freeze at any point, including [hapisaba] and [habisapa] if IDENT is top-ranked on the next round.

- To get local optionality, as in *marketability*...
- Uses French schwa-deletion as case stidy—analyzed in terms of footing (GEN can only build feet, not destroy them).
  - On the one hand, you want to foot as many syllables as possible, but on the other hand you don't want a vowel in the weak position of the foot.
  - At each point in derivation, either a monosyllabic or a disyllabic foot gets built, till no syllables left.
  - Once a foot is built, deletion of the weak vowel is possible to satisfy the no-weak-vowels constraint.

(58) *la queue de ce renard* 'this fox's tail'

| | | |
|---|---|---|
| (ˌdə)(ˌsə)(ˌrə)(ˈnar) | → | (ˌdə)(ˌsə)(ˌrə)(ˈnar) |
| (də ˌsə)(ˌrə)(ˈnar) | → | (d_ ˌsə)(ˌrə)(ˈnar) |
| (ˌdə)(sə ˌrə)(ˈnar) | → | (ˌdə)(s_ ˌrə)(ˈnar) |
| (ˌdə)(ˌsə)(rəˈnar) | → | (ˌdə)(ˌsə)(r_ ˈnar) |

(p. 31 of "online first" version)

- We get local optionality here in the footing because once a foot has been built, we're stuck with it. Even if PARSE is ranked high on next round, can't expand a monosyllabic foot to include another syllable.
- Once footing is established, Kimper assumes a ranking that makes deletion obligatory.

- How could we do local optionality in *marketability* in this theory?

***So what do we want from our theory?***
Which of these variation types should it capture?

## 12 Global? (Warao)

- Kaplan, Riggle/Wilson, MaxEnt: all predict that all-or-nothing variation shouldn't exist.
- Stochastic OT predicts it should exist.

- Kaplan explains Warao away through an agreement/harmony constraint: all labial stops in a word must agree in voicing.

## 13 A better global case, from Kaplan 2012

- Eastern Andalusian metaphony (vowel harmony).
- Word-final /s/ laxifies preceding V, then usually deletes
  - on the face of it, looks like counterbleeding, but Kaplan cites Jiménez & Lloret's analysis as reassociation of [spread glottis] from /s/ to V.

| | | |
|---|---|---|
| *mes* | mɛ́ | 'month' |
| *tos* | tɔ́ | 'cough' |
| *mis* | mí | 'my (pl.)' |
| *tus* | tú | 'your (pl.)' |

- Laxness spreads to preceding stressed V, if non-high:
  *lejos* lɛ́hɔ 'far'
  *tesis* tɛ́sɪ 'thesis'
- If other Vs intervene, they participate too, all-or-none:
  *treboles* tréβolɛ ~ tréβɔlɛ 'clovers'
  *cómetelo* kɔ́metelɔ ~ kɔ́mɛtɛlɔ 'eat them (for you)!'
- Similarly, non-high Vs before the stress can laxify, all-or-none:
  *cotillones* kotiʒɔ́nɛ ~ kɔtiʒɔ́nɛ 'cotillions'
  *monederos* moneðéɾɔ ~ mɔneðéɾɔ 'purses'
- Finally, the pretonic Vs lax only if the post-tonic ones do:
  *recógelos* rekɔ́helɔ ~ rekɔ́hɛlɔ ~ rɛkɔ́hɛlɔ 'pick them'

- How would we get the all-or-nothing behavior of *cómetelos* in Stochastic OT/Partial ordering?
- Kaplan actually argues that this case is best handled in a Partial Ordering/Stochastic OT model, where the unattested variants are out because they're harmonically bounded—that is, this is a real case of global optionality.
- I'll refer you to Kaplan for what the markedness-suppression analysis (or Constraint cloning, or MaxEnt, etc.) would look like—he finds that it's overly tortured.
  - Essentially, you have to say that *[kɔ́mɛtelɔ], *[kɔ́metɛlɔ] don't actually do better on any constraint than [kɔ́metelɔ]

## 14 Local? (English aspiration)

- Kaplan, Riggle/Wilson, MaxEnt: it should exist.
- Stochastic OT: it shouldn't exist

- There are some appealing cases out there.

## 15 A famous case of local optionality: French schwa-deletion

- There's a long literature on this. See Riggle & Wilson 2005, Kaplan 2011 for references.
- As we saw above, essentially any schwa can delete (unless a bad C cluster is created).
- Kaplan gives some corpus examples of variation in the same speaker, matched for whether intonation-phrase boundary precedes (*Phonologie du Français Contemporain* corpus, PFC)
  *je m'* souviendrai toujours, et, et il y a, il y a t
  *J' me* souviens dans, on a, on faisait des soirées

## 16 Local optionality in text-setting?

- Bruce observes out that text-setting decisions in a line can be independent:

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | x | | | | x | | | | x | | | | x | |
| x | | x | | x | | x | | x | | x | | x | | x | |
| x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| The | | peo- | ple | were | | sad; | | the | | peo- | ple | felt | | grim | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | x | | | | x | | | | x | | | | x | |
| x | | x | | x | | x | | x | | x | | x | | x | |
| x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| The | | peo- | | ple | were | sad; | | the | | peo- | ple | felt | | grim | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | x | | | | x | | | | x | | | | x | |
| x | | x | | x | | x | | x | | x | | x | | x | |
| x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| The | | peo- | ple | were | | sad; | | the | | peo- | | ple | felt | grim | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | x | | | | x | | | | x | | | | x | |
| x | | x | | x | | x | | x | | x | | x | | x | |
| x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| The | | peo- | | ple | were | sad; | | the | | peo- | | ple | felt | grim | |

## 17 Another case of local optionality from Riggle & Wilson: Pima reduplication

Munro & Riggle 2004, Uto-Aztecan language of Mexico, about 650 speakers [Lewis 2009].

- Infixing reduplication marks plural—in compounds, at least one member needs to reduplicate, but it can be more, and the choice is free:

  for singular [ʔus-kàlit-váinom], lit. *tree-car-knife* 'wagon-knife', plural can be any of:

  ʔu**ʔu**s-kà**k**lit-vá**pa**inom 'wagon-knives'
  ʔu**ʔu**s-kà**k**lit-váinom
  ʔu**ʔu**s-kàlit-vá**pa**inom
  ʔus-kà**k**lit-vá**pa**inom
  ʔu**ʔu**s-kàlit-váinom
  ʔus-kà**k**lit-váinom
  ʔus-kàlit-vá**pa**inom

- We could have called this a 5th type of variation ('at-least-one-target'), but we can also just rule out a completely non-reduplicated candidate with another constraint (what?)

## 18 Yet another case of local optionality from Riggle & Wilson: Miya palatalization

Schuh 1998. Afro-Asiatic language of Nigeria, 30,000 speakers [Lewis 2009].

- [palatalized] is a feature that attaches to some words, and it has to be realized at least somewhere, but where and how much is optional.

| | | |
|---|---|---|
| /kánúw, [palatalized]/ | **kʲ**ánúw ~ k**ɛ́**núw | 'smoke' |
| /ápatlám, [palatalized]/ | áp**ɛ**tlám ~ á**p**ʲatlám | 'hip' |
| /ràɗaɗə, [palatalized]/ | rè**ɗ**ʲaɗ**i** ~ rà**ɗ**ʲaɗ**i** | 'dampness, cold' |
| /dədadə, [palatalized] / | di**d**ʲadi | 'falling' |
| /ʔədə, [palatalized]/ | ʔí**dʒ**ə | 'mortar' |
| /ágər, [palatalized]/ | á**g**ʲír | 'hole' |

- Probably there's an element of lexical variation here—for each lexical item, the range of variation is restricted—but on the whole this looks like local optionality.

## 19 Local optionality? Hebrew obstruents

- Temkin Martínez 2010: recall from Class 9 that Hebrew has always-stops, always-fricatives, and alternators (fricative V__, else stop)

| | Root | 3rd Person Sg. Past | Infinitive | |
|---|---|---|---|---|
| alternator | /**k**tb/ | [**k**atav] | [li**χ**tov] | 'to write' |
| always-stop | /**k**r?/ | [**k**ara] | [li**k**ro] | 'to read' |

(p. 28)

| | Root | 3rd Person Sg. Past | Infinitive | |
|---|---|---|---|---|
| always-fricative | /vtr/ | [viter] | [levater] | 'to give up' |
| always-fricative | /**χ**ps/ | [**χ**ipes] | [le**χ**apes] | 'to look for' |
| alternator | /**b**tl/ | [**b**itel] | [levatel] | 'to cancel' |
| alternator | /**k**pr/ | [**k**iper] | [le**χ**aper] | 'to atone' |

(p. 29)

- Plus some free variation, perhaps created by the confusion this lexical variation causes:

| Expected | Acceptable Variant | Gloss |
|---|---|---|
| pagaʃ | **f**agaʃ | 'met' |
| jik**b**or | jik**v**or | 'will bury' |
| je**χ**ase | je**k**ase | 'will cover' |

(p. 8)

- What we didn't discuss last time was Temkin Martínez's rating study of words with more than one of the key segments.
  - TM predicts that the always-stops and always-fricatives should tend to be unacceptable in any other form, because of a higher-ranking faithfulness constraint indexed to them.
  - But for alternators, the competition is mainly about conflicting markedness:

*A. [levakeʃ] = *V-STOP » *[+cont, -sib] (occurs 88.4% in grammar)*

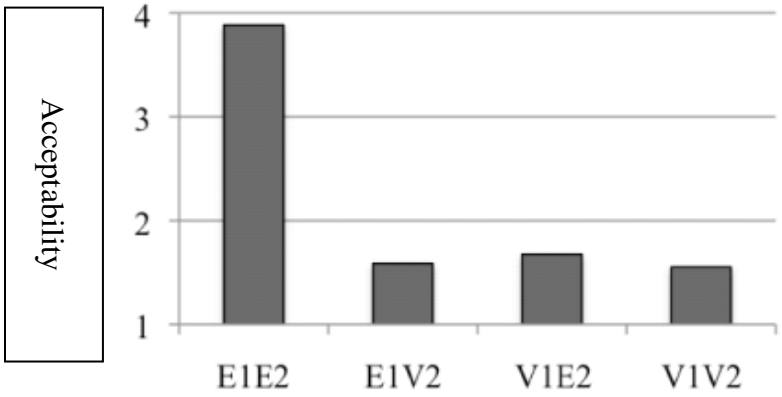
| /bk$_1$ʃ/ + inf. *'to ask for'* | IDENT-IO[cont]$_1$ | *V-STOP | *STOP | *[+cont, -sib] | IDENT-IO[cont] |
|---|---|---|---|---|---|
| ☞a. levak$_1$eʃ | | * | * | * | * |
| b. lebak$_1$eʃ | | **! | ** | | |
| c. leva$\chi_1$eʃ | *! | | | ** | * |
| d. leba$\chi_1$eʃ | *! | | * | * | |

(p. 74)

- What should happen if there are two alternators in a word? T-M uses Stochastic OT.

- Results here are for a mix of "hybrid" (one alternator and one non-alternator) and 2-alternator roots, and for a mix of $C_1VC_2V$ and $VC_1C_2V$, but it looks like having just one C deviate from expected is similar in acceptability to having both deviate:

Figure 19. Words containing two alternating segments




E1: $C_1$ is fricative or stop, as **E**xpected from position (or underlying value, for non-alternators)

V1: $C_1$ **V**aries from what is normally expected

E2, V2: likewise for $C_2$

(p. 92)

**20 Unique-target optionality? (hablar fisno)**

- It's not clear to me that any theories predict this straightforward.
- Unless you have a constraint demanding. at least one realization *and no constraint favoring additional realizations*.
  - This is Bradley's approach: there's a constraint that wants an [s] to be inserted, but there's no benefit to inserting more than one.
    - MAX-CONSERVATIVE-OUTPUT-[S]: an [s] in (what the speaker believes is) the conservative output should have some correspondent in the output.
    - Presumably, if the speaker believes the conservative form has >1 [s], they can share a single correspondent.
- On the other hand, there's reason to be skeptical about this case:
  - The claim that only one *s* inserts per word is not well established
  - Bullock & Toribio 2010 : inserted *s* is almost always word-final, pre-{p,t,k}, or both.
    - To feel confident that the absence of multiple insertions in a word was significant, we'd need to look only at words that have more than one of the right environment, like *in.vi_.ta.do_*, *e_.tu_.pi.do_*

**21 Iterative optionality? (Vata)**

- Kaplan, Riggle & Wilson, MaxEnt: predict this, as long as partial application ameliorates constraint violations (e.g., ALIGN rather than AGREE, as we saw above).
- Stochastic OT, Anttilan OT: predict this shouldn't exist

## 22 Another case of iterative optionality, from Kaplan 2011: Shimakonde

Aka Makonde, Niger-Congo language from Mozambique & Tanzania with 980,000 speakers [Lewis 2009]. Data originally from Liphola 2001.

- A sequence of mid Vs before the penult (lengthened, probably stressed) can reduce to [a], but starting from the left:

| | |
|---|---|
| kú-pélévélélééla | 'to not reach a full size for' |
| kú-p**á**lévélélééla | |
| kú-p**álá**vélélééla | |
| kú-p**álá**v**á**lélééla | |
| kú-p**álá**v**álá**lééla | (p. 337) |

  - Let's try a tableau for this one—we'll have to get creative on what the constraints are

## 23 Conclusions

| *variation type* | Global optionality | Local optionality | Unique-target optionality | Iterative optionality |
|---|---|---|---|---|
| *partial ordering, stochastic OT* | predict | predict doesn't exist | predict, if we have the right constraints | predict doesn't exist |
| *MaxEnt, Noisy HG* | predict doesn't exist | predict | | predict |
| *serial variation* | predicts | predicts | | ? |
| *examples* | ▪ Warao: but there could be an agreement constraint<br>▪ Eastern Andalusian | ▪ English tapping?<br>▪ French ə-deletion<br>▪ Text-setting<br>▪ Pima reduplication<br>▪ Miya palat. (lexical)<br>▪ Maybe Hebrew | ▪ hablar fisno | ▪ Vata: but markedness constraint has to prefer partial spreading to no spreading<br>▪ Shimakonde |

- MaxEnt (and Noisy HG) are doing well: the one problem for them is Eastern Andalusian.
- Partial ordering and Stochastic OT are doing poorly: they miss a bunch of cases.
- Serial variation: might be looking good.
- But keep in mind that predictions are sensitive to the constraint set involved.
  - The most obvious analysis might be

| /atapa/ | *V[-VOICE]V | IDENT(voice) |
|---|---|---|
| [atapa] | ** | |
| [adapa] | * | * |
| [ataba] | * | * |
| [adaba] | | ** |

- But the picture changes if there's a constraint demanding agreement:

| /atapa/ | CC-AGREE(voice) | *V[-VOICE]V | IDENT(voice) |
|---|---|---|---|
| [atapa] | | ** | |
| [adapa] | * | * | * |
| [ataba] | * | * | * |
| [adaba] | | | ** |

- Or we got one of the constraints wrong:

| /atapa/ | HAVEAVOICEDOBST | IDENT(voice) |
|---|---|---|
| [atapa] | * | |
| [adapa] | | * |
| [ataba] | | * |
| [adaba] | | ** |

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