Class 7: Rule+constraint theories?

Overview: We'll try to make the framework for rule/constraint interaction more explicit (and find problems in so doing).

1. Reminder of where we left off

- People liked constraints, because
  - They allow rules within a language that do realted things (like eliminate or avoid creating CCC) to share something formally (*CCC)
  - They gave clearer theoretical status to the idea of "markedness"
    - Everyone knew languages don't "like" CCC sequences (they are "marked"), but this was not directly encoded in grammars until constraints like *CCC came along.

Review of how rule application would work

2. "Normal" rule application, no constraints

- apply V → Ø / VC__CV to /bladupi/

program	*contents of* `current_form`
`current_form <- bladrupi`	`bladupi`
`current_form <- deletion_rule(current_form)`	`bladpi`
`current_form <- next_rule(current_form)` *etc., till all rules used*	`blatpi` *or whatever*
`return(current_form)`	

3. Constraints as rule blockers

- apply V → Ø / C__C , unless result would violate *CCC
  - … to /bladupi/

program	`current_form`	`candidate_forms`
`current_form <- bladupi`	`bladupi`	
`candidate_forms <- deletion_rule(current_form)`	`bladupi`	`<bldupi, bladpi, bldpi>`

`for i in length(candidate_forms)`
`{`
`  if (no_CCC(candidate_forms[i]) == TRUE)`
`  {`
`  current_form <- candidate_forms[i]`
`  exit loop`
`  }`
 	
`}`
	`i=1 : bladupi`
	`i=2 : bladpi`
	`(then exit)`
		`<bldupi, bladpi, bldpi>`

`similarly for other rules`	`blatpi`	
`return(current_form)`		

Worry: what if there's an equally viable candidate form later in the list?

4. Constraints as rule triggers

- apply Ø → i , only if needed to eliminate *CCC violation

? What exactly will happen, step by step?

5. Implementing triggering: Sommerstein's (1974) proposal (underlining is mine)

- "A P-rule R is positively motivated with respect to a phonotactic constraint C just in case the input to R contains a matrix or matrices violating C AND the set of violations of C found in the output of R is null or is a proper subset of the set of such violations in the input to R." (p. 74)
    - Note that this has to be checked on a case-by-case basis (the "input to R" and the "output of R" differ depending on what form we're working on)
- "A rule [...] positively motivated by phonotactic constraint C does not apply unless its application will remove or alleviate a violation or violations of C." (p. 75)
    - Later modified: "a rule applies if its application will remove or alleviate a violation of AT LEAST ONE of its motivating constraints" (p. 87)
- What is "alleviate"?
    - Imagine an underlying form /abstro/
    - ? Do you think Ø → i should count as helping with *CC in this case?
- Sommerstein's definition (p. 76):
    - "The DEGREE OF VIOLATION $V_{M,C}$ to which a matrix M violates a phonotactic constraint C is equal to the **cost** of the minimal structural change necessary to turn M into a matrix satisfying C.
    - "The application to a matrix M of operation A ALLEVIATES a violation in M of phonotactic constraint C just in case the output M′ of such application is such that $0 < V_{M',C} < V_{M,C}$."

6. If time, Latin example (Sommerstein p. 87; slightly edited[1])

genitive sg.	*nominative sg.*	*UR*	
lakt-is	lak	/lakt/	'milk'
kord-is	kor	/kord/	'heart'

- *deletion 1: word-final voiceless stops delete after stops*

$$\begin{bmatrix}\text{–continuant}\\ \text{–voice}\end{bmatrix} \rightarrow \emptyset \,/\, \begin{bmatrix}\text{+consonantal}\\ \text{–sonorant}\\ \text{–continuant}\end{bmatrix} \_\_ \,\#$$

- *deletion 2: word-final nasals and voiced stops delete after a consonant*

$$\begin{bmatrix}\text{–continuant}\\ \text{+voice}\end{bmatrix} \rightarrow \emptyset \,/\, [\text{+consonantal}] \_\_ \,\#$$

  - both are positively motivated by constraints that are **surface-true** in the language: [2]

- *no final voiced in cluster* $^{*}[\text{+consonantal}]\begin{bmatrix}\text{+consonantal}\\ \text{+voice}\end{bmatrix}\#$ (p. 82)

- *final obst. restrictions* if $\underset{1}{\begin{bmatrix}\text{–sonorant}\\ \text{<–continuant>}\end{bmatrix}}\underset{2}{[\text{–sonorant}]}\,\#$ then 2 is $\begin{bmatrix}\text{+coronal}\\ \text{<+continuant>}\end{bmatrix}$ (p. 82)
  - i.e., [st], [ps], [ks] are OK

? With those constraints, try to simplify the deletion rules

[1] Thanks to Kaeli Ward for pointing out a change that the rules needed!
[2] Sommerstein refers to a different constraint (16 on p. 79), but that seems to be the wrong one for /lakt/.

- A derivation might look like this (we'll fill it in):

	/lakt/	/kord/	/re:ks/
violates no final voiced in cluster*?*	no	yes	no
violates final obstruent cluster restrictions*?*	yes	no	no
if any 'yes', tentatively apply deletion			NA
is the violation alleviated/eliminated?			NA
if so, accept the change (else don't)			NA

7. Multiple available repairs

- Imagine a Roman, Caecilius, who for some reason ends up with this additional rule:
  [ ] → [–voice]

? How does our derivation change (assuming Caecilius sounds the same as other Romans)? Do we need to add more information to his grammar?

- Imagine Caecilius's neighbor, Metella, who for some reason has this rule (plus the normal Latin rules):
  [ ] → [+continuant]

? How does our derivation change (again, assuming Metella sounds like everyone else)? Do we need to add more information to her grammar?

8. Partial violation, violation alleviation

- As we saw, for Sommerstein a constraint doesn't have to be surface-true to be part of the grammar
  - You could have a constraint whose violations are only ever alleviated, not eliminated

Can we invent another case or two where a violation could be alleviated without being eliminated? (it's hard to think of non-silly cases; Sommerstein himself introduces this idea just to keep the possibility open, not because he has any data that require it.)

9. Implementing blocking: taking inspiration from Sommerstein (he didn't say this)...

Simple example of blocking, as a reminder:

V → Ø (rule) unless prohibited by *CC (constraint)

- A P-rule R is negatively motivated with respect to a phonotactic constraint C just in case the tentative output of R contains a matrix or matrices violating C AND the set of violations of C found in the input to R is null or is a proper subset of the set of such violations in the tentative output of R.
- A rule that is negatively motivated by phonotactic constraint C does not apply (i.e., the tentative output is discarded) if its application will create or worsen a violation or violations of C.
- The application to a matrix M of operation A worsens a violation in M of phonotactic constraint C just in case the output M′ of such application is such that $V_{M',C} > V_{M,C}$

10. What a derivation might look like

- syncope rule V → Ø / C__C
- cluster constraint $*\begin{Bmatrix}\#\\C\end{Bmatrix} C \begin{Bmatrix}\#\\C\end{Bmatrix}$

	/abito/	/ildoku/	/uda/	/brodu/
tentatively apply syncope	(abto)	(ildku)	NA	
does this create/worsen violation of cluster constr.?	no	yes	NA	
if not, accept the change (otherwise reject)	abto [abto]	ildoku [ildoku]	NA [uda]	

11. Blocking vs. triggering: Myers's (1991) persistent rules

- Zulu: Bantu language (which makes it part of Niger-Congo family)
- From South Africa, about 12 million speakers
- An official language of South Africa, one of the most widely spoken and understood languages there
- Some English words that are loans from Zulu: *impala, mamba* [could be from Swahili]

Nkosazana Dlamini-Zuma ("NDZ")
anti-apartheid activist, politician

Nokutela Dube
educator, publisher, political organizer, co-founder of first Zulu newspaper

[3]
Lucky Dube
album in Zulu

Benedict Vilakazi
poet, novelist

- Zulu has prenasalized affricates, but no prenasalized fricatives. We might propose a constraint:[4]

$$*\begin{bmatrix}+\text{continuant}\\+\text{nasal}\end{bmatrix}$$

- Here is a prefix that creates prenasalized consonants (p. 329):

singular	*plural*	
u:-ba^{m}bo	izi-^{m}ba^{m}bo	'rib'
u:-p^{h}ap^{h}e	izi-^{m}pap^{h}e	'feather'
ama-t^{h}at^{h}u	ezi-^{n}tat^{h}u	'three'
u:-k^{h}uni	izi-^{ŋ}kuni	'firewood'

? Assume the underlying form of the prefix is /izin/. Formulate a prenasalization rule.

[3] from discogs
[4] Myers actually uses something called autosegmental representations

- Here's what happens when the prefix attaches to a fricative-initial stem:

singular	*plural*	
eli-ʃa	e-^{n}t͡ʃa	'new'
uː-fudu	izi-^{m}p͡fudu	'tortoise'
uː-sizi	izi-^{n}t͡sizi	'sorrow'
uː-zwa	izi-^{n}d͡zwa	'abyss'
uː-zime	izi-^{n}d͡zime	'walking staff'
uː-ɮubu	izi-^{n}d͡ɮubu	'groundnut'
uː-ʃikisi	izi-^{n}t͡ʃikisi	'quarrelsome person'

? What would happen if prenasalization were subject to blocking by the constraint above?

- Myers proposes instead a "**persistent rule**"—it tries to apply at every point in the derivation, so that any time its structural description is created, it immediately gets changed.

$$\begin{bmatrix} \text{+nasal} \\ \text{+continuant} \end{bmatrix} \rightarrow \begin{bmatrix} \text{+delayed release} \\ \text{–continuant} \end{bmatrix}$$ i.e., nasal fricative → affricate

? Let's spell out what the derivation would look like.

? Can we recast this as a simpler rule that is triggered by the constraint?

12. Interim summary

- We've tried to make a rules+constraints theory work, really spelling out the details.
- You should now feel uncomfortable about ignoring conspiracies, yet also uncomfortable about exactly how constraints are supposed to work.
  - Now you know how many phonologists felt through the 1970s and 1980s!

The "conceptual crisis" (Prince & Smolensky 2004, p. 1)

- Since Kisseberth 1970, constraints were taking on a bigger and bigger role. But as we saw there were open questions…

13. Why aren't constraints always obeyed?

- Korean avoids VV and CC through allomorph selection (narrow-ish transcription):

plain	*nominative*	
ton	ton-i	'money'
saɾam	saɾam-i	'person'
koŋ	koŋ-i	'ball'
namu	namu-ga	'tree'
pʰaɾi	pʰaɾi-ga	'fly'
kʰo	kʰo-ga	'nose'
ɕ*i	ɕ*i-ga	'seed'

- And yet, CC and VV occur in the language

plain	*locative*
namu	namu-e
kʰo	kʰo-e
	plural
saɾam	saɾam-dɨl
koŋ	koŋ-dɨl

14. Can different constraints prioritize rules differently?

❓ Grammar: {*CC, *C#, C → Ø, Ø → i} What happens to /ubt/??

I'll assign you to small groups, one per problem: prepare brief discussion of your problem. I've given suggested examples and you can add your own.

15. Simple rules → more indeterminacy

⁇ What happens if the grammar has a rule ∅ → i (with no context) and a constraint *CCC?

/arbso/

16. What happens if there's more than one way to satisfy a constraint?

⁇ Grammar: {*CC, C → Ø, Ø → i} What happens to /absko/??

17. What happens when constraints conflict?

- What if one constraint wants to trigger a rule, but another wants to block it?

⁇ Grammar: {*VV, *ʔ$\begin{bmatrix} \text{V} \\ \text{–stress} \end{bmatrix}$, Ø →ʔ}[5] What happens to /aórta/?? /xáos/??

[5] based on Dutch; data from Booij 1995 via Smith 2005)

18. Should a rule be allowed to look ahead in the derivation to see if applying alleviates a constraint violation? (how far?)

❓ Grammar: {*C#, C → [–voice], [–voice] → Ø} What happens to /tab/??

19. Relatedly, is a rule allowed to make things *worse* if a later rule will make them better?

❓ Grammar: {*CCC, Ø → p / m__s, $\begin{matrix} C & C & C & C \\ 1 & 2 & 3 & 4 \end{matrix}$ → 3 ("if you have 4 consonants in a row, delete all but the third one")} What happens to /almso/??

20. Can a constraint prohibit a certain type of <u>change</u>, rather than a certain structure?

21. Where does this leave us?

- Tormented, I hope!
- It seems like constraints would be a good thing
- But we don't know how to make them work with rules and each other
- Now you know how it felt to be a phonologist in the 1970s and 1980s
- The response that took the field by storm: get rid of the rules altogether!

Coming up:

- Next reading is excerpts from Prince & Smolensky's 1993 manuscript introducing Optimality Theory (OT), an all-constraint theory.
- Over the next couple of classes we'll cover the fundamentals of OT.
    - Excruciating-detail style again, so even if you already know OT I hope you'll gain some new insights
- Then we'll move into explore the differing **predictions** that SPE, OT, and their variants make about phonologies.

References

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Sommerstein, Alan. 1974. On phonotactically motivated rules. *Journal of Linguistics* 10. 71–94.