

# Phonology

[These slides are missing most examples and discussion from class ...]

# What is Phonology?

	Pronunciation	Spelling
cat + -s	"kats"	cats
dog + -s	"dawgz"	dogs
rose + -s	"roziz"	roses
kiss + -s	"kisiz" why?	kisses

How do you pronounce a sequence of morphemes? Especially, how & why do you fix up the pronunciation at the seams between morphemes?

phonology doesn't care about the spelling (that's just applied morphology)

# What is Phonology?

	Pronunciation	Spelling
nap + -t	"næpt"	napped
nab + -t	"næbd"	nabbed
nod + -t	"nadid"	noddled
knot + -t	"natid"	knotted

Actually, these are pronounced identically:

naɪɪd

thanks to the English "flapping" rule (similarly: ladder/latter, bedding/betting)

# What is Phonology?

## "Trisyllabic Shortening" in English

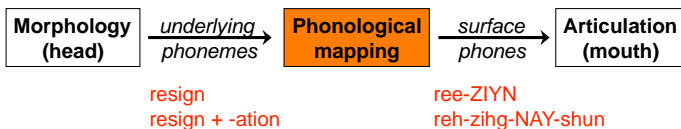
divine → divinity  
 futile → futility  
 senile → senility  
 satire → satirical  
 decide → decision  
 wild → wilderness

serene → serenity  
 supreme → supremacy  
 obscene → obscenity  
 obese → \*obesity

(and similarly for other vowels)

# What is Phonology?

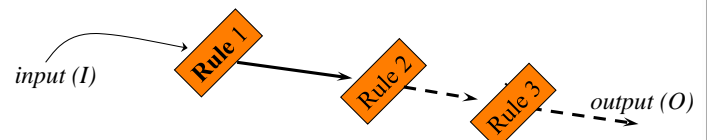
- A function twixt head and lip



- What class of functions is allowed?
  - Differs from one language to next
  - Often complicated, but not arbitrary
- Comp Sci: How to compute, invert, learn?

# Successive Fixups for Phonology

- Chomsky & Halle (1968)
- Stepwise refinement of a single form
- How to handle "resignation" example?



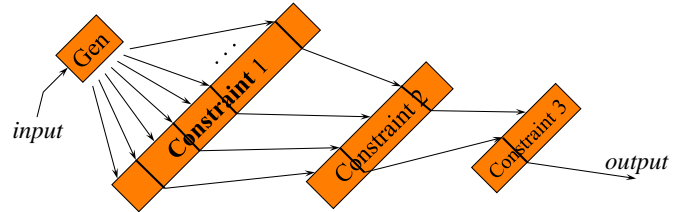
- That is,  $O = f(I) = g_3(g_2(g_1(I)))$ 
  - Function composition (e.g., transducer composition)

## How to Give Orders

- Directions version: **successive fixup (derivation)**
  - Break two eggs into a medium mixing bowl.
  - Remove this tab first.
  - On the last day of each month, come to this office and pay your rent.
- Rules version: **successive winnowing (optimization)**
  - No running in the house is allowed.
  - All dogs must be on a leash.
  - Rent must be paid by the first day of each month.
- In rules version, describe what a good solution would look like, plus a search procedure for finding the best solution). Where else have we seen this?

## Optimality Theory for Phonology

- Prince & Smolensky (1993)
- Alternative to successive fixups
- Successive winnowing of candidate set



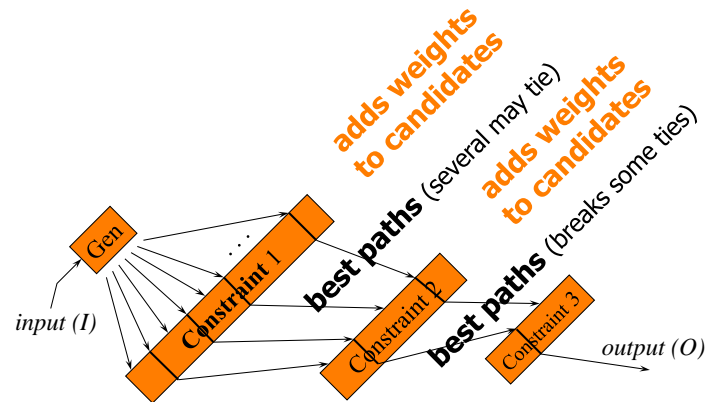
## Optimality Theory "Tableau"

★ ★ = candidate violates constraint twice (weight 2)

	Constraint 1	Constraint 2	Constraint 3	Constraint 4
Candidate A	↔		↔	↔↔↔↔
<b>Candidate B</b>		↔↔↔	↔	
Candidate C	↔	↔		
Candidate D		↔↔↔↔		
Candidate E		↔↔↔	↔	↔
Candidate F	↔↔↔	↔↔↔↔		↔

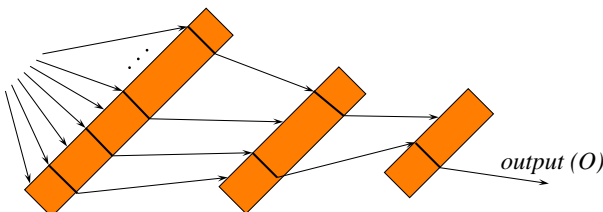
constraint would prefer A, but only allowed to break tie among B,D,E

## Optimality Theory for Phonology



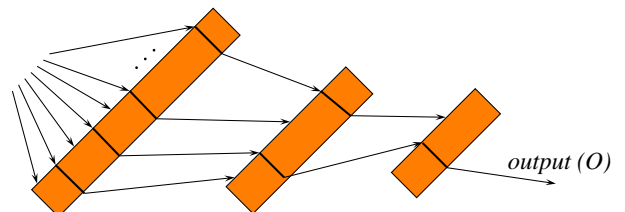
## When do we prune back to best paths?

- Optimality Theory: At each intermediate stage
- Noisy channel: After adding up all weights



## Why does order matter?

- Optimality Theory: Each machine (FSA) can choose only among outputs that previous machines liked best
- Noisy channel: Each machine (FST) alters the output produced by previous machines



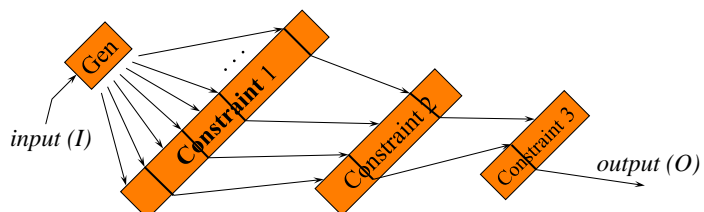
## Final Remark on OT

Repeated best-paths only works for a single input

Better to build full FST for  $I \rightarrow O$  (invertible)

Can do this e.g. if every constraint is binary:

Assigns each candidate either 1 star ("bad") or 0 stars ("good")



## Optimality Theory "Tableau"

	Constraint 1	Constraint 2	Constraint 3	Constraint 4
Candidate A	↔		↔	↔
<b>Candidate B</b>			↔	
Candidate C	↔	↔		
Candidate D	↔			
Candidate E			↔	↔
Candidate F	↔	↔		↔

all surviving candidates violate constraint 3,  
so we can't eliminate any