Phonology

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

What is Phonology?

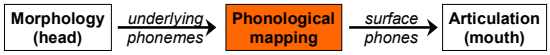
	Pronunciation	Spelling
cat + -s	"kats"	cats
dog + -s	"dawgz"	dogs
rose + -s	"roziz"	roses
kiss + -s	"kisiz" why?	kisses

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?

- A function twixt head and lip



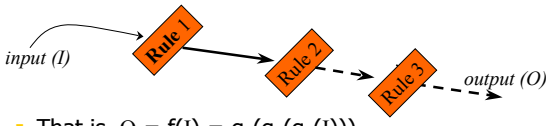
resign
resign + -ation

ree-ZIYN
reh-zihg-NAY-shun

- 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)

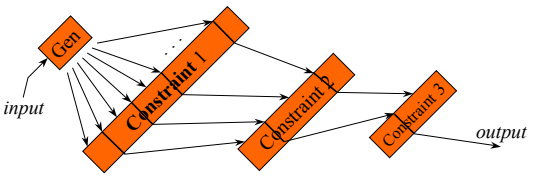
example courtesy of K. Crosswhite

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



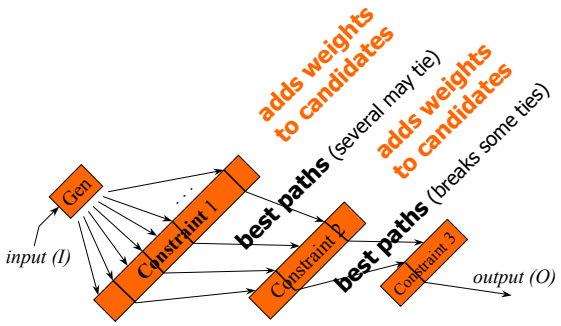
Optimality Theory "Tableau"

★★ = candidate violates constraint twice (weight 2)

	Constraint 1	Constraint 2	Constraint 3	Constraint 4
Candidate A	★		★	★★★
Candidate B		★★	★	
Candidate C	★	★		
Candidate D		★★★		
Candidate E		★★	★	★
Candidate F	★★	★★★		★

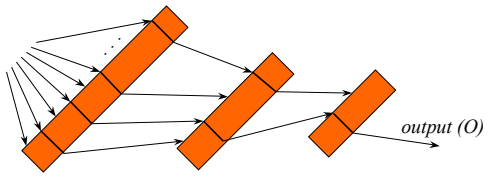
constraint would prefer A, but only allowed to break tie among B,D,E

Optimality Theory for Phonology



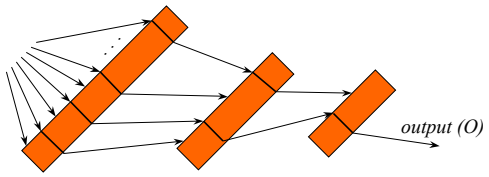
When do we prune back to best paths?

- *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



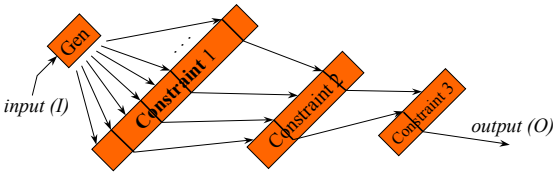
Final Remark on OT

Repeated best-paths only works for a single input

Better to build full FST for I → 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	★		★	★
Candidate B			★	
Candidate C	★	★		
Candidate D		★		
Candidate E			★	★
Candidate F	★	★		★

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