What is Optimality Theory?

Michael Hammond
U. of Arizona

A. Overview

(1) Organization:
- a. What is generative linguistics and phonology?
- b. Rule-based phonology
- c. How OT works
- d. Predictions of the model
- e. Acquisition and OT
- f. Current developments
- g. Resources

B. What is generative linguistics and phonology?

(2) Competence vs. performance
Generative linguists are interested in describing what a speaker *knows* about their language, rather than in describing how they might use that knowledge in performance.

(3) Levels of adequacy:
- a. *Observational*: does the analysis describe the facts?
- b. *Descriptive*: Does the analysis describe the the mental state of a speaker?
- c. *Explanatory*: Does the analysis describe the the mental state of a *learner*?

(4) Some simple facts of English
Vowels are nasalized if and only if the following segment is a nasal consonant. (Compare: *beed* [bid], *beet* [bit], *bean* [bĩn], *bee* [bi], *[bĩ], *[bĩd], *[bin], etc.)

(5) Levels of adequacy:
- a. Can we characterize the facts correctly?
- b. Can we describe how the speaker's knowledge of these facts is represented?
- c. Can we account for how a speaker might be capable of learning such facts?

C. Rule-based phonology

(6) Chomsky & Halle 1968:
- a. A universal/finite set of features to describe elements;
- b. a restricted rule formalism to express generalizations;
- c. any phonology is a set of ordered rules.

(7) [+syl] → [+nasal] / ____ [+nasal]

(8) For example: /hæt/ → [hæt], /hænd/ → [hæ̃nd].

(9) But: /bæ̃t/ → *[bæ̃t].

(10) Input restriction for English:
The input may not contain a nasalized vowel.

(11) Problems:
a. An infinite number of rule types are possible;
b. a phonology can contain an unbounded number of rules;
c. input restrictions are treated differently.

D. How OT works

(12) Structure of Optimality Theory:
a. CON: a universal set of constraints,
b. a language specific "ranking" of those constraints.
c. GEN: a mapping of inputs to *every* possible output,
d. EVAL: a method for choosing the best candidate.

(13) NASAL
Vowels are nasalized before a nasal consonant.

(14)

	/hænd/	NAS
☞	[hæ̃nd]	
	[hænd]	*!

(15) But GEN can produce *anything*!

(16)

	/hænd/	NAS
☞	[hæ̃nd]	
	[hænd]	*!
☞	[hæbd]	
☞	[blorg]	

(17) Universal markedness constraints like NASAL interact with *faithfulness* constraints.

(18) The intuition for English:
The pressure for vowel nasalization is resolved by changing the vowel.

(19) FAITH-C
Input consonants are identical to the output.

(20) FAITH-V
Input vowels are identical to the output.

(21)

	/hænd/	F-C	NAS	F-V
☞	[hæ̃nd]			*
	[hænd]		*!	
	[hæbd]	*!		

(22) How do we rule out nasalizing vowels everywhere?

(23)

	/hæt/	F-C	NAS	F-V
☞	[hæt]			
	[hæ̃t]			*!

(24)

	/hæ̃t/	F-C	NAS	F-V
	[hæt]			*!
!☞	[hæ̃t]			

(25) ANTI-NASAL
Vowels are not nasalized.

(26)

	/hæ̃t/	F-C	NAS	A-N	F-V
☞	[hæt]				*
	[hæ̃t]			*!	

(27) FAITH-C ≫ NASAL ≫ ANTI-NASAL ≫ FAITH-V

E. Predictions of the model

(28) There are only a finite number of possible phonologies in the world.

(29) Phonologies differ only with respect to the relative force of phonological universals.

(30) Factorial Typology
If there are n constraints in the world, there are only $n!$ different phonologies.

(31) Generality
Constraints are not specific to one phenomenon in a language. Thus the ranking FAITH-C ≫ FAITH-V applies to *everything* in English.

F. Acquisition and OT

(32) OT allows for a simpler learning algorithm.

(33) Rule-Based Phonological Acquisition
Choose the simplest possible analysis consistent with the facts from among the infinite number of analyses available.

(34) Worst Case Scenario
Go through all the finite rankings one by one.

(35) Recursive Constraint Demotion (Tesar & Smolensky 1998)
Starting from any ranking, if an error is observed, demote the lowest ranking error-generating constraint above the highest-ranking constraint to eliminate the error. Iterate.

(36) Gradual Learning Algorithm (Boersma & Hayes 2001)
Starting from any ranking, if an error is observed, demote the lowest-ranking error-generating constraint *just a little* and promote the highest-ranking error-limiting constraint *just a little*. Iterate.

G. Challenges

(37) Empiricist theory of constraints

(38) Derivational opacity
A multi-step derivation isn't compatible with OT.

(39) Biblical Hebrew (McCarthy 1998)

/dešʔ/	input
dešeʔ	epenthesis to break up word-final consonant cluster
deše	final consonant deletion

H. Resources

(40) Rutgers Optimality Archive (ROA)
`http://roa.rutgers.edu`

(41) Pedagogical software: Hayes constraint-ranking software
`http://www.linguistics.ucla.edu/people/hayes/otsoft/`

(42) Modeling software (and phonetics too!): praat
`http://www.praat.org`

References

ARCHANGELI, DIANA, & DOUGLAS PULLEYBLANK. 1994. *Grounded Phonology*. Cambridge: MIT Press.

BOERSMA, PAUL, & BRUCE HAYES. 2001. Empirical tests of the Gradual Learning Algorithm. *Linguistic Inquiry* 32.45–86.

CHOMSKY, NOAM, & MORRIS HALLE. 1968. *The Sound Pattern of English*. New York: Harper & Row.

HAMMOND, MICHAEL. 1999. *The Phonology of English*. Oxford: Oxford University Press.

MCCARTHY, JOHN, 1998. Sympathy and phonological opacity. U. Mass., ROA.

——, & ALAN PRINCE, 1993. Prosodic morphology. U. Mass.

PRINCE, ALAN, & PAUL SMOLENSKY, 1993. Optimality Theory. U. Mass and U. of Colorado.

TESAR, BRUCE, & PAUL SMOLENSKY. 1998. Learnability in Optimality Theory. *Linguistic Inquiry* 29.229268.