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Final Study Guide

Ling 105, Fall 2021

(1) Suggested Review:
   a. Phonemes and Features: B&H chapters 2, 4
   b. Rules and allophony B&H chapters 6, 7, 8.4
   c. Stress and weight: B&H chapter 14
   d. Sound change: B&H chapter 11
   e. Midterm Review Sheet
   f. Lecture Notes
   g. B&H feature sheet (on Canvas), as well as the IPA chart (on Canvas), though both will be available during the test.

(2) New material in this handout:
   a. An example of simplifying and making a more parsimonious rule (14)
   b. An overview of the stress assignment procedure, or footing (35)
   c. Quantity insensitive weight systems may have stress in different positions! (36)
   d. Writing autosegmental rules (47)

Phonemes and Phones

(3) Terminology:
   a. Surface Form: The forms of a signal that we see/hear in the real world.
   b. Underlying Form: The form of a signal underlying in the mental representation.
   c. Phoneme: abstract units of contrastive information: underlying segments.
   d. Phone: the surface forms/realizations of phonemes: surface segments.
   e. Allophone: two or more phones which are surface representations of the same underlying form (same phoneme).

Much of phonology is trying to figure out what the underlying forms of segments/morphemes/words of a language are, based on the surface forms that we observe.

(4) Kinds of distributions of phones:
   a. Complementary distribution: two phones never occur in the same context: [l] and [ɬ] in English

b. Free variation: two phones occur in the same contexts without changing the meaning of the words which contain them: [p] and [$\widetilde{\text{ʔp}}$] word finally in English
c. Complementary distribution and free variation tend to hint that the phones are allophones of the same phoneme.
d. Contrasting distribution: two phones occur in the same context but make a meaning contrast in these two places: minimal pairs
e. Partial neutralization: In some contexts there is contrasting distribution, but in others they are 'neutralized' such that only one form shows up: [t] and [d] in German: contrast word medially, but only [t] surfaces word finally.
f. Contrasting distribution and partial neutralization heavily suggest that two phones are not allophones of the same phoneme.

Segments (Phonemes and Phones) as Bundles of Features

(5) Claim: Rather than phonemes as the basic building blocks of phonology, features (attributes of phonemes) are.
   a. Our brain cares not about arbitrary labels like /p/, but rather the things which define /p/ (bilabial, voiceless, oral, stop)
   b. Segments are just bundles of features
   c. Features have a binary structure: they represent the engagement of some muscle or attribute of sound and so they are either "on" or "off".
   d. We can thus distinguish how similar two sounds are: what/how many features do they share?

(6) /d/ undergoes devoicing word finally in German, why does it become [t] rather than [p]?

$$[\text{d}] = \begin{bmatrix} + & \text{VOI} \\ + & \text{COR} \\ - & \text{LAB} \\ & \dots \end{bmatrix} \quad [\text{t}] = \begin{bmatrix} - & \text{VOI} \\ + & \text{COR} \\ - & \text{LAB} \\ & \dots \end{bmatrix} \quad [\text{b}] = \begin{bmatrix} + & \text{VOI} \\ - & \text{COR} \\ + & \text{LAB} \\ & \dots \end{bmatrix} \quad [\text{p}] = \begin{bmatrix} - & \text{VOI} \\ - & \text{COR} \\ + & \text{LAB} \\ & \dots \end{bmatrix}$$

   a. Devoicing replaces $\begin{bmatrix} + & \text{VOI} \end{bmatrix}$ with $\begin{bmatrix} - & \text{VOI} \end{bmatrix}$
   b. [t] is just [d] with the $\begin{bmatrix} - & \text{VOI} \end{bmatrix}$ instead of $\begin{bmatrix} + & \text{VOI} \end{bmatrix}$

We can define sets of segments as natural classes: sets of feature bundles which describe the entire group of segments.

(7) $\begin{bmatrix} - & \text{NAS} \\ + & \text{VOI} \end{bmatrix}$ = voiced oral segments

(8) Natural classes can be interpreted in two ways:
   a. The set of all segments which contain the features defined in the natural class
   b. A structural change which affects exactly and only the features defined in the natural class

Features and Natural Classes in Rule-Making

(9) Target $\rightarrow$ Structural Change / Context

a. Target: A natural class which undergoes change
b. Structural Change: The features which this natural class gains in a certain context
c. Context: The context in which the Target changes, where "__" represents the target
d. Read as: [Target] becomes [Structural Change] when [Context].

(10) Special symbols:

a. # represents a word boundary (either the beginning or ending of a word):
__# means that the target is word final.
b. $[_\sigma$ and $]_\sigma$ represents the beginning and ending of a syllable:
__$]_\sigma$ means that the target is syllable final.
c. Ø represents null (nothing):
(i) X $\rightarrow$ Ø represents deletion of X
(ii) Ø $\rightarrow$ X represents epenthesis of X
d. C represents consonants, V represents vowels
e. X_n^m means any number of X segments between n and m. If no upper bound is listed, assume infinite.
f. Greek letters: α, β, γ, etc. represent variable values.
g. PLACE represents any place features (major or minor).
h. FEAT represents all features.

(11) The goals of rulemaking:

a. The rule should cover all of the places where it applies (avoid underrapplication)
b. The rule should not affect contexts where the change does not actually apply (avoid overapplication)
c. The rule should be as simple as possible (contain as few features as possible)
d. The rule should be as natural as possible (based on markedness, assimilation, articulatory, or perceptual pressures)

(12) Parsimony:

a. Express classes and rules with the fewest number of symbols
b. Generalize as much as the data permits
c. Why? Because that is what people tend to do with phonological data:
(i) Learners make the broadest generalizations unless given data which contradicts the generalizations they make.
(ii) Acquisition tends to go through stages of overgeneralization, cf. 'goed'

Lets look at final devoicing in some fictional language:

(13)

Meaning	Nominative	Accusative
Dog	pel	pela
Fish	din	dina
Cat	mek	mega
Bee	tep	tepa

Obstruent sounds devoice word finally: this is a form of neutralization as voiced/voiceless obstruents are distinguished elsewhere.

(14) Obstruents devoice word finally, some attempts:

a. $\begin{bmatrix} - & \text{NAS} \\ - & \text{SON} \\ + & \text{VOI} \end{bmatrix} \rightarrow \begin{bmatrix} - & \text{NAS} \\ - & \text{SON} \\ - & \text{VOI} \end{bmatrix} / \_\_\#$

Problem 1: while all the targets are $[-\text{NAS}]$, all of the segments which are $[-\text{NAS}]$ in this language (that we have seen so far) are also $[-\text{SON}]$, so $[-\text{SON}]$ covers this.

b. $\begin{bmatrix} - & \text{SON} \\ + & \text{VOI} \end{bmatrix} \rightarrow \begin{bmatrix} - & \text{SON} \\ - & \text{VOI} \end{bmatrix} / \_\_\#$

Problem 2: Because all of the targets are $[-\text{SON}]$, $[-\text{SON}]$ in the structural change is redundant; there is no reason to keep it.

c. $\begin{bmatrix} - & \text{SON} \\ + & \text{VOI} \end{bmatrix} \rightarrow \begin{bmatrix} - & \text{VOI} \end{bmatrix} / \_\_\#$

Problem 3: This rule takes $[+\text{VOI}]$ segments and devoices them, however, if this rule applied to $[-\text{VOI}]$ segments as well, the result would be the same ($[-\text{VOI}]$ become $[-\text{VOI}]$ is fine). If both rules are equivalent, the most general one should be used:

d. $\begin{bmatrix} - & \text{SON} \end{bmatrix} \rightarrow \begin{bmatrix} - & \text{VOI} \end{bmatrix} / \_\_\#$

This rule accurately represents the change that happens in final devoicing of obstruents without any superfluous material.

Kinds of Rules

(15) Assimilation and Dissimilation

a. Features change to be similar (assimilation) or dissimilar (dissimilation) with surrounding segments.
b. Progressive: conditioner precedes target (feature spreads rightwards): preserve feature and change late.
c. Regressive: conditioner follows target (feature spreads leftwards): anticipate feature and change early.
d. Vowel Harmony: feature change only occurs to vowels, intervening consonants are ignored.
e. When writing rules: use greek letter variables: e.g. $[\alpha\text{PLACE}]$, in both structural change and condition.

(16) Deletion and Epenthesis:

a. Deletion or Creation (Epenthesis) of a segment.
b. When writing rules: use Ø, in target for epenthesis, in structural change for deletion.

(17) Metathesis:

a. Two segments switch ordering.

b. When writing rules: subscripts to represent different orderings:

c. $\left[-\ \ \text{SON}\right]_a \begin{bmatrix} + & \text{SON} \\ - & \text{SYL} \end{bmatrix}_b \rightarrow C_b C_a$

(18) Reasons to have sound change:

a. Ease of articulation:
   (i) Changing between segments with different features means moving muscles for each different feature!
   (ii) Consonant clusters can be hard to pronounce!
   (iii) Too many syllables means too much time spent talking!

b. Ease of perception:
   (i) Too many similar sounds make it difficult to distinguish repetition from unique words (did he say 'go-go' or did he just say 'go' twice by accident?)
   (ii) Consonant clusters can be hard to hear clearly!

Ordering of Multiple Rules

(19) If two sound changes deal with completely different targets and contexts, then they may not ever influence the other:

a. For all inputs:
   input > Rule A > Rule B is the same as
   input > Rule B > Rule A
   Then there is no strict ordering.

b. This must be the case for all inputs in order to hold true!

(20) There are four kinds of interactions:

a. Feeding
b. Bleeding
c. Counterfeeding
d. Counterbleeding

(21) TL;DR:

	A > B (Reality)	B > A (Could've been)
A feeds B	B applies	B does not apply
A bleeds B	B does not apply	B applies
A is counterfed by B	A does not apply	A applies
A is counterbled by B	A applies	A does not apply

(22) a. Feeding; give the wool to the spinner, then the weaver:

		A (spinner)		B (weaver)
wool	→	thread	→	cloth

b. Counterfeeding; the weaver can't weave the wool, but could've if it was the other way around:

		A (weaver)		B (spinner)
wool	? →?	wool	→	thread

(23) a. Bleeding; the baker roasts the seeds before the gardener can sow them:

A (baker) B (gardener)

seeds → roasted seeds ? →? roasted seeds

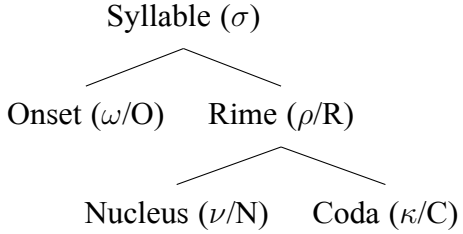
b. Counterbleeding; the gardener can plant the seeds, but couldn't have if the baker got to them first:

A (gardener) B (baker)

seeds → pumpkin → pumpkin pie

Syllable Structure

(24)



(25)
a. Onset and coda are typically composed of consonants. Segments in these positions have $[-\text{SYL}]$ feature. Remember non-syllabic markers for vowels: [e̯]
b. Nucleus is typically composed of vowels. Segments in nucleus have $[+\text{SYL}]$ feature. Remember syllabic markers for consonants: [n̩]
c. Rime is considered a constituent (consisting of nucelus and coda) due to mutliple factors:
   (i) Rhyming in poetry tends to care only about the rime
   (ii) Phonotactics and Allophony tend to place special emphasis on rime as a constituent (English: dark l appears in rime position), while it's very rare to find rules that care about onset and nucleus but not coda
   (iii) Speech errors and ludlings: people tend to keep the rime intact when messing up/around with language; spoonerisms.
   (iv) Syllable weight depends on rime structure and size, but rarely about onset.

(26) Onset maximization.
a. Know your nuclei! For all syllabic segments, assign a nucleus.
b. Find what are considered 'acceptable' onsets in the language. Can this cluster be the onset? One way to check is if it can be at the beginning of a word.
   (i) For each consonant cluster, determine if it can be an onset: if it can be, then it is an onset.
   (ii) If not, then try the previous consonant cluster minus the leftmost segment: if it can be, then it is an onset.
   (iii) Repeat until an onset is assigned or there are no segments left.
c. All other consonants will be codas.
d. Assign onsets to the following nucleus, and codas to the previous nucleus to syllabify.

(27) Cross-linguistic restrictions.
a. Some languages require an onset for all syllables, no language bans onsets.
b. Some languages ban codas for all syllables, no language requires codas.

c. Some languages ban complex onsets (more than one segment) for all syllables, no language requires complex onsets.
d. Some languages ban complex codas (more than one segment) for all syllables, no language requires complex codas.

Sonority Scale and Sonority Sequencing

(28)

Most sonorous:	vowel
	glide
	rhotic approximant
	lateral approximant
	nasal stops
	fricatives
	affricates
Least sonorous:	plosives

The sonority scale determines many things:

(29)
a. Sonority sequencing in syllables (syllables generally rise in sonority from onset to nucleus, fall in sonority from nucleus to coda)
b. What is considered a valid nucleus (for a given language, some point in the scale and all levels more sonorous e.g.: English: nasals and above)
c. What kind of coda is considered moraic for a given language

Prosodic Structure

(30) The prosodic word (the phonological word) has a structure beyond just the segments or syllables that make it up.
a. Segments are units of single sounds: they are represented as phonemes (in the head) or phones (in the world)
b. The mora, plural morae (μ), are units of weight: they are associated with groups of segments which are pronounced (approximately) in the same length of time as other morae.
c. Syllables (σ) are prosodic units composed of morae: they are associated with syllabic structure (onset, nucleus, coda) and are assigned stress.
d. Feet (F) are prosodic units composed of syllables: they determine the rhythm of a word and are also assigned stress.

Syllables are made of morae, and the 'weight' of a syllable can be determined by how many morae are in a given syllable.

(31)
a. Light syllables (L) have one mora
b. Heavy syllables (H) have two morae

Feet are made of syllables. For languages with stress, feet determine which syllables are stressed.

(32) a. Feet are typically binary (consisting of two morae or two syllables)
b. Feet assign stress to one of their component syllables
c. Not all syllables are part of a foot, but they must be part of a foot in order to get stress.
d. The word also assigns stress to a foot:
(i) Stressed syllables in unstressed feet have secondary stress
(ii) Stressed syllables in stressed feet have primary stress

(33) Kinds of feet:
a. Iambs: the last syllable of the foot is stressed.
b. Trochees: the first syllable of the foot is stressed.
c. Languages tend to have either all trochees or all iambs (monosyllabic feet count as both!)

Footing and Stress

(34) Parameters in Footing:
a. Iambs or Trochees?
b. Right-to-Left footing or Left-to-Right footing (directionality)?
c. Weight/Quantity sensitive?
d. Left-Bounded, Right-Bounded, or Unbounded?
e. Non-Finality?
f. Binary Feet?

(35) Stress assignment procedure:
a. If a language is weight sensitive; apply footing to heavy syllables such that heavy syllables are stressed. For multiple heavy syllables, apply footing in order of directionality.
b. Apply footing to all syllables: apply footing in order of directionality. Apply until all syllables are footed, or until all possible binary feet are made.
c. If Left-Bounded: leftmost foot is stressed, leftmost foot's stressed syllable has primary stress.
d. If Right-Bounded: rightmost foot is stressed, rightmost foot's stressed syllable has primary stress.
e. If Unbounded: right or leftmost foot with a heavy syllable; if no heavies, then right or leftmost foot, depending on language.
f. Exceptions: if non-finality, avoid stress on the final syllable OR avoid footing the final syllable.

Quantity-Insensitive Stress doesn't care about weight: treat every syllable the same (as if it is light).

(36) Result of quantity insensitivity:
a. Because weight is not a factor, there are no heavy feet to cause unboundedness.
b. Usually, quantity insensitive systems will assign stress to the same place always,

unless the directionality and the boundedness are from different sides: (right-to-left but left bound)
Example: Directionality and Boundedness are opposite:
$(\sigma\ {}_{\shortmid}\sigma)(\sigma\ {}^{\shortmid}\sigma)$ vs $(\sigma\ {}_{\shortmid}\sigma)(\sigma\ {}^{\shortmid}\sigma)\sigma$

(37) Bounded systems: either the first or the last foot.

a. Stress on Initial foot - stress always on one of the first three syllables
b. Stress on final foot - stress always on one of the last three syllables

Not all bounded systems are quantity insensitive: Quantity Sensitive Bounded systems only allow within the first three or last three syllables, but may allow more variation in which of those syllables than quantity insensitive systems.

(38) Non-bounded systems: depends on whether or not there is a heavy foot (a foot with a heavy syllable)! Differs across two dimensions:

a. If there are heavy syllables, is stress on the first heavy foot or the last heavy foot?
b. If there are no heavy syllables, is stress on the first foot or the last foot?

(39) A general guide:

Bounded	Weight Insensitive	Stressed syllable always confined within one or two possible positions, no distinction made by syllable weight
Bounded	Weight Sensitive	Stressed syllable always confined to either the last three or first three syllables
Unbounded	Weight Sensitive	Stressed syllable always on a heavy syllable if there is a heavy syllable (38)

Autosegmental Theory

Rather than treating segments as sets of features, we may instead want to treat them as units for which features can be linked to.

(40)
[+COR]
|
[−SON]
|
[+VOI]
|
[d]

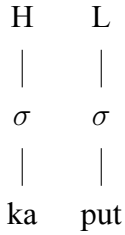
Rather than sound rules being the creation of new features within segments, it can be seen as the linking of already existant features to other segments.

(41) a. $C \rightarrow [+\ \text{VOI}] \,/\, \begin{bmatrix} + & \text{VOI} \\ + & \text{CONS} \end{bmatrix}$ __#

b. [+VOI] [−VOI] → [+VOI] [−VOI]

This method is extremely useful for capturing how tone works

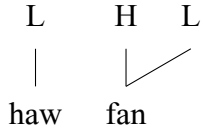
(42) Most commonly we see this used with tone: a word may have associated links between a words tones and a words syllables or morae (Tone Bearing Units).



(43) Tone values come in three kinds: H(igh), L(ow), and M(id).

a. Rising, falling, and other contour tones are made from multiple links between a syllable and the tone

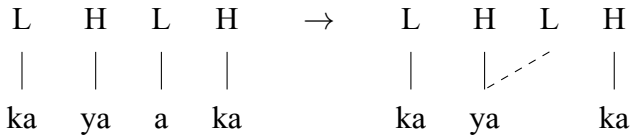
b.



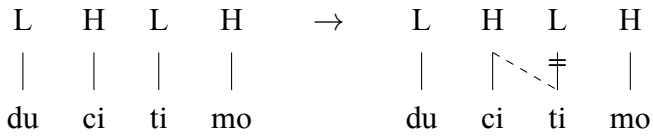
c. Shorthand for tones: high = á, low = à, mid = ā

(44) Why use this system? Now different kinds of sound changes and rules can be understood as the linking and de-linking of various features across tiers.

a. Non-underlying linking is shown with dashed lines:

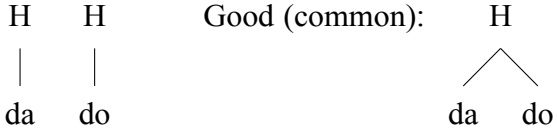


b. Delinking is shown with a double-crossed out line:



(45) It is common (it almost always it ends up being the case) that two syllables of the same tone are underlyingly linked to one tone, rather than being linked to separate similar tones.

a. Bad (uncommon): Good (common):



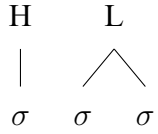
(46) Autosegmental phenomena:

a. Floating Tones: Tones associated with words or morphemes may be detached from their segments and float
b. Mobile Tones: Tones may move to different syllables due to phonological pressure
c. Fixed Melodic Inventories: words are associated with a set of tones, but not with any clear linking; linking will depend on the number of syllables/morae in a word
d. Independence under Reduplication: reduplication might target non-tonal segments but not tone.

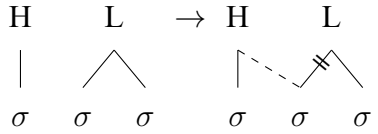
Writing Autosegmental Rules

(47) a. Find a generalization:
HLL → HHL

b. Show underlying form (assuming that there are no adjacent of the same kind of feature):



c. Show linking and delinking of those features as the result of the rule (e.g.: the second syllable becomes high, so it delinks from L and links up with H):



(48)