

(1) From Chapter 3 of the textbook: Do Problem #2.

#2 Hindi Problem

Are [b] and [ɓ] allophones of the same phoneme, or separate allophones in Hindi?

HINT: Always start by looking to see if there is clear evidence that the two segments are phonemes. Specifically, look for minimal pairs. Unfortunately, there are no minimal pairs in the given data set. In this case, consider the next possibility: are they allophones of the same phoneme? If so, they should be complimentary distribution, and you should be able to identify environments where you find one but never the other. Can we find such environments? Again, the answer appears to be no. By looking at the given data, we can't figure out how we could predict when a Hindi speaker would pronounce [b] versus [ɓ]. Instead, what we see in the data are near minimal pairs. [See answer below.]

Although there are no minimal pairs, there are near-minimal pairs such as the following:

- 1) [bara] 'large' and (b) [ɓari] 'heavy', where both [b] and [ɓ] appear at the start of the word and are followed by the same vowel [a] (as well as the following consonant [r])
- 2) [bap] 'father' and (j) [ɓag] 'part', where both segments are again found at the start of the word and are followed by the same vowel [a]
- 3) [bina] 'without' and (d) [ɓir] 'crowd', where both segments are found before the same vowel [i] (as well as at the start of the word)

Furthermore, there are no apparent conditioning factors elsewhere in the given list of words that we could use to predict the appearance of either segment. (Syllable structure doesn't help either!) Thus, for example, both segments appear before both front and back vowels.

Because we can't predict when we get [b] versus [ɓ] (for the reasons given above), I conclude that these two segments must be contrastive, i.e., they are separate phonemes in Hindi.

[Note: This means that both [b] and [ɓ] appear in underlying representations in Hindi.]

(2) From Chapter 3 of the textbook: Do Problem #5. Add one extra step between parts (iii) and (iv): State your generalization in the form of a phonological rule (using feature notation).

#5 Plains Cree Problem [This is an extended version of the answer!]

(i) [p] and [b] are allophones of the same phoneme.

Consider the following distribution:

Forms with [p]		Forms with [b]	
e) paskwa:w	'prairie'	o) mi:bit	'tooth'
p) pime:	'lard'	t) wa:bos	'rabbit'
j) ospwa:gan	'pipe'	u) na:be:w	'man'
c) asaba:p	'thread'	c) asaba:p	'thread'

We see that [p] appears word-initially, word-finally, and next to other consonants, while [b] is found between vowels. [p] and [b] are in complementary distribution. Since [p] and [b] are phonetically similar, and since they are in complementary distribution, we can argue that they are allophones of the same underlying phoneme.

Given the fact that [p] appears in a variety of environments, while [b] only appears in one specific environment, we can treat [p] as the "elsewhere" case and posit /p/ as the underlying form. The rule we will need to formulate in order to account for the appearance of [b] can be stated as:

Voiceless bilabial stops become voiced between vowels.

And we can formalize this rule as:

$$\left(\begin{array}{l} +\text{consonantal} \\ -\text{syllabic} \\ -\text{sonorant} \\ -\text{continuant} \\ -\text{voice} \\ +\text{labial} \end{array} \right) \rightarrow [+voice] / \left(\begin{array}{l} -\text{consonantal} \\ +\text{syllabic} \end{array} \right) \text{ — } \left(\begin{array}{l} -\text{consonantal} \\ +\text{syllabic} \end{array} \right)$$

(ii) The segments [t] and [d] can be shown to be allophones of the same phoneme. Consider the following distribution:

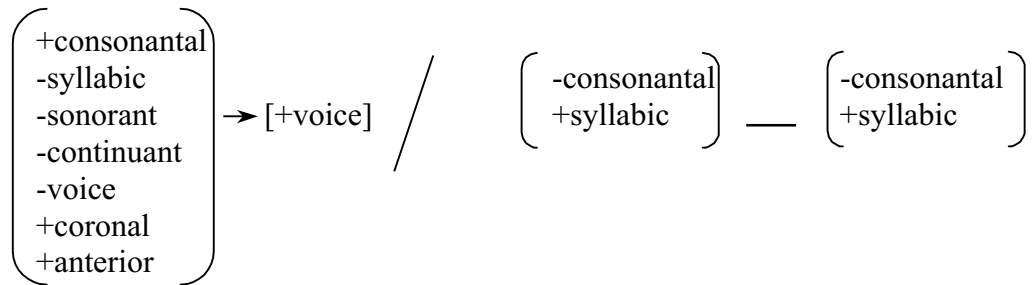
Forms with [t]		Forms with [d]	
h) tahki	'often'	b) kodak	'another'
o) mi:bit	'tooth'	n) a:dim	'dog'
l) nisto	'three'	q) mide	'heart'

We see that [t] appears word-initially, word-finally, and next to other consonants, while [d] is found between vowels. [t] and [d] are in complementary distribution. Since [t] and [d] are phonetically similar, and since they are in complementary distribution, we can argue that they are allophones of the same underlying phoneme.

Given the fact that [t] appears in a variety of environments, while [d] only appears in one specific environment, we can treat [t] as the "elsewhere" case and posit /t/ as the underlying form. The rule we will need to formulate in order to account for the appearance of [d] can be stated as:

Voiceless alveolar stops become voiced between vowels.

And we can formalize this rule as:



Similarly, the phones/segments [k] and [g] can be shown to be allophones of the same phoneme. Consider the following distribution:

Forms with [k]		Forms with [g]	
b) kodak	'another'	f) mi:bit	'tooth'
g) ko:gos	'pig'	g) ko:gos	'pig'
d) wasko:w	'cloud'	j) ospwa:gan	'pipe'
e) paskwa:w	'prairie'	m) tʃi:gahigan	'axe'
h) tahki	'often'	r) o:gik	'these'
r) o:gik	'these'		
a) niska	'goose'		

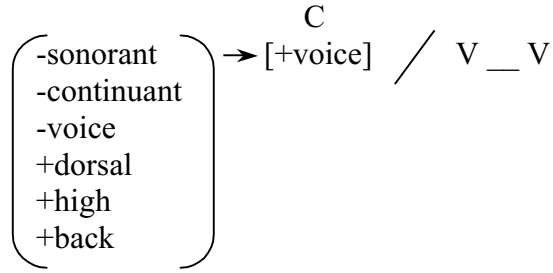
The data show that [k] appears word-initially, word-finally, and next to other consonants, while [g] is found between vowels. [k] and [g] are in complementary distribution. Since [k] and [g] are phonetically similar, and since they are in complementary distribution, we can argue that they are allophones of the same underlying phoneme.

Given the fact that [k] appears in a variety of environments, while [g] only appears in one specific environment, we can treat [k] as the "elsewhere" case and posit /k/ as the underlying form. The rule we will need to formulate in order to account for the appearance of [g] can be stated as:

Voiceless velar stops become voiced between vowels.

And we can formalize this rule as:

(using 'C' and 'V' as shorthand for [+consonantal, -syllabic] and [-consonantal, +syllabic], respectively)



And finally! The phones/segments [tʃ] and [dʒ] can be shown to be allophones of the same phoneme. Consider the following distribution:

Forms with [tʃ]		Forms with [dʒ]	
m) tʃi:gahigan	'axe'	k) midʒihtʃij	'hand'
s) tʃihtʃij	'finger'	k) mi:dʒiwin	'food'
i) namwa:tʃ	'not at all'		
k) midʒihtʃij	'hand'		

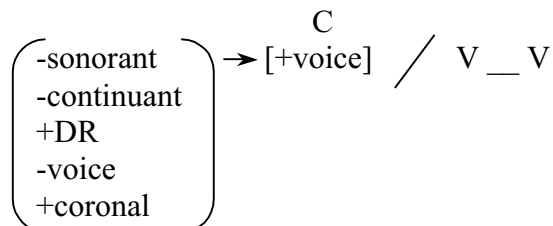
The data show that [SURPRISE!] [tʃ] appears word-initially, word-finally, and next to other consonants, while [dʒ] is found between vowels. [tʃ] and [dʒ] are in complementary distribution. Since [tʃ] and [dʒ] are phonetically similar, and since they are in complementary distribution, we can argue that they are allophones of the same underlying phoneme.

Given the fact that [tʃ] appears in a variety of environments, while [dʒ] only appears in one specific environment, we can treat [tʃ] as the "elsewhere" case and posit /tʃ/ as the underlying form. The rule we will need to formulate in order to account for the appearance of [dʒ] can be stated as:

Voiceless alveopalatal affricates become voiced between vowels.

And we can formalize this rule as:

(using 'C' and 'V' as shorthand for [+consonantal, -syllabic] and [-consonantal, +syllabic], respectively)



(iii) Hopefully, it is clear to you that we can make one general statement encompassing the four individual rules that we posited in (ii). Note that the only thing differing from rule to rule is the "A" part: A [] B / X__ Y. What do the different "A" parts have in common? The labial stops, alveolar stops, velar stops, and alveopalatal affricates all belong to the following natural class: nonsonorant noncontinuant consonants. Thus, we can state our generalization as follows:

Nonsonorant noncontinuant consonants are voiced between vowels.

The prose version of the relevant rule, call it the **Cree Obstruent Voicing Rule** [although you could have called it anything you wanted in your own answer, as long as you refer back to your rule later], would be:

Nonsonorant noncontinuant consonants become voiced between vowels.

(iv) We can write the rule as follows:

Cree Obstruent Voicing Rule:

$$\left(\begin{array}{c} \text{C} \\ \text{-sonorant} \\ \text{-continuant} \end{array} \right) \rightarrow [+voice] \ / \ V _ V$$

NOTE: I left out the [voice] feature on the left-hand side. You could have included this feature as well (it would be [-voice] if you included it). I left it out because it actually isn't necessary; the rule will apply to all of the non-sonorant, non-continuant consonants appearing in between vowels. If the consonant in question is [+voice], the rule applies vacuously (i.e., nothing changes); if the consonant in question is [-voice], the rule applies and changes the '-' to '+'.
This rule reflects a process of voicing assimilation.

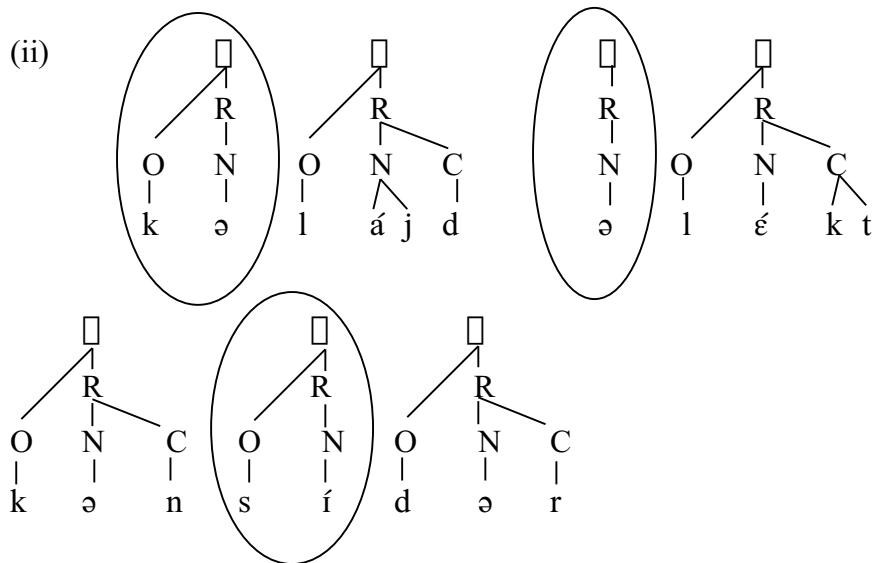
(v) Remember: a crucial part of the work you have to do when providing example derivations is to make sure that you have the correct **underlying representation** (UR, = phonemic form). The UR will depend on your earlier hypotheses regarding underlying forms and the choices you made regarding how to formalize the phonological rule(s).

In (iii)/(iv), we posited the unvoiced variant as the underlying form. This means that there should be NO voiced non-sonorant obstruents in your URs!

In general, pay particular attention to the differences between the URs and the PRs.

	UR: /mitʃihtʃij/	'hand'	/tʃi:kahikan/	'axe'	/mi:pit/	'tooth'
Cree Obstruent Voicing Rule	midʒihtʃij		tʃi:gahigan		mi:bit	
	PR: [midʒihtʃij]		[tʃi:gahigan]		[mi:bit]	

(3) Draw the syllable structures for the following words: *collide*, *elect*, *consensus*. Then CIRCLE all of the light syllables. [Remember: you should be drawing syllable structures over the IPA transcriptions, not the words as they are spelled above!]



(4) Cree Morphophonology Problem

Cree is an Algonquian language spoken in Canada.

Examine the following data from Cree and answer parts A–G below.

Notes: Some phonological alternations have been glossed over in the given data set. Also, just so you know, a vowel followed by the [:] diacritic indicates that the vowel is long.

<u>Cree</u>	<u>English gloss</u>	<u>Cree</u>	<u>English gloss</u>
1. čí:ma:n	'canoe'	12. nitospwa:kan	'my pipe'
2. niči:ma:n	'my canoe'	13. akimew	's/he counts'
3. so:niya	'money'	14. nitakimen	'I count'
4. niso:niya	'my money'	15. apiw	's/he sits'
5. wiya:š	'meat'	16. nitapin	'I sit'
6. niwiya:š	'my meat'	17. ispelohkew	's/he rests'
7. e:mihkwa:n	'spoon'	18. nitispelohken	'I rest'
8. nite:mihkwa:n	'my spoon'	19. kaakimew	's/he will count'
9. astotin	'hat'	20. nikaakimen	'I will count'
10. nitastotin	'my hat'	21. kaapiw	's/he will sit'
11. ospwa:kan	'pipe'	22. nikaapin	'I will sit'

A. Give the Cree morphemes for the following:

'sit' api-_____

future tense ka-_____

's/he' -w_____

UR:	/ni-+č̣i:ma:n/ MY + 'canoe'	/ni-+astotin/ MY + 'hat'
(list your morpho-phonological rule from Section E here: ni-/nit- rule	-----	nit-astotin
PR:	[nič̣i:ma:n]	[nitastotin]

G. Give the Cree form for the following: 'I will rest' nikaispelohken