Phonemes, allophones, and complementary distribution

I. Mental sound categories and context-specfic pronunciations

(1) What can we conclude about the pronunciation of the hiragana character <ん>, based on question (3) from Homework Assignment #1? [We'll see later that there is more to the story!]

(2) The behavior of <ん> illustrates several important concepts:

(a) Sounds often behave in **systematic** ways according to their **sound properties**

- **natural class** — a group of sounds with properties in common that behave in a consistent fashion

(b) The pronunciation of a single **mental sound category** can **vary according to context**

(3) Some basic definitions:

phoneme — mental sound category (notate with slash brackets: /… /)
allophone — the surface realization(s) of a phoneme (essentially, actual pronunciation(s); notate with square brackets: […])

- Every phoneme has at least one allophone; some have more than one

(4) When two sounds are phonetically similar, we need to determine whether they belong to **separate phonemes**, or whether they are **allophones** of the same phoneme.

- Why does this matter?

(a) Practical consequences: Two allophones of the same phoneme can be:

- Difficult for speakers to speakers to distinguish in perception
- Difficult for speakers to produce outside their usual environments

(b) Theoretical consequences: What principles of mental/cognitive organization predict the kinds of phoneme/allophone patterns we see across languages?

- A big question for Japanese: What does it mean when two sounds are "only sometimes" allophones of the same phoneme? [We'll come back to this later!]

II. An example from English (with consequences for L2 Japanese)

(5) Consider the following words of English. How are the "t" and "d" sounds pronounced?

(a)			(b)		
	let	letting		need	needing
	hot	hotter		wide	wider

(6) What we have here is a case of phonemes with multiple allophones:

(a) /t/ has [t] and [ɾ] (among others!)

(b) /d/ has [d] and [ɾ]

(7) For both the /t/ and /d/ phonemes, their [ɾ] allophone occurs *when between vowels* as long as the second vowel is *not stressed* (fine print: this is a slight simplification)

- What happens when an English-speaking beginning learner of Japanese tries to produce the word [kɯdasai] 'please give me…'? ***Why?***

III. Analysis of data set - "Voiceless vowels in Japanese"

(8) In what **phonological environments** does [i] occur? What about (voiceless) [i̥]? Try stating phonological environments in terms of **natural classes** whenever possible.

(a) When there is no *systematic* way to differentiate between the two sets of environments, the two sounds are "acting independently," and have the ability to distinguish words with different meanings — the sounds are in **contrastive distribution**, and belong to **separate phonemes**

(b) When it is **predictable** which sound occurs in which environment, this means that the two sets of environments are **distinct**; the two sounds are "dividing the labor," and switching them doesn't make a different word (although it might sound odd!) — the sounds are in **complementary distribution**, and belong to the **same phoneme**

(9) We conclude: [i] and [i̥] occur in ***predictable*** environments, so they are **allophones** of the same phoneme (let's call it /i/, which is the general or **default** allophone)

- That is, it is **predictable** for any given "*i* vowel" whether it will be [i] or [i̥], based on the **phonological environment** in which the sound occurs

(10) If we repeat this process for [ɯ] and [ɯ̥], we find the same result, and we conclude that [ɯ] and [ɯ̥] are allophones of the phoneme /ɯ/

(11) Finally, we note that /i/ and /ɯ/ are themselves a natural class

- They are the high vowels of Japanese

(12) Can we prove that /i/ and /ɯ/ are separate phonemes in Japanese?

IV. Phonological rules

(13) When a phoneme, or a natural class of phonemes, has different allophones in different environments, we can write a **phonological rule** to produce each allophone in the approriate context

(a) General format for a phonological rule: **target → change / environment**

- *target* — the natural class of sounds that is affected by the rule
- *change* — list only those sound properties that are actually changed by the rule
- *environment* — specify the phonological environment where the rule applies:
  / X _ 'after X' / _ Y 'before Y' / X _ Y 'between X and Y'
- Always write target, change, environment using **properties** (not IPA symbols)!

(b) Rule for voiceless vowels in Japanese:

high vowels	→	voiceless	/	voiceless __ voiceless	*Paraphrase of rule:* High vowels become voiceless when they occur between voiceless sounds.

- It is important to include a *paraphrase* with any rule you propose, so the reader fully understands what you are intending to propose (side benefit: this can also help you check your work and your understanding of your analysis)

V. Some general points for phonological analysis

(14) Whether two (phonetically similar) sounds are separate phonemes, or allophones of the same phoneme, can differ from language to language

(15) Example: The status of the sounds [d] and [ð] is different in English and in Spanish

(a) In English:

[**d**ɛn] *den*	[low**d**] *load*
[**ð**ɛn] *then*	[low**ð**] *loathe*

(b) In Spanish:

[**d**uða]	'doubt'	[**d**oβlar]	'to double'
[kon **d**uðas]	'with doubts'	[sin **d**oβlar]	'without doubling'
[la **ð**uða]	'the doubt'	[re**ð**oβlar]	'to redouble, to reiterate'
[mi **ð**uða]	'my doubt'	[o **ð**oβlar]	'or to double'

	English		Spanish		
phoneme(s)	/d/	/ð/	/d/		*(posited in mental representations)*
	|	|	/ \		
allophone(s)	[d]	[ð]	[d]	[ð]	*(observed in language data)*

(16) A note on phonemes vs. **spelling**

(a) Many spelling systems operate at *approximately* the level of the phoneme

- Often, each phoneme is spelled differently but multiple allophones of the same phoneme are spelled the same way (Spanish [**d**u**ð**a] 'doubt' is spelled ***d****u****d****a*)

(b) However, this is not *guaranteed* — remember Japanese <とう>/<tou> = [to:]

(c) Best practice: Spelling may serve as a supplementary source of evidence if relevant, but **consider phonological evidence first**