

# Phonemics

# Goals of a phonemic analysis

- Produce a minimal set of phonemes for the language. It will be a set smaller than the set of phones.
- With the set of phonemes, every utterance can be analyzed phonetically into phones, and also into phonemes. For each utterance, there will be a 1-to-1 relationship between the phones and the phonemes.

# Rules of allophony

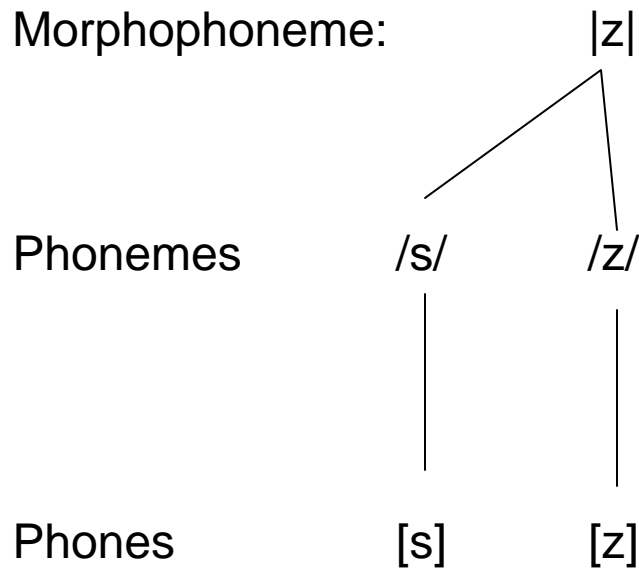
- It must be possible to come up with rules of allophony, which tell us what the realization of each phoneme is in a given context: a *phonetic* context.
- Given a string of phones, we can determine uniquely the string of phonemes that (you might say) lies *behind* it.

# Rules of allophony

- For every pair of phones, we can say that they are allophones of the same phoneme, or they are allophones of different phonemes. (Most phonemicists proposed that you couldn't have both: so the set of phones realizing two different phonemes could *not* overlap. Since [s] and [z] contrast word-initially, they can't be allophones of the same phoneme word-finally.)

# Momentary anachronism...

So the phonemicists had three levels:



Generativists eventually said:  
There may (or may not) be evidence  
for 3 levels, but you put such strong  
conditions on the rules of allophony  
that virtually all phonology gets  
pushed upstairs to morphophonology,  
where *anything* goes.

# Allophony

If you have two phones that are allophones of the same phoneme, then you should be able to divide the contexts in which the phoneme is realized into (distinct) contexts, and for each context show that either

- both sounds occur in *free variation*
- only one of the phones occurs ... this leads us to *complementary distribution*:

# Complementary distribution

Two phones are in complementary distribution if the contexts in which they occur do not overlap.

**So the allophones of a phoneme must be in free variation, or in complementary distribution, or both.**

That statement summarizes phonemics.

# Contexts

So most of the work in carrying out the analysis consists of organizing the *contexts* by seeing which phones occur in which contexts.

If the set of possible contexts were small, this would be very simple.

But it's not. So...

# Actual practice...

- We generally start with the most general set of contexts that's likely to be useful, and then refine it on the basis of the data.
- The immediate context (what immediately precedes and follows) is most likely to be relevant;
- The major sound categories + boundaries:  
C, V, #, ||

- If a category has no members in it, fine;
- If a category has only one phone in it, fine;
- If a category has two+ phones in it, but the phones are in free variation there, fine;
- If a category has two+ phones in it, and they *are not free variants of the same word*, refine the context.
- Stop only when you cannot find a reasonable way to refine the context, or you find minimal pairs (which contrast, by definition).

- That's it.

# English /t/, so far

Realizations: [t<sup>h</sup>], [t<sup>ʔ</sup>], [D] = flap

Utterance-final: [t<sup>h</sup>], [t<sup>ʔ</sup>] in free variation (FV)

\_# [v, +stress]: [t<sup>ʔ</sup>], [D] in FV

\_# [v, -stress]: [D]

## *t* followed by stress:

- She took a test (*both ts followed by a stressed vowel*) -- *flap impossible*.
- She ate ten cookies.
- She brought the ten largest cookies.
- The tedium can be overwhelming.

# Followed by unstressed syllable:

...flap impossible here as well.

- True telepathy might be a boon to humanity.
- He met with *a tenacious opponent in the final round.*
- I tried to buy *a tomato.*
- I *saw Toledo from the air (or, I saw Topeka...)*
- It's not always easy to construct *a topology for a fifteen-dimensional sphere*

# Word-initial /t/

Before unstressed or stressed vowel:

Tomato, Topeka, tumultuous, topology

[t<sup>h</sup>]

Tonight, tomorrow, together, today, to

[D] after vowel-final word,

[t<sup>h</sup>] after consonant-final word

- [repeated] Generalization: When an English word ends in a *t*, that *t* is realized as a flap when a word immediately follows which begins with a vowel; otherwise the *t* is realized as a glottalized stop.
- Generalization: When an English word starts with a *t*, that *t* is realized as a true [t], not as a flap [D].

# And inside words?

**Vowels on both sides unstressed: any word ending in -ity: *sanity***

**Vowel on the left unstressed, vowel on the right stressed *Italian***

**Vowel on the left stressed, vowel on the right unstressed: *Italy, writing* (But: *Latin, button, satin, Martin*)**

**Vowels on both sides stressed:  
*Beethoven, rattan, Eiton* (proper name *Rafi Eiton*), *atoll***

# Word-internally

	Next vowel -stress	Next vowel +stress
Preceding V -stress	<i>Sanity</i> : free variation	<i>Italian</i> : not flapped
Preceding V +stress	<i>Italy</i> : flap <i>writing</i>	<i>Rattan</i> : not flapped <i>Beethoven</i> , <i>atoll</i>

If any consonant immediately follows the t, then we *cannot* have a flap [D]. If the following consonant is an r, the t and r together make a sound not all that different from the sound of ch; the sound is certainly not that of a flap, but it's not a true [t] either: words like *trick*, *troop*, *Petri*, *paltry*.

- If an r precedes the *t*, the flap is normal, with one special case. The normal cases include words like *artichoke*, *Sparta*, *Jakarta*, *article*, *artificial*, *aorta*, *mortal*, and *furtive*.
- But: *important*.

- *Atkins, delightful, platform, beatnik, catnip, atmosphere*, etc. When a consonant other than *r* precedes, such as an *l* or an *n*, as in *altitude* or *cantaloupe*, we generally get a [t], though in casual speech, it is true that the combination of *lt*, and even more of *nt*, is produced so quickly that it is not possible to distinguish it from a rapid flap.

*To, and also Today, tonight,  
tomorrow*

We're going to fly [D]o Seattle on Monday.

What are you going to see [D]onight?

Who will you see [D]omorrow?

This violates the generalization we saw  
before. This 't' is acting as if it were word-  
internal.

# Summary:

t # [-stress v] : [D] [t<sup>?</sup>] • Elsewhere: [t<sup>h</sup>]

t # [+stress v] : [D]

t || : [t<sup>?</sup>]

t # C : [t<sup>?</sup>]

V (r) # to +: [D] [t<sup>h</sup>] FV

Word-internal:

V(r) t [-stress V]: [D]

[-stress V] t [-stress V]:  
[D] [t<sup>h</sup>] FV

# Rider/writer

In most dialects of American English, the diphthong /aj/ is realized as [ʌj] before a voiceless consonant in the same word.

- [ʌj] in *height, tight, hike, type, write*
- [aj] in *tie, tied, ties, time, tile, hide, ride*

What about *rider* and *writer*?

# Rider/writer

- The phonemicists said, the only thing that is relevant for phonemic analysis is the sounds, not “where the words came from”.
- If so, *writer* and *rider* establishes a minimal pair distinguishing [aj] and [Λj]; but they are only contrastive before [D].
- So aj / Λj differences gets pushed upstairs: can't be phonemic. But where each can appear is based in part on allophony!

# Generative phonology: an alternative

- Start with underlying form
- Establish rules modifying a form, and
- Allow rules to be ordered
  - Rule 1: /aj/ -> [ʌj] /  $-\left[ \begin{array}{c} C \\ -voice \end{array} \right]$
  - Rule 2: Flapping
- So Rule 2, by applying after Rule 1, makes it harder to see (for the learner) what the conditions are for Rule 1: *opacity*; counter-bleeding.

## Brief digression on *rule ordering*

Let's say Rule 1 is ordered before Rule 2.

If Rule 1 creates opportunities for Rule 2 to apply, the ordering is *feeding*.

If Rule 1 takes opportunities away from Rule 2 to apply, it's *bleeding*.

If Rule 2 destroys evidence for why Rule 1 applied, it's counter-bleeding.

If Rule 2's output would satisfy Rule 1, it's counter-feeding.