Allophones
Within a given language, some sounds are considered to be the same sound, even though they are phonetically distinct.

- Same or different?
- pool \([p^hul]\)  spool \([spul]\)
  - phonetically different (aspirated vs. unaspirated)
  - native speakers perceive the same sound
A phoneme can be pronounced in different ways according to its context.

Compare:
The difference between /t/ in: tea, eat, writer, eighth, two
The difference between /i:/ in: see, seed, seat, seen

Therefore, a phoneme may have more than one realization.

The different realizations of a phoneme are called allophones of that phoneme. The allophone is a variant of a phoneme.
Try saying these two words: *car* and *keys*

What’s different about the initial sound in each word?

Phonetically: \[k^h\alpha: \text{c}^h\text{i:z}\] (\(^h\) = aspiration c=palatal stop;)

\([k^h]\) and \([c^h]\) are *allophones* of the /k/ phoneme.
# Aspirated and unaspirated voiceless stops in English

<table>
<thead>
<tr>
<th>English</th>
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<tbody>
<tr>
<td>( p^h u: )</td>
<td>pool</td>
</tr>
<tr>
<td>( spu: )</td>
<td>spool</td>
</tr>
<tr>
<td>( k^h I: )</td>
<td>kill</td>
</tr>
<tr>
<td>( skI: )</td>
<td>skill</td>
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</table>

- Complementary distribution
- Predictable (no minimal pairs)
- \([ p ]\) and \([ p^h ]\) are allophones of the /p/ phoneme
The phonemic principle

Two or more sounds are allophones of the same phoneme if:

a) they have a predictable, complementary distribution;
b) they do not create a semantic contrast; and
c) they are phonetically similar.

(E.g. [l] and [ɫ] in English: [l] never occurs before consonants or word-finally, [ɫ] never occurs before vowels)
Contrastive distribution: Two sounds are said to be *contrastive* if replacing one with the other results in a change of meaning.

Example:

‘cat’ [kʰæt] and ‘hat’ [hæt]
Types of Distribution Cont.

- **Complementary distribution**: phones appear in differing environments; are allophones of the same phoneme
  - Example:
    - ‘top’ [tʰap] and ‘stop’ [stap]
Free Variation: phones appear in exactly the same environments; no difference in meaning; are allophones of the same phoneme.

- Example:
  ‘economics’ [i] or [ɛ] initially
The mental concept of "supermanhood" (phoneme)

In complementary distribution: never seen in the same place at the same time. Allophones!
NOT in complementary distribution: can both be present at the same time: 
allophones of *different* phonemes
Phonemes & Allophones

/t/ phonemic (abstract/mental) category

\[ \text{in your mind} \]

[t] [tʰ] allophonic (phonetic) realizations

\[ \text{what you actually say} \]
Bracketing convention

- slashes enclose phonemes: /t/
- square brackets enclose allophones: [t]

- This is an important distinction!
Variation in sounds: The case of “t” in American English

- Say the following words:
  - *top, stop, metal, and right*

- What is the difference between the four “t”s?
  - top [tʰap] the “t” is aspirated [tʰ]
  - stop [stap] the “t” is unaspirated [t]
  - metal [mɛrl] the “t” is a flap [ɾ]
  - right [raɪt’] the “t” is unreleased [t’]
The sound we perceive as “t” actually has four phonetic realizations. Since in our mind, the abstract sound is still a “t” we call “t” a PHONEME. Phones go in brackets [t], phonemes go in slashes /t/. Every language has phonemes and variants of that phoneme, which we call ALLOPHONES. Appearance of allophones depends on rules.
What are the rules for the different allophones of /t/?

/t/

[tʰ] [t] [t′] [ɾ]
Allophonic rules for /t/:

- /t/ → [tʰ] word-initially and in front of stressed syllables
  - table, treat, attend, until, attack
- /t/ → [ɾ] intervocally, when second vowel is unstressed
  - better, Betty, butter, cutie, buttocks
- /t/ → [tˈ] word-finally
  - set, right, caught, pit
- /t/ → [t] elsewhere
  - stop, street, antics, Baltic
Allophones of /l/ in English (Hayes)

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>file</td>
<td>slight</td>
<td>wealth</td>
<td>listen</td>
</tr>
<tr>
<td>[fərt]</td>
<td>[sɪˈlɑrt]</td>
<td>[ˈweəθ]</td>
<td>[ˈlɪsən]</td>
</tr>
<tr>
<td>fool</td>
<td>flight</td>
<td>health</td>
<td>lose</td>
</tr>
<tr>
<td>[fuʃ]</td>
<td>[ˈfɪlɑrt]</td>
<td>[ˈheəθ]</td>
<td>[ˈlʊz]</td>
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<tr>
<td>all</td>
<td>plow</td>
<td>filthy</td>
<td>allow</td>
</tr>
<tr>
<td>[ɔl]</td>
<td>[ˈpləu]</td>
<td>[ˈfɪli]</td>
<td>[əˈlaʊ]</td>
</tr>
<tr>
<td>ball</td>
<td>clinging</td>
<td>tilth</td>
<td>aglow</td>
</tr>
<tr>
<td>[bɔl]</td>
<td>[ˈklɪŋ]</td>
<td>[ˈtrɪθ]</td>
<td>[əˈɡlou]</td>
</tr>
<tr>
<td>fell</td>
<td>discipline</td>
<td>stealth</td>
<td>blend</td>
</tr>
<tr>
<td>[fɛl]</td>
<td>[ˈdɪsəpliən]</td>
<td>[ˈsteθ]</td>
<td>[ˈblɛnd]</td>
</tr>
<tr>
<td>feel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[fiʃ]</td>
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The pattern turns out to be as follows:

![Diagram]

- at the ends of words
- when the preceding consonant is voiceless
- when the next sound is [θ]
- elsewhere
Rules describing /l/

Underlying representation: /l/

Phonological rules:

/l/ Devoicing

/l/ → [l] / [+consonant] __

/l/ Dentalization

/l/ → [t̠] / ___ θ

/l/ Velarization

/l/ → [t̠] / ___ ]word
Are these sounds in complementary or similar distribution?

- bat, pat  
  only in similar distribution,
  these are different phonemes

- dun, ton  
  these are the same phoneme

- \( p^h \)in, spin  
  only in complementary distribution

- \( t^h \)on, stun  
  these are the same phoneme
Are these sounds in complementary or overlapping distribution?

- bat, pat \{ overlapping distribution, these are different phonemes
- dun, ton
- $p^h$in, spin \{ complimentary distribution these are the same phoneme
Phonemes vs. allophones

- Recognized by speakers as separate sounds
- Differentiate between words (kill/dill/will), so they appear in overlapping distribution with each other (all at the same place in a word)
- Phonemes are the separate sounds of a language

- Speakers hear them as the same sound
- Allophones are different versions of the same phoneme, so they never appear in the same place in a word: tʰun, but not stʰun. “stʰun” and “stun” aren’t different words.
- That means allophones of a single phoneme appear in complementary distribution.