Week 3: Foreign Accent Transfer
Distinctive Features

Readings: Hayes (APS reader) Chapter 4
Homework: Homework 2 is due before lecture April 19th (you don't have to use distinctive features). **Term Paper**: You should be finding a native speaker to work with and identifying reference sources.

- ❖ For Homework 2 you don't have to use distinctive features
- ❖ For Homework 3 and beyond (including exams and papers) you must use distinctive features.

I. Foreign Accents and Transfer

1. Phonological theory claims that phonological rules/constraints are internalized

- Evidence comes from second language acquisition
  - **i.** A foreign accent is not simply missing the mark

- Three main sources of foreign accent
  - **i.** Speakers apply internalized rules of native language to a foreign language (that doesn't have that rule)
  - **ii.** Speakers fail to detect and apply a phonological rule of the foreign language
  - **iii.** Speakers don't distinguish the phonemes of the foreign language

2. Application of native language rule to a foreign language

- English speakers apply aspiration when speaking Spanish and Italian
  - i. Aspiration rule: word initial voiceless stops become aspirated
  - **ii.** Spanish [tu] realized as [t^hu]

3. Speakers fail to detect and apply phonological rule

- Spanish speakers of English don't apply Aspiration rule:
- Spanish speakers of English don't apply Velarization: word final /ɬ/ is velar
  - **i.** American English [p^hɪɬ] 'pill' realized as [pil] (hard to get the front lax high vowel right also)

4. Failure to detect phonemic difference

- Italian has long consonants:
  - **i.** /setːe/ 'seven' vs. /sete/ 'thirst
  - **ii.** /t/ is not being articulated twice, the closer (apex of tongue to alveolar ridge) is held longer
  - **iii.** Vowels are also short before long consonants, long before short consonants (vowel length is not distinctive – additional phonetic cue to the consonant length)
  - **iv.** [setːe] 'seven' vs. [seːte] 'thirst
- English speakers cannot hear the length distinction, so they don't produce it
- They don't produce vowel length differences either
  - i. [sete] for both 'seven' and 'thirst

- English has two phonemes /b/ and /v/: 'bile' 'substance secreted by liver' vs. 'vile' 'loathsome'
- Peninsular Spanish doesn't distinguish between /b/ and /v/ - they only have /b/ with the allophone [β]
  - **i.** /v/ is illegal in peninsular Spanish

ii. Some Spanish speakers fail to detect the phonemic difference: [báɪl] for 'loathsome' and the 'substance' secreted by the liver.

5. Illegal distribution of allophones

- Allophonic distribution of /j/ and [dʒ] in Peninsular Spanish
  - **i.** Word/phrase initial [dʒ]: *llueve* [dʒwéβe] 'it rains'
  - **ii.** intervocalic [j]: *esta lloviendo* [está joβiéndo] 'it is raining'
- Phonemic difference in English
  - **i.** /j/ 'you', /dʒ/ 'June'
- Spanish has both sounds; theoretically they should be able to get "you" and 'June" because they exist in Spanish.
  - **i.** Depending on distribution in sentence either realized as initial [j] or [dʒ] (following Spanish distribution)
  - **ii.** [jun] 'June' and [dʒu] 'you' according to Spanish distribution.

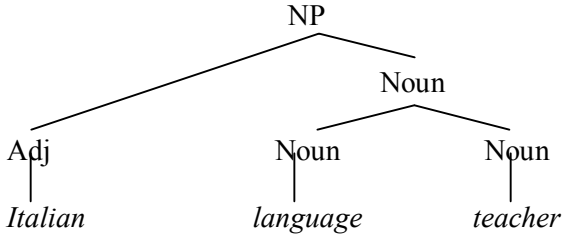
6. Illegal phonemes or sequences:

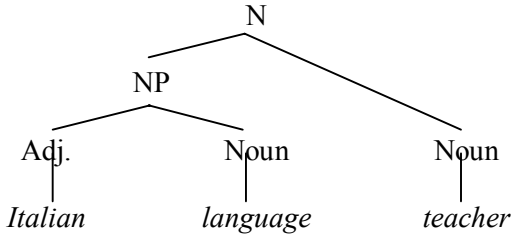
- Phonology is the set of legal sequences in a language (hlep cannot be English)
- Phonology specifies the things that are pronounceable
- Word initial /s/ + another consonant never occurs in Spanish
  - **i.** *estudiante* 'student', *escribir* 'write'
  - **ii.** no words like 'spaghetti' or 'Spain"
  - **iii.** How are these sequences realized in Spanish accented English?

II. Representations in phonology

7. Formal representations of mental phenomena

- Mental representation: a formal device that attempts to model knowledge
- Tree diagram: in syntax it is a formal representation which represents the structure of a phrase
- *Italian language teacher:* Two interpretations, therefore two possible representations





8. Mental representations in phonology

- How are the sounds of speech represented in the mind?
- Phonemes are mental representations: abstract categories

9. Feature Matrix Hypothesis

- An utterance is made up of **individual segments**
- **Individual segments are not indivisible wholes, they can be broken down into bundles of features**

- **Each segment** is represented by a **bundle of features: feature matrix**[1]
- Features are a finite set of physically and/or acoustically defined properties of speech sounds.
- No two sounds have exactly the same features.

e.g. phonemic representation of /kæt/ = [-syllabic, +consonantal, -sonorant, -continuant, -nasal, -voice, +dorsal] [+syllabic, -consonantal, +sonorant, +continuant, -nasal, +voice, +low, -back] [-syllabic, +consonantal, -sonorant, -continuant, -nasal, -voice, +coronal]

10. Strengths of Feature Matrix Hypothesis

- It is explicit, avoids ambiguity, can be tested
- It links mental representations in a direct way to observable phonetic facts (ideally)
  - **i.** [nasal] has an acoustic correlate and a physical correlate (raised velum)
- It allows us to express phonological processes in terms of **natural classes**.

11. Evidence for features: Rules target natural classes – defined as segments that share a set of features

- Phonetically related classes of sounds pattern together in phonological rules.
- Aspiration involves the change of just one feature to a class of sounds

Aspiration: voiceless stops become aspirated when word initial
/p, t, k/ → [p^h, t^h, k^h] / / [$_{word}$___

Previous formulation (using pseudo feature): [consonant, stop, voiceless] → [aspirated] / [$_{word}$___

Formalized with features: [-syllabic, -continuant, -voice] → [+spread glottis] / [$_{word}$___

- We look for any word initial sound whose feature matrix includes these features and change [-spread glottis] to [+spread glottis]
  / kæt/ → [k^hæt]

[**-syllabic**, +consonantal, -sonorant, **-continuant**, -nasal, **-voice**, +dorsal] [+syllabic, -consonantal, +sonorant, +continuant, -nasal, -voice, +low, -back] [-syllabic, +consonantal, +sonorant, -continuant, -nasal, +voice, +coronal] → [**-syllabic**, +consonantal, -sonorant, **-continuant**, -nasal, **-voice**, +dorsal, **+ spread glottis**] [+syllabic, -consonantal, +sonorant, +continuant, -nasal, -voice, +low, -back] [-syllabic, +consonantal, +sonorant, -continuant, -nasal, +voice, +coronal]

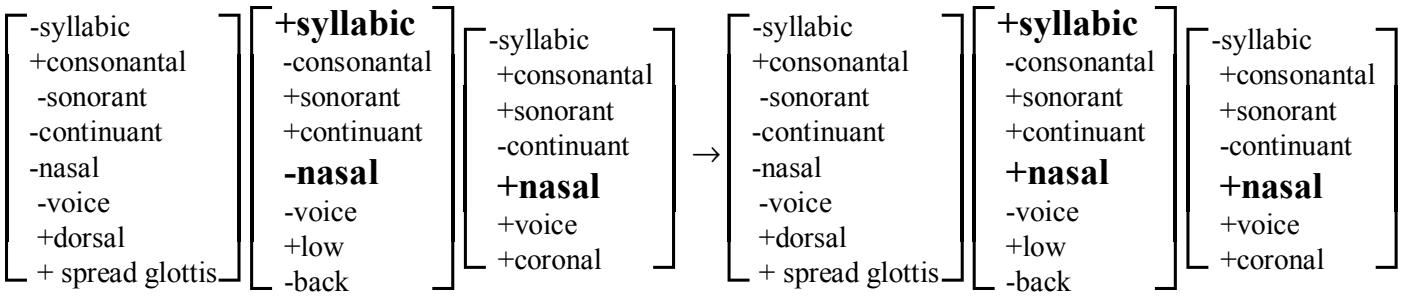
- Only the feature matrix that contains the features [-syllabic, -continuant, -voice], and occurs word initially, undergoes the rule.

12. Nasalization rule: In English, vowels become nasalized when they are followed by a nasal

[1] Bruce Hayes has a file available on his 120a website that allows you to easily do feature matrices with brackets in Word: go to http://www.linguistics.ucla.edu/people/hayes/120a/Brackets.htm

[+syllabic] → [+nasal] / ____ [+nasal]

/kæn/ → [kæ̃n]



- only the matrices that contain the feature [+syllabic] undergo the rule

13. Features systems

- As a result of studying the phonemic contrasts within a number of languages, Roman Jakobson, Gunnar Fant, and Morris Halle proposed about 14 distinctive features (mostly acoustic) in 1951. All of the features were binary (+/-), in the sense that a phoneme either had, or did not have, the phonetic attributes of the feature.
- Sound Pattern of English (Chomsky and Halle 1968) proposed many more features. The features we will use are mostly the ones from the SPE (except +/-approximant). These features refer both to the production of sounds and the acoustic properties of sounds, and are binary (have either a positive or negative value).

14. Ideally the distinctive features should do the following:

- Be able to **characterize all contrasting segments** in human languages, but (ideally) we don't want features that are only needed to characterize one language (system should be economical)
- **Be able to capture natural classes** in a clear fashion (phonological rules usually refer to natural classes);
- Be transparent with regard to phonetic correlates (ideally): for aspiration the feature [spread glottis] refers to position of vocal chords.

15. Disclaimer: Memorizing segments and their features

- I don't expect you to memorize the exact feature set for all segments (because I haven't done this either).
- For assignments and papers you should use the tables on pages 95-101 in the Hayes reader.
- You can also use Feature Pad if you find it helpful**:**
  http://www.linguistics.ucla.edu/people/hayes/120a/FeaturePad.htm
  - **i.** I would practice using charts, since Feature Pad won't be available when you take in class exams.

❖ The set of distinctive features, and how they apply is not uncontroversial.
❖ For the purpose of this class we will follow the charts in the Hayes reader

❖ *We won't have time to go into detail on every issue. You should read Hayes Chapter 4 and refer back to it when doing problem sets. From now on we will be using features so we will return to these issues repeatedly.*

III.

IV. Manner features

16. Manner features distinguish 'manner of articulation': degree of constriction in the vocal tract (how close the articulators get)

- Manner features distinguish major classes of sounds: vowels, glides, liquids, nasals, obstruents (fricatives, affricates and stops).

17. [syllabic]: not really a manner features but used to distinguish vowels: functions as the peak of a syllable (in most languages only vowels- we will return to this point): this feature is more abstract (not a concrete phonetic correlate) and will require further explanation.

- [+syllabic]: sound which is part of the nucleus of the syllable
- [-syllabic]: sound which is in the onset or coda of the syllable
- Distinguishes vowels from glides, liquids, nasals and obstruents [stops, fricatives affricates]
    i. [+ syllable]: vowels
    ii. [-syllabic]: glides, liquids, nasals, obstruents (fricatives, affricates, stops)

18. [Consonantal]: sounds with a radical obstruction/constriction in the vocal tract

- Distinguishes vowels and glides from liquids, nasals and obstruents (fricatives, affricates, stops)
    i. [-consonantal]: vowels and glides [j, w],
        1. Hayes: [h] glottal fricative
    ii. [+consonantal]: consonants (liquids, nasals, obstruents)
        1. Hayes includes [ʔ] glottal stop and [ʕ] pharyngeal fricative

19. [Approximant]: Sounds which are [+approximant] are those sounds whose constriction allows for a frictionless escape of air in the oral cavity. (non-SPE feature)

- Distinguishes vowels, glides and liquids from nasals and obstruents
    i. [+approximant]: vowels, glides and liquids
    ii. [-approximant]: nasals [there is a oral closure], obstruents (fricatives, affricates, stops)

20. [Sonorant]: sounds for which spontaneous voicing is possible (the default setting for sonorant sounds is +voice [constriction in the vocal tract that allows the air pressure both behind and in front of the constriction to be relatively equal]

- [+sonorant] voicing is default setting (air pressure doesn't build up)
- [-sonorant]: there is an obstruction the vocal tract, pressure builds up (high pressure) and voicing is more difficult (pressure cannot be the same or higher than the pressure in the lungs because air won't flow)
    i. Voiceless obstruents are more common than voiced obstruents
    ii. Voiced sonorants are far more common.
- *Distinguishes vowels, glides, liquids, nasals (all usually voiced – voice usually not distinctive) from obstruents (fricatives, affricates, stops) (sounds which more commonly have a voicing distinction)*
    i. [+sonorant]: vowels, glides, liquids, nasals
        1. nasals qualify because there is unrestricted airflow through the nose – even though there is a constriction in the vocal tract: air escapes through the nose and allows spontaneous voicing (higher air pressure in lungs than in oral/nasal cavity- air flows from high to low pressure, you need airflow over vocal chords to get voicing)
    ii. [-sonorant]: obstruents (fricatives, affricates, stops)

21. Sonority Hierarchy: It is useful to arrange the manners of articulation into a hierarchy based loosely on the acoustic sonority (loudness) of sounds.

most sonorous (loudest) ◄——————————————————► **least sonorous**

	vowels	glides	liquids	nasals	obstruents
[syllabic]	+	-	-	-	-
[consonantal]	-	-	+	+	+
[approximant]	+	+	+	-	-
[sonorant][2]	+	+	+	+	-

- Contiguous sets on the sonority hierarchy tend to form natural classes.
  i. vowels and glides
  ii. liquids and nasals
- Non-contiguous sets seldom pattern as natural classes.
  i. vowels and nasals, but not glides and liquids
  ii. nasals and glides, but not liquids

22. The four above features capture this pattern. Each feature defines a cutoff point along the hierarchy

- All contiguous sets along the hierarchy can be expressed as a natural class.
  i. glides, liquids and nasals: [-syllabic, + sonorant]
  ii. vowels, glides, liquids: [+approximant]
  iii. liquids and nasals: [+consonant, +sonorant]
  iv. nasals and obstruents [-approximant]

- Generally, for major classes of sounds, the following holds (we will discuss complications): you can use these features do define each class.
  i. vowels: [+syllabic]
  ii. consonants: [-syllabic]
  iii. glide: [-syllabic, -consonantal]
  iv. liquid: [+consonantal, +approximant]
  v. Nasal: [-approximant, + sonorant]
  vi. obstruents (except the nasal stops): [-sonorant]

23. [Nasal]: produced with nasal airflow, used with both vowels and consonants

- [+nasal]: nasal stops, nasalized vowels
- [-nasal]: all oral sounds

[2] You may notice that there is a type in the sonority hierarchy in the Hayes reader on page 74. The vowels, glides, liquids, nasals should be [+sonorant] not [-sonorant]

24. [Long]: refers to relative duration of vowels or consonants

- Italian: distinctive long consonants: /sétːe/ 'seven' vs. /séte/ 'thirst'
  - i. long consonants often referred to as 'geminates'
  - ii. short consonants, 'singletons'
- Latin and Papago have distinctive long vs. short vowels
  - **i.** Latin: /i, iː, e, eː, a, aː, o, oː, u, uː/

25. [+Syllabic] the peak/loudest segment of a syllable (cross-linguistically, usually vowels):

- [+syllabic] generally refers to vowels, because vowels are usually the peak (most sonorous/loud part) of syllables
- [-syllabic] usually means a consonant [not the peak/loudest part of a syllable]
- There are languages where consonants can be the peaks of a syllables
  - i. English [n] in 'night' and 'tan' is [-syllabic]
  - ii. English [l] in 'light' is [-syllabic]
  - **iii.** English: [bǽɾ̩t] 'battle', [bʌ́tn̩]: these sounds have two syllables – there is not vowel in the second syllables: consonant is said to be [+syllabic] because it is the loudest segment of the syllable.

Syllabic liquid: [+syllabic, +consonantal, +approximant]

Syllabic nasal: [+syllabic, -approximant, +sonorant]

- Berber said to allow fricatives and stops to be syllabic (this is rare): you want loud/sonorous segments as the peak of a syllable: obstruents are at the least sonorous end of the sonority scale.

26. The only feature that distinguishes vowels from glides is [+syllabic].

- In this system, syllabic glides (if they exist) and vowels will have the same representation

Vowel: [+syllabic, -consonantal]

Glides: [-syllabic, -consonantal]

Syllabic glide: add feature [+ syllabic] and it becomes the same as a vowel: [+syllabic, -consonantal]

- In principles, any sound can be [+syllabic], however the majority of worlds languages only allows vowels as syllable peaks. For these languages it is reasonable to use [+syllabic] to indicate all of the vowels.

27. Implicational hierarchy and the sonority scale: if in a given language, a segment of a certain type can be a syllable nucleus (peak), then all segments of greater sonority may also serve as a syllable nucleus

- Some Berber languages allow obstruents to occur as a nucleus: [+syllabic] obstruents imply [+syllabic] nasals, liquids, glides and vowels (everything at least as sonorous as an obstruents)

- English allows [+syllabic] nasals: therefore [+syllabic] liquids, glides and vowels are implied/predicted by the hierarchy (everything at least as sonorous as a nasal)
- Czech and Serbo-Croatian allows liquids and vowels but not other sounds: a syllable peak must be at least as sonorous as a [+approximant] (everything at least as sonorous as a liquid)
- Most languages only allow vowels as the syllable nucleus: [-consonantal]

28. *Sonority Sequencing Principle [SSP]: The most sonorous element of a syllable serves as the nucleus; segments become progressively less sonorous towards the edge of the syllable.*

plant

p	l	æ	n	t
obstruents	liquid	vowel	nasal	obstruents
		most sonorous		
least sonorous		◄——►		least sonorous

29. *[s] common exception to the sonority sequencing principle [SSP]*

- The scale can be further broken down
- among obstruents, fricatives are more sonorous than affricates and stops,
- /s/allowed at syllable margins (creates a sonority dip)
- Maybe just because [s] is generally more audible than other fricatives (high frequency frication noise) and therefore is an exception on the sonority scale

stripes

s	t	r	aɪ	p	s
fricative	stop	liquid	vowel	stop	fricative

V. Obstruents: Stops, affricates and fricatives

30. *[continuant]: produced with continuous airflow in the vocal tract*

- Among obstruents, distinguishes fricatives from affricates and stops
- [+continuant]: fricatives, liquids, glides and vowels
- [-continuant]: involves full closer in the vocal tract, stops, affricates
    i. stops, affricates
    ii. nasals are [-continuant]; vocal tract is obstructed
    iii. glottal stops

31. *[delayed release]: produced with delayed release of oral obstruction (this "delay" produces frication)*

- Distinguishes fricatives and affricates from stops
- [+delayed release]: fricatives and affricates
- [-delayed release]: stops

- Papago Palatalization involves change in just the feature [delayed release]:
  /t, d/ → [tʃ, dʒ] / ____ [i,u]
  $\begin{bmatrix}\text{+coronal}\\ \text{-continuant}\end{bmatrix} \rightarrow [\text{+delayed release}] \;/\; \text{\_\_\_\_} \begin{bmatrix}\text{+syllabic}\\ \text{+high}\end{bmatrix}$

32. *We can now distinguish fricative, affricates and stops*

	fricatives	affricates	stops
[continuant]	+	-	-
[delayed release]	+	+	-

33. *Not all segments are assigned a value for all features*

- In system presented in the Hayes reader, only oral stops (not nasal stops), affricates and fricatives have a value [+/-] for [delayed release].
- [delayed release] is undefined [0] for all other sounds (including nasal stops)

VI. Features for Vowels

34. *Phonetic basis for classifying vowels is to specify height, backness and rounding.*

35. *Horizontal dimension: [back] and [front] – gives you a three way distinction*

- [back]: produced with the body of the tongue retracted from the neutral position
- [front]: produced with the body of the tongue more forward than the neutral position
- Papago: [i, ɨ, u]
- Norwegian: [y, ʉ, u]: [byː] 'town', [bʉː] 'shack', [buː] 'live'

	front vowels	central vowels	back vowels
[back]	-	-	+
[front]	+	-	-
	[i, y]	[ɨ, ʉ]	[u]

- Spanish

	front vowels	central vowels	back vowels
[back]	-	-	+
[front]	+	-	-
	[i, e]	[a]	[u, o]

- ❖ Notice there /a/ is a low central vowel and /æ/ is the lowest front vowel. This is different from the IPA system where /a/ is a front low vowel.
- ❖ Goal is to only provide as many features (and subsequently symbols which represent feature matrices) necessary to describe possible contrasts within a language, and provide a way of identifying natural classes.
- ❖ IPA has four symbols for low vowels
- ❖ No language has a vowel inventory that has a phonemic contrast for all four low vowels.
- ❖ There are some subtle differences between the use of IPA symbols for phonetic vs. phonological purposes.

36. Vertical dimension: [high] and [low]: allow three way distinction

- [high]: produced with the body of the tongue raised above the neutral position
- [low]: produced with the body of the tongue lowered below the neutral position
- Spanish, Calabrian

	[high]	[low]
[i, u]	+	-
[e, o]	-	-
[a]	-	+

- Calabrian bans mid vowel contrasts in stressless syllables: $*\begin{bmatrix} +\text{syllabic} \\ -\text{high} \\ -\text{low} \\ -\text{stress} \end{bmatrix}$
- Calabrian vowel raising: /e, o/ → [i, u] / $\begin{bmatrix} \underline{\quad} \\ -\text{stress} \end{bmatrix}$

$$\begin{bmatrix} +\text{syllabic} \\ -\text{high} \\ -\text{low} \end{bmatrix} \rightarrow [+\text{high}] / \begin{bmatrix} \underline{\quad} \\ -\text{stress} \end{bmatrix}$$

- Papago palatalization environment: / ____ $\begin{bmatrix} +\text{syllabic} \\ +\text{high} \end{bmatrix}$

37. [stress]: we are using it as a feature in the above rules: discussed later in Chapter 14 – may be a feature of an entire syllable.