Suprasegmentals
(and syllables)
Syllables

• General idea of syllable is easy
• Phonetic details are not so clear
  – May be as much about phonology as phonetics
• Easy to harder questions:
  – How many syllables?
  – Where are syllable boundaries?
  – What are the phonetic (physical) properties of syllables?
How many syllables?

- Often pretty clear: ‘dad’ 1, ‘banana’ 2
- What about these 1 or two syllables?
  - ‘tower’ vs. ‘hour’; ‘hire’ v. ‘higher’
    - /ˈtɔwər/ or /ˈtɔwər/, /ˈhajər/?
  - ‘feel’: [ˈfɛl] or [fiɛl]?
Syllable boundaries

• We have rules for English… but that seems more like phonology than phonetics
  – Native speakers can disagree

• But we seem to need to refer to syllables for understanding occurrences of some allophones
  – E.g. dark [ɬ] at end of syllable, clear [l] elsewhere

• Chicken and egg phenomenon?
  – Hard to do detailed phonetics without reference to phonology
Phonetic properties

• Hypothesis: Syllable centers are sonority or (loudness??) peaks
  – Maybe, but we need to exclude sibilants or ‘spa’ will be two syllables
  – No accepted phonetic interpretations (physical definitions) of sonority work

• Breaks down when we consider ‘lightning’ vs. ‘lightening’
  – Ladefoged suggests we need a measure of ‘prominence’ that includes duration as well as sonority
Morae

• The mora:
  – Some languages may have ‘timing units’ intermediate between syllables and segments (Cs and Vs)

• Japanese seems to care about the mora
  – A single short vowel with or without an onset consonant (C)V is one mora
  – But (C)V: with long vowel or
  – (C)VN with coda nasal count as 2 morae
Rogers haiku example p 271

/ha-ru-ta-tsu ja
ʃi-n-ne-n fu-ru-ki
ko-me-goʃo-o/

‘Spring starts;
new year, old rice
five quarts’
Isochronicity (equal timing)

- Persistent claims of differences among languages of ‘equally timed units’
- Claim: Roughly equal time interval between
  - Syllables in syllable-timed languages (French, Spanish)
  - Morae in mora-timed languages (Japanese, Finnish??)
  - Stressed syllables in stress-timed languages (English, other Germanic languages)
- Measurements show rough tendencies
- Experiments with speaking in time to metronome seems to be consistent
Suprasegmentals

• Roughly 5 things referred to as suprasegmental
  – **Length** or quantity (long v. short Cs and Vs)
  – **Tone** (pitch differences mark word differences)
  – **Pitch accent** (somewhere between stress and tone)
  – **Stress** (some syllables more ‘prominent’ than others)
  – **Intonation** (pitch patterns associated with whole phrases)
Length (quantity)

• Many languages have systematic difference between long and short consonants and vowels with same ‘quality’
• Long ones sometimes called ‘geminates’ (twins)
• Examples: Italian long vs. short consonants
  – /fato/ v. /fatto/ = [fat:o] ’fate’ v. ’done’
Finnish C(:) and V(:)

- saattaa [saːtːaː] ‘to be able’
- saata [saːta] ‘be able’
- sata [sata] ‘one hundred’
- sataa [sataː] ‘it is precipitating’
- kuka [ kuka] ‘who’
- kukka [ kukːa] ‘flower’
- kuukausi [ kuːkausi] ‘month’
Lexical tone

• Tone languages: languages that use stylized pitch differences to signal different words
  – The majority of the worlds languages are tone languages
  – The mechanism that accomplishes this can be called:
    • ‘tone’, ‘lexical tone’ or ‘lexically distinctive tone’
Two major types

- Register tone languages
  - A few ‘steady’ or level tones
    - High v. low
    - High v. mid v. low

- Contour tone languages
  - Some level tones (low, high, mid)
  - Some that have ‘contours’ i.e., they change pitch (e.g., Low -rising, high falling’)
  - May have quite a few patterns: 4-7 not uncommon
## Nupe: (Nigeria)
### A Register Tone Language

<table>
<thead>
<tr>
<th>Word</th>
<th>IPA</th>
<th>Tone</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>ba</td>
<td>ba ˦</td>
<td>high</td>
<td>to be sour</td>
</tr>
<tr>
<td>ba</td>
<td>ba ˧</td>
<td>mid</td>
<td>to cut</td>
</tr>
<tr>
<td>bà</td>
<td>ba ˨˩</td>
<td>low</td>
<td>to count</td>
</tr>
</tbody>
</table>
Ways to mark tone

• Several variations
  – Numbers in pitch range is popular
  – E.g. a high tone might be 5, a low tone 1,
    • A low mid rising tone might be 3-5

• Official IPA is via ‘tone glyphs’

• Vertical line (trunk) at right represents range
  – Horizontal line to left (branch) indicates level tone
  – More complex tones suggested by position and shape of the left branch
## Mandarin /ma/ + tone

Famous example one more time

<table>
<thead>
<tr>
<th>Description</th>
<th>Wade-Giles</th>
<th>IPA</th>
<th>Pinyin</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>High level</td>
<td>ma¹</td>
<td>ma</td>
<td>mā</td>
<td>‘mother’</td>
</tr>
<tr>
<td>High rising</td>
<td>ma²</td>
<td>ma</td>
<td>má</td>
<td>‘hemp’</td>
</tr>
<tr>
<td>Low-falling rising</td>
<td>ma³</td>
<td>ma</td>
<td>mǎ</td>
<td>‘horse’</td>
</tr>
<tr>
<td>Low falling rising</td>
<td>ma⁴</td>
<td>ma</td>
<td>mà</td>
<td>‘scold’</td>
</tr>
</tbody>
</table>
Wikipedia’s tone chart for mandarin Tones 1-4
http://upload.wikimedia.org/wikipedia/commons/7/76/Pinyin_Tone_Chart.png

High range of speaker’s pitch

Low range of speaker’s pitch
Modifications of tone

• Not just a fixed musical pitch or melody
  – Relative to speaker’s range (soprano vs. basso)

• Several other phenomena complicate the realization of tone
  – Language specific phonological patterns
    • Downdrift-- gradual lowering of pitch of all tones
    • Downstep- specific syllables trigger shift of pitch range
  – Intonation can affect pitch patterns globally
Pitch Accent

• Pitch accent is a phenomenon somewhere between lexical tone and stress systems.
• Lexical tone: any syllable can have almost any tone.
• Pitch accent: only certain specific syllables in a word get special tone (e.g. one high level pitch per word).
  – Japanese pitch accent somewhat more complex.
    • Pitch accent roughly determines where in a word certain tone switches take place (see Rogers p 277).
Stress

• Stress prominence tied to word or phrase
• Some languages have predictable stress,
  – E.g. Finnish always on first syllable.
  – Can be tied to end of word
    • Ultimate, penultimate, antepenultimate
  – Can be more complex but still fully predictable
• Some (English) have stress as a distinctive property
  – ‘insult’ noun vs.. verb.
• Some languages may have only phrasal stress
  – E.g. French: last syllable of a phrase is stressed
What is stress?

• Ladefoged says it involves extra effort on part of speaker
  – Push air out harder
  – Laryngeal adjustment to raise pitch
  – Hold vowel longer

• Has complex set of acoustic cues
  – Not fully understood
Intonation

• Intonation is use of pitch to signal meaning differences at the level of an entire phrase or sentence

• Study of intonation is almost a separate branch of phonology
  – Phonetic details are hard to grasp
  – I can’t explain what I don’t understand.
Summary

• Suprasegmentals are an important part of language
• The phonetics of the phenomena is not well understood yet
• Many distinct phenomena involve overlapping acoustic properties (pitch, amplitude, duration)
• Not clear what the articulatory source is nor how to parse out the acoustic consequences