English and tone languages

Class 10

John Goldsmith
English as a Tone Language

- Some basics about language and speech
- Tone languages and non-tone languages around the world
- Intonation in English
  - for those working in speech
  - for those whose work in grammar can feed the prosodic component to make a superior prosodic system.
First, some basics about speech and language...
Some reminders about speech...

- On the physical nature of the speech signal, and the origin of pitch and fundamental frequency
Source and filter model of speech

- Source: vibrations of the vocal folds
  - ...give rise to a regular wave with fundamental frequency ($F_0$) equal to the pulsation rate...
  - ...and with harmonics equal to integral multiples of that fundamental frequency $F_0$. 
Phones (a.k.a ‘segments’)

- Vowels
- Consonants
  - And the rest is prosody
Prosody

- Pitch
- Length
- Loudness
- Organization of phones into larger units:
  - Syllable
  - Stress Foot
  - Intonational phrase
Some terms

- Pitch: the linguistic side of fundamental frequency ($F_0$)
- Tone: the analysis of pitch into discrete units (both in temporal and frequency dimensions)
Tone languages and other languages around the world
Languages of the world

- Tone languages
  - Classical definition: Use tone to distinguish ‘lexical items’ - i.e., words.
  - Employment of tone in grammatical system
- All else: nontonal languages?
Sharper resolution:

- This ‘tonal/nontonal’ split is unsatisfactory because it leaves a lot of languages unresolved: hence a better split has been suggested:
- Accentual languages vs. nonaccentual languages...
Accentual languages

...where exactly one syllable is marked as special in some respect that bears on tone

- Japanese (standard, Tokyo): all syllables (but the first) are High in tone, up to and including the accented syllable
- many European languages: the accented syllable serves as the point of sharp pitch change, either upwards or downwards.
Typologizing some more, along a dimension orthogonal to accent:

- What is the source of the tone melody on a given word? What else can influence that tone?
  - the word itself can be the source of the tone (clear cases of tone languages, in Asia, Africa, and Mesoamerica);
  - two (+) accent classes (Scandinavian, Japanese dialects, Serbocroatian, etc.), where 2 options are available
  - the grammatical construction
  - the pragmatic and semantic system
- What formal (algorithmic) techniques are necessary to align the tone melody to the syllables?
Source of tones

- Tone language: Igbo (Nigeria)
  - *mma* (‘good’: High Mid; ‘knife’: High Low)
  - Further split:
    - Unrestricted tone languages
    - Restricted tone languages

- Tone language: Tonga (Bantu, Zambia)

- Grammar; Semantic and pragmatics
  - familiar European languages:
    - Neutral reports
    - Questions
    - Irritation intonations, etc.
Alignments of tones and syllables

- Languages with small words: few problems
- Languages with long words: accentual systems serve as the anchor point for tone melodies
  - tone languages: Bantu
  - non-tonal languages: English
Tone Language: Igbo (Nigeria)

- mma ‘good’ High Mid
- mma ‘knife’ High Low
Traditional work on English intonation, plus theoretical models developed in the second half of the 1970s by J. Goldsmith, M. Liberman, and J. Pierrehumbert at MIT.
English and its intonation

- Let’s look at the pitch of some neutral utterances of single words:
  - Sam (1 syllable)
  - Canada (3 syllables, initial 1 stress)
  - balloon (2 syllables, final 1 stress)
Neutral intonation 1

Sam

H L

pitch
Neutral intonation 2

Ca na da

Ca na da

H  L
Neutral intonation 3: final stress

balloon

H   L
Neutral melody
Words versus phrases

- We have not carefully distinguished between properties of words and properties of phrases.
- We reserve the term “stress” to designate a property of individual syllables within particular lexical items (=words).
- Accent is used to refer to prosodic properties within an utterance. An utterance contains at least one word, and frequently many more than one.
Within the word: there are 3 levels of stress in English:

- **Primary stress**: top layer of prominence of grid (see textbook)
- **Secondary stress** (layer 1)
- **Unstressed** (layer 0 only)
Metrical grid

<table>
<thead>
<tr>
<th>Row 0</th>
<th>x</th>
<th>x</th>
<th>x</th>
<th>x</th>
<th>x</th>
<th>x</th>
<th>x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Row 1</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Row 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

A L A B A M A

*  

Tone melody links here
Levels of stress:
Primary stress

- Every word has a syllable where the pitch change occurs. In the neutral intonation, it is the final High pitched syllable (which will have a falling tone if it's final). This is the primary stress (1 stress). It bears the asterisk. In short: melody: H* L

- Primary stress is culminative: exactly one per word. * sits on the primary stress.
Primary stress

- The syllable of the word which has the potential to be associated with a special (accented) tone in a phrase is the *Primary stressed syllable*.

- In a given utterance, not all primary stresses will in fact bear a pitch accent:

  "I *told* Bill that those books wouldn’t *sell.*" (*Bill, books, sell*: no pitch accent)
Secondary stress and unstressed

- Syllables of English may be divided into: +stress: those that have a (nonreduced) vowel, and
- Stress: those that have only a reduced vowel (schwa, syllabic l, r, n).
- There are alternations: metal, metallic; Italy, Italian; etc.
Duration (in brief)

- Lengthening of monosyllables
  - King
  - the King family
  - Smoking

- Monosyllabic feet
  - stressed syllable before a stressed syllable:
    - *Ti-con-de-ro-ga*
Compound nouns

- *The White House* (versus a *white house*)
- What is the stress pattern?
- The first word bears the final High pitch, hence it has the primary stress.
- *White House*
Shifting to phrasal intonation...
Are all 1 stresses High?

- No.
- Do you want coffee, tea, or milk?
“Disjunction” intonation: coffee, tea, or milk?

\((L^* H)^n \quad H^* L\)

coffee \quad tea \quad or \quad milk

\(L \quad H\) \quad \(L \quad H\) \quad \(H \quad L\)
Source of melodies

Basic melody formulas, in English as in Tonga, but in English is determined by the message, not by the lexical items (the morphemes).
Some words in an utterance bear accent, and some do not. Some of this is guided by linguistic rules, but not all.

Tonal melodies are assigned to the phrases of an utterance, and there are three centers of interest: the edges (L and R); the accented words; and the unaccented material that follows the last accent.

The choice of the tone melodies is tricky and elusive!
Tones are High or Low, but there are principles for realization of these tones at specific pitches.

The main principles for pitch realization is decrease in pitch of High tones.

This can happen at two “levels” at the same time: a slower, longer term decrease, and a quicker, short term decrease.
Pitch accents

In general, certain syllables are assigned pitches, and others have a pitch not directly controlled by the "language", but are rather within the idiosyncratic control of the speaker:
Developing some basic intonational formulas
Parts of the formula

- The sentence is divided into intonational phrases. Each phrase has potentially:
  - Initial boundary tone %T (%H or %L)
  - A sequence of 0 or more prenuclear melodies, each with a single tone accent: H*, or H*L, or LH*, or L* H, etc.
  - A single final nuclear melody: H*, L*
  - a spreading phrasal tone: L (no star)
  - A Final boundary tone (H% or L%)
A typical, neutral pattern

%L  H*  H*  H*  L-  L%

The President won’t sign the bill tomorrow.

%L  H    H    H  L L%
Parts of the formula

- The sentence is divided into intonational phrases. Each phrase has potentially:
  - **Initial boundary tone** %T (%H or %L)
  - A sequence of 0 or more prenuclear melodies, each with a single tone accent: H*, or H*L, or LH*, or L* H, etc.
  - A single final nuclear melody: H*, L*
  - a spreading phrasal tone: L (no star)
  - A Final boundary tone (H% or L%)
Bill Gates, *president of Microsoft*, was present at the dinner.

Bill Gates, *president of the Microsoft Corporation*, was present at the dinner.

Apposition will be either:

- L* H H%
- H* L H%
Syntax: Appositives and conjuncts

- Bill Gates, the President of the United States, the Prime Minister of Canada, and the Queen of England were all present at the dinner.
  - L H*, L H*, L H*, H* L- ....
**Appositive**

*Bill Gates, the president of the Microsoft Corporation, was present at the dinner.*

- Here, *Bill Gates* can have either L H*, followed by L% L* H% in the parenthetical, or *Bill Gates* can have H*L, but this sounds more formal (and as if read); but it won't have L* H. (Perhaps it *can*, in the context of a longer listing.)

- NB: these are *not* effects of the comma: those are limited to boundary tones. We are looking at the tone assigned to the nuclear accent of the preceding phrase (High versus Low).
Parts of the formula

- The sentence is divided into intonational phrases. Each phrase has potentially:
  - Initial boundary tone %T (%H or %L)
  - A sequence of 0 or more prenuclear melodies, each with a single tone accent: H*, or H*L, or LH*, or L* H, etc.
  - A single final nuclear melody: H*, L*
  - A spreading phrasal tone: L (no star)
  - A Final boundary tone (H% or L%)
Phrasal tone

- This is the tone that immediately follows the final pitch accent of the phrase. In unusual cases, there may be none, leading to unusual intonations: ★ ★

- **Would you stop putting your feet on my desk?**

  ![Prenuclear and nuclear tones](image)
Downdrift, downstep, declination

- the single most important item in natural sounding speech
- NPR item 1: Cool and cloudy today.
'Cool and 'cloudy today. 'Showers are 'like/ly by this 'af/ternoon, with 'highs/ in the upper ^60s. It's 'fifty nine degrees at '8:!'10/. This is KUOW. I'm ^Bill^ Radke.
Downdrift and declination....

[As might have been anticipated], [nothing about Kim Philby] [was quite what it seemed]. [reset] [In January 1963] he had been [offered a formal immunity from prosecution], [specially authorized by the Home Secretary and the Director of Public Prosecutions, and he had accepted it.]
A familiar pattern in long sentences
The overlay of two linear functions

\[ f(t) = 0.2t + 0.5 \]

Remainder(3t)
Prominence

All Highs are High -- but some are Higher than others: assign syntactic and semantic prominence. (Do it linearly.)
Nuclear Stress Rule

“The last accent is always the most important.”

Not true! ....but this is a rule not without some utility.
Pitch Accent attractors

- All major class items (nouns, verbs, adjectives)
- Pronouns will not bear pitch accent except under special conditions (focus, contrast).

  - We noticed an eight foot tall yeti among the trees. I tried to photograph him before he could run away. But he ran too fast, the sun of a gun.
More pitch accent attractors

- ‘only’:
  - Only *Military Intelligence* knew that Oswald had used the name “Heidell.”

- comparatives:
  - *Asian* languages have more rising tones than *Bantu* languages do.
In conclusion

- Intonation in English is part of a larger structure of tonal patterns in the world’s languages
Intonation

- Intonation is composed by merging an intonational formula with a pattern of accentual prominences established on each intonational phrase