Graz Summer School, September, 2018
Intonation and word order, Féry

Class 2: Tone and intonation in sentences

1. Introduction

The typology is extended to tonal structure and pitch accents assigned at the level of the Φ-phrase and the ι-phrase, i.e. to 'sentence intonation'.
In intonation languages, all tones are specified at the level of higher prosodic levels; no invariant tonal contour is assigned at the level of the ω-word. The tones defining the sentence melody have their own grammar, and they associate at different points in the sentence, an important anchoring reference being the (abstract) lexical stresses. As a result, sentence melodies are independent of the text carrying them. Different melodies can carry different pragmatic meanings.

(1) a. Did you hear the news: Baxter will come BACK.
b. Is it true? Baxter will come BACK?
c. It is not Smith I am talking about: BAXTER will come back.

A large part of sentence intonation is the direct consequence of scaling of tones, e.g. downstep, reset and upstep, which must be kept apart from tonal assignment.

2. The role of information structure

Information structure (focus, topic, givenness) is crucial for the study of sentence intonation.

(2) Focus indicates the presence of alternatives that are relevant for the interpretation of linguistic expressions.

- change in the phrasing of the sentence
- change in the tonal structure of a lexical stress or of the sentence intonation
- syntactic and morphological reflexes.
- change of register in an entire prosodic domain – usually the one containing the focus, as pre- or post-focal compression.

(3) {Who ate a lemon pie?}
a. [MARY]$_F$ ate a lemon pie.
{What did Mary eat?}
b. She ate [a LEMON PIE]$_F$
{What happened?}
c. [Mary ate a LEMON PIE]$_F$

(4) A given constituent is entailed by the preceding discourse, or it is salient (accessible) in the context.

(5) a. I got on a bus yesterday and [the driver]$_G$ was drunk.
b. I got on a bus yesterday and I immediately noticed [the driver]$_G$.

(6) A topic is a denotation of a referential expression about which the remainder of the sentence expresses a proposition.

(7) A: What do your children do?
B: [My [DAUGHTER]$_F$]$_{TOP}$ [studies law]$_{COM}$, and [my [SON]$_F$]$_{TOP}$ [wants to travel to Brazil]$_{COM}$.

3. Tonal structure

```
                                        ×       ι
          ×             ×             ×       Φ
  ×       ×     ×       ×     ×       ×       ω
(8) [(The young BAKER)Φ (had to bake ROLLS)Φ (early in the MORNING )Φ]ι
```

```
          ×                   ×                   ι
          ×         ×         ×                   Φ
  ×       ×         ×   ×     ×     ×     ×     ω
(9) [(Die junge BÄCKERIN$_{Top}$)Φ]ι [(hat in der FRÜH)Φ (schon BRÖTCHEN$_F$ backen müssen)Φ]ι
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          L* HΦ             L* HΦ          H* LΦ          Lι
(10) [(Die junge BÄCKERIN)Φ ( hat in der FRÜH)Φ (schon BRÖTCHEN backen müssen)Φ]ι
                            ×                             ι
          ×                 ×                             Φ
    ×     ×                 ×     ×   ×     ×     ×       ω
(11) [(Die junge BÄCKERIN)Φ (hat in der FRÜH)Φ (schon Brötchen backen müssen)Φ]ι

          L* HΦ             H*LΦ                          Lι
(12) [(Die junge BÄCKERIN)Φ (hat in der FRÜH)Φ (schon Brötchen backen müssen)Φ]ι
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4. Pierrehumbert's tone sequence model

4.1 Discrete tones

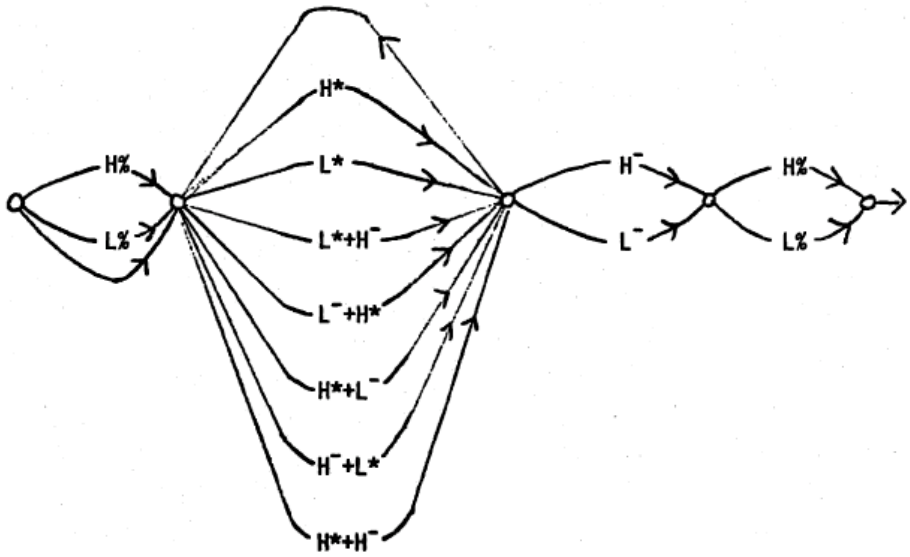


Fig. 1 Finite state grammar of tone sequences (from Pierrehumbert 1980:29)

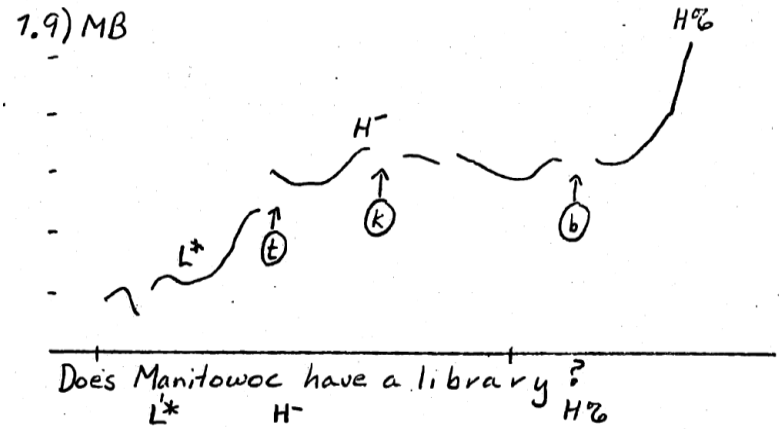


Fig. 2 *Does MANITOWOC have a library?*: L* H⁻ H% (from Pierrehumbert 1980:265)

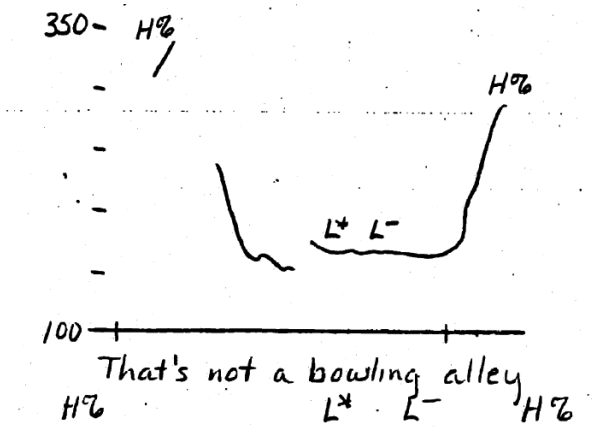


Fig. 3 Contradiction contour: *That's not a BOWLING alley*: H% L* L⁻ H% (from Pierrehumbert 1980:385)

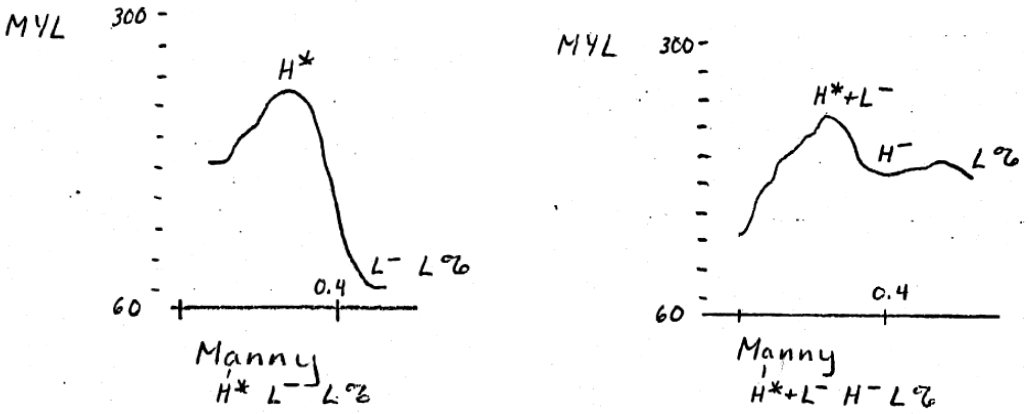


Fig. 4 *MANNY* in two tone sequences, H* L⁻ L% and H*+L⁻ H⁻ L% (from Pierrehumbert 1980:273)

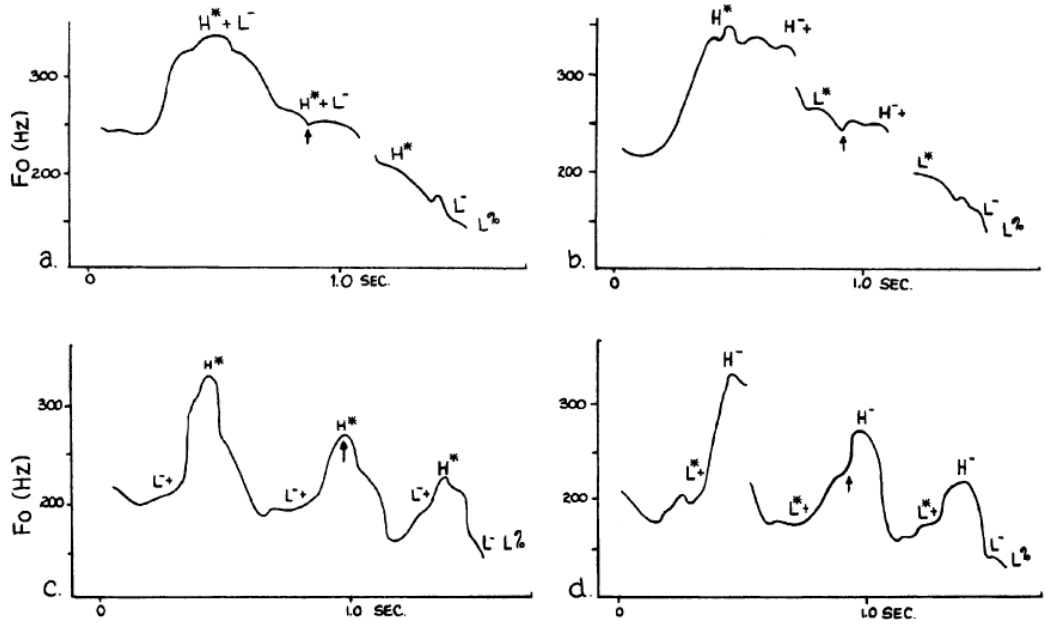


Fig. 5 From Ladd (1983a) reproducing four pitch tracks from Pierrehumbert (1980): *There are MANY INTERMEDIATE LEVELS* in four variants with downstep. The arrows show the location of [d] of *intermediate*.

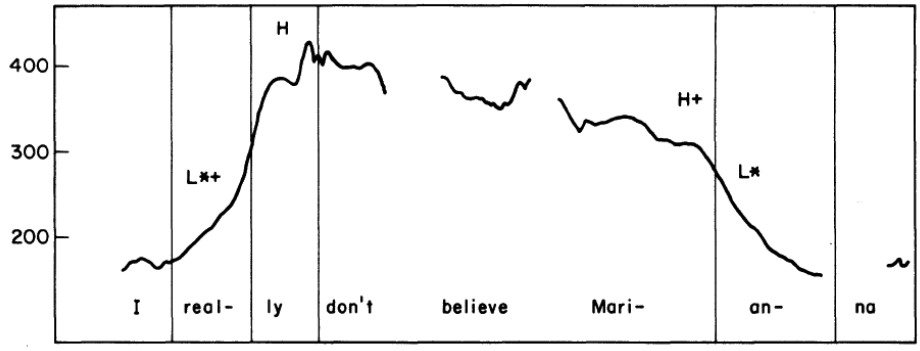


Fig. 6 *I REALLY don't believe MARIANNA*: downstep of H after L*+H (Beckman & Pierrehumbert 1986:276)

4.2 Text-tone association

(13) Phonological rules for text-to-tune association

a. Pitch accents associate with (the strongest) stressed syllables within their prosodic domain.

b. Boundary tones associate with the boundary of the prosodic domain for which they are diacritically marked.

(14)

a.	b.	c.	d.
(Mary)$_\omega$	((Isa)$_F$(belle)$_F$)$_\omega$?	((Ale)$_F$ (xandra)$_F$)$_\omega$	((Aber)$_F$(nathy)$_F$)$_\omega$?
H*L	L*H	H* L	L* H

4.3 Continuous phonetic melody

Context-sensitive rules assign a tone its F0 value according to the following three parameters (see also Liberman & Pierrehumbert 1984):

a) Its relation to a bottom line (or baseline), i.e. the deepest value in the speaker's register, which is fairly invariant for each speaker.

b) The degree of prominence that the speaker assigns to the utterance or to a local accent: the F0 range increases with emphasis.

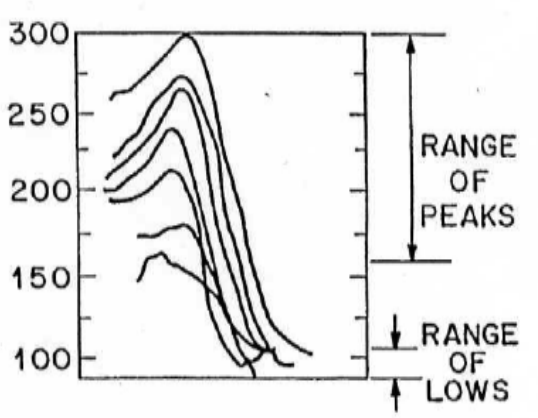


Fig.7a Realizations of the word *Anne* by the same speaker (from Liberman & Pierrehumbert 1984:159)

Compare with realizations of the same word by different speakers

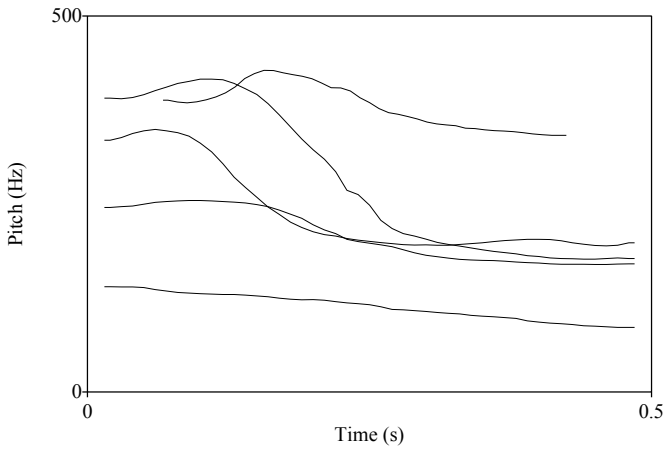


Fig.7b Realizations of the word *Anna* by different German speakers

c) Its relation to the preceding tones. According to Pierrehumbert, every tone is calculated on the basis of the preceding tone, with the help of the so-called *tone mapping rules*, which calculate the phonetic value of each tone relative to the preceding one.

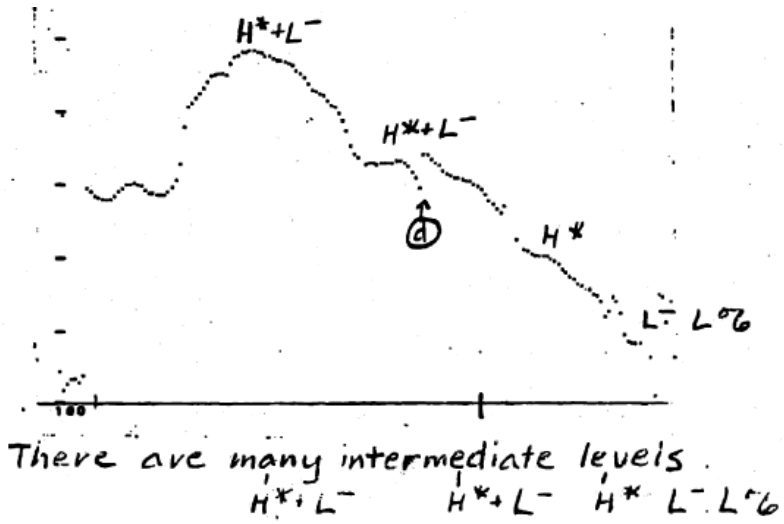


Fig. 8 *There are MANY INTERMEDIATE LEVELS*: interpolation between L⁻ and H* and between H* and L⁻ (from Pierrehumbert 1980:329)

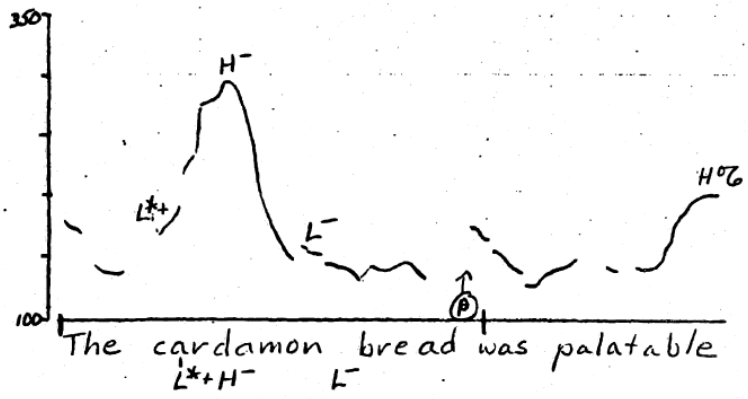


Fig. 9 *The CARDAMON bread was palatable*: spreading of L⁻ (from Pierrehumbert 1980:371)

4.4 Downtrends, reset and upstep

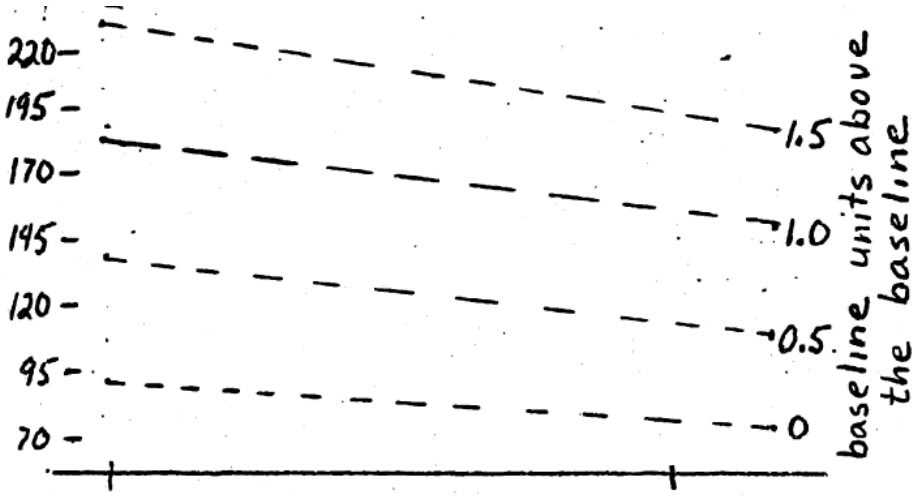


Fig. 10 Declination as downward tilt and narrowing on a graph (Pierrehumbert 1980:270)

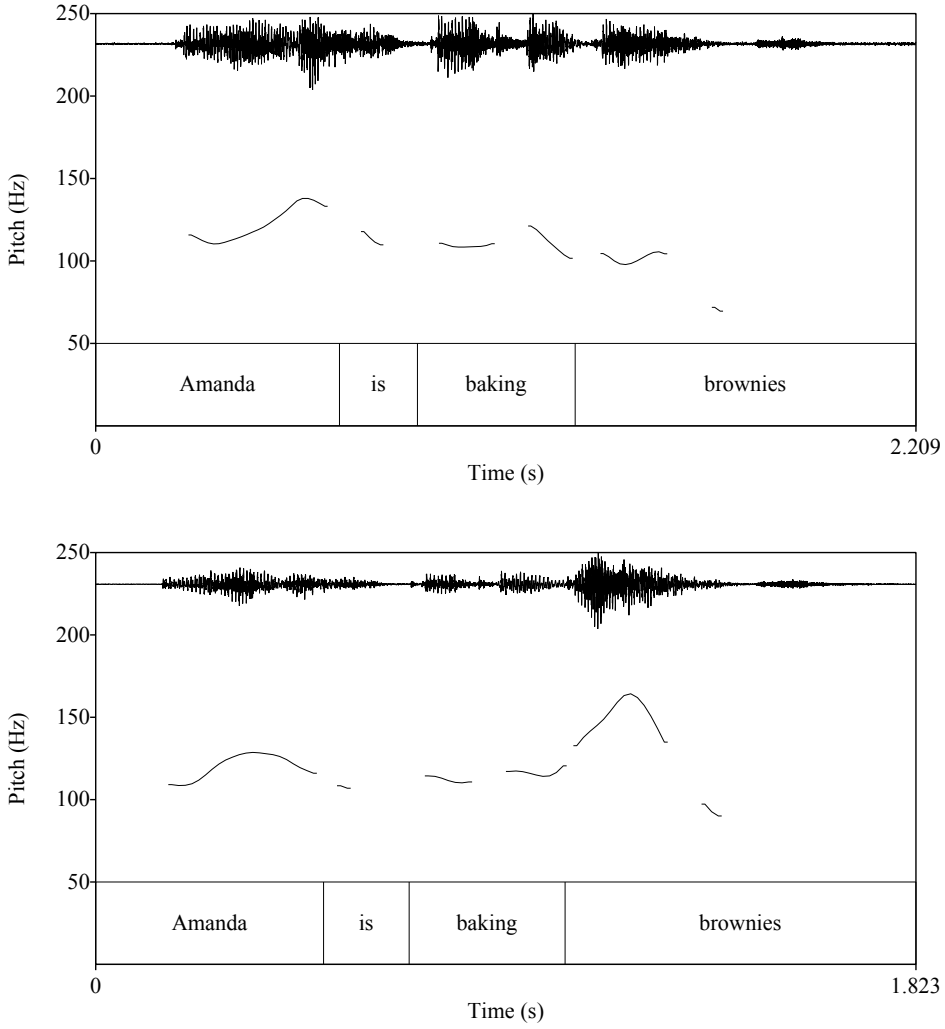


Fig. 11 Downstep and upstep between *AMANda* and *BROWnies*

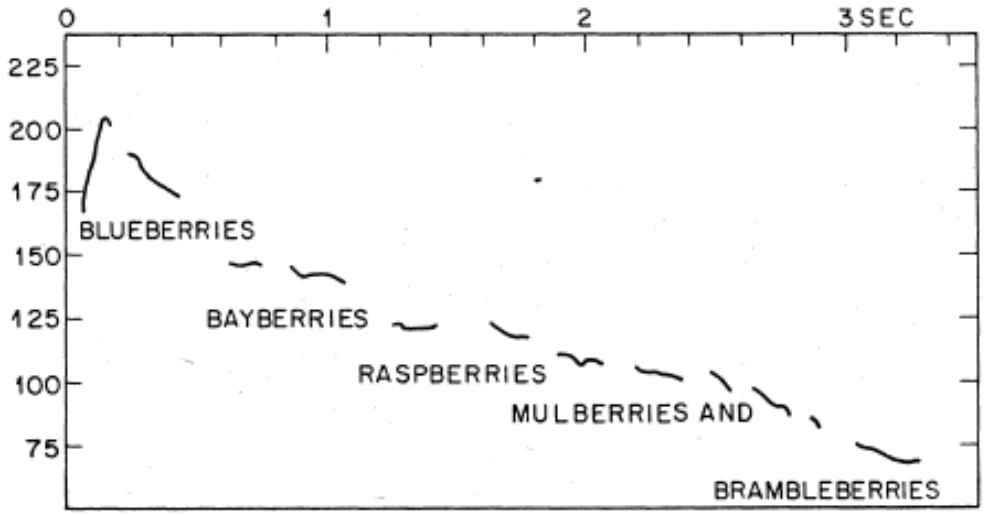


Fig. 12 List intonation (from Liberman & Pierrumbert 1984:171)

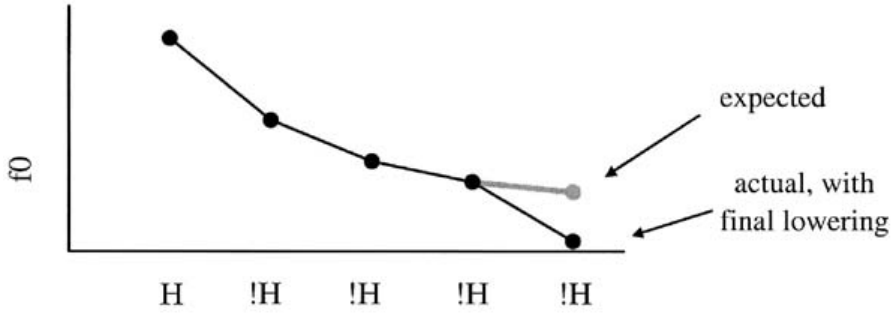


Fig. 13 Final lowering (from Truckenbrodt 2004:314, adapted from Liberman & Pierrehumbert 1984:187)

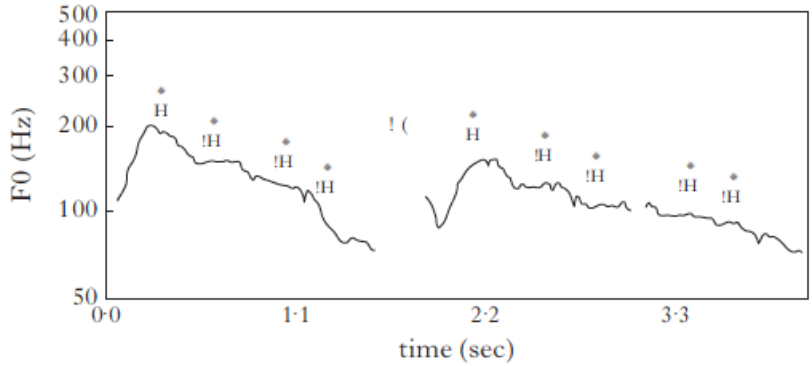


Fig. 14 Partial reset in the Dutch utterance (*Merel, Nora, Leo, Remy*), en (*Nelie, Mary, Leendert, Mona en Lorna*). From van den Berg, Gussenhoven & Rietveld (1992:334)

Fig. 15 Reset across two intonation phrases

5. Alignment of tones

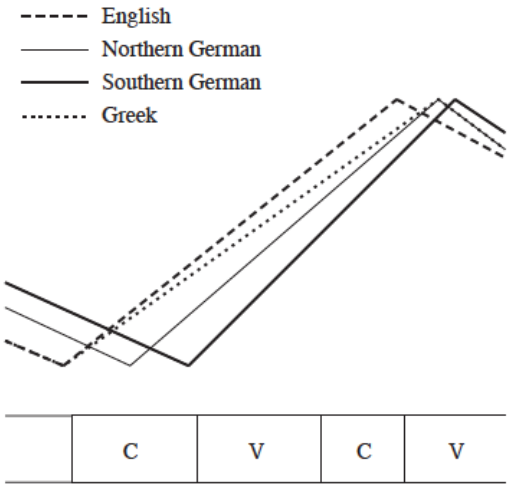


Fig.16 Schematic representation of alignment of H and L in prenuclear rises in different languages (from Atterer & Ladd 2004:187)

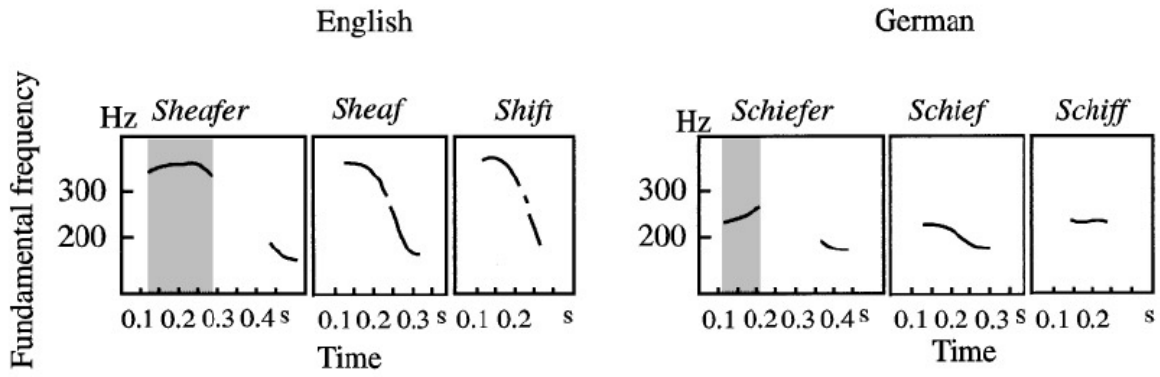


Fig.17 Compression in English vs. truncation in German (from Grabe 1998b:139)

6. ToBI Annotation

ToBI, (Tones and Break Indices), is an annotation convention for intonation (Silverman et al. 1992). ToBI has been applied to a large number of languages (see for instance Jun 2005, 2014 for a review of some of them). ToBI is a surface oriented representation of intonation integrating components of Pierrehumbert's model.

(15) pitch accents: L*, H* (!H*), L+ H* (L+!H*), L*+H (L*+!H), H+!H*
phrase accents: H^- (!H^-), L^- (obligatorily placed at every Break Index = 3 and higher)
boundary tones: H%, L% (obligatory at every Break Index = 4)
%H (marginal, at the beginnings of some intonational phrases after a pause)

(16) a. downstep: e.g. !H*, L+!H*, !H^-
b. uncertainty: *?, $^-$?, %? (uncertainty about occurrence)
X*?, X$^-$?, X%? (uncertainty about tone type)
c. delayed tone <; early tone >

(17) Basic break index values:
0 (very close inter-word juncture)
1 (ordinary phrase-internal word end)
2 (a stronger or weaker disjuncture as expected, depending on the level)
3 (intermediate phrase end, with phrase accent)
4 (intonational phrase end, with boundary tone)

ToBI's labelling tools are extremely useful for the development of synthetic speech or for automatic tonal annotation of large spoken corpora. However, the annotation surface cannot distinguish between different kinds of underlying tones. Lexical tones, default nuclear accents, pitch accents arising from a narrow focus etc. are all represented as starred tones. A development of ToBI could be to integrate metrical structure, syntactic structure and information structure, since up to now there is no practical way to address these issues directly in the annotation.

Conclusion for intonation languages
In intonation languages, tones are only assigned at higher prosodic levels: Φ-phrase and ι-phrase. Starred tones are assigned to syllables with the highest column of metrical beats.

Since Culminativity is active, every Φ-phrase and ι-phrase has a head that is translated into prominence, phonologically T* and phonetically as a high (or low) tone.

7. Pitch accent languages

7.1. Germanic pitch accent languages

(18) Swedish has two lexical tonal specifications: Accent 1 and Accent 2

a. ^{1}and-en ‘the duck’ ^{2}ande-n ‘the spirit’
^{1}regl-er ‘rule-PL’ ^{2}regl-ar ‘mirror-PL.’

b. ^{1}fänrik ‘second lieutnant’ ^{2}sommar ‘summer’
^{1}ketchup ‘ketchup’ ^{2}senap ‘mustard’

(19) a. Derivation: ^{2}sjuk¸dom ‘illness’, ^{2}under¸bar ‘wonderful’

b. Compounding: ^{2}sommar¸dag ‘summer day’, ba^{2}nan¸skal ‘banana peel’, ^{2}byx¸kjol ‘pant-skirt’

(20) Compound stress assignment

$$((\acute{\sigma})_{\omega} ( )_{\omega})_{\omega}$$
$$|$$
$$H^* \quad L^*$$

H* L* H_Φ

(21) a. ((^{2}mellan¸målen)$_{\omega}$)$_{\Phi}$ ‘the snacks’ (compound)

H*L HL* H_Φ

b. ((^{2}mellan)$_{\omega}$ (^{1}målen)$_{\omega}$)$_{\Phi}$ ‘between the meals’ (phrase)

Sentence intonation: additional sentence accent and terminal juncture, Figure 18.

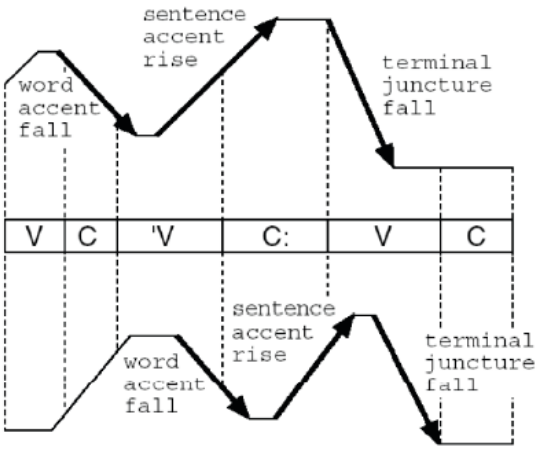
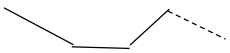


Fig.18 Bruce’s (1977:50) model of Swedish nuclear intonation in a declarative sentence

(22)

Myrberg & Riad 2015	Word accent (small accent)	Focal accent (big accent)
Accent 1	HL*	HL* H_Φ
Accent 2	H*L	H*L H_Φ
		(H*L* H_Φ in compounds)



H* L* H_Φ (L_ι)

(23) a. ^{2}mellan¸målen 'the snacks'

H* L H_Φ (L_ι)

b. ^{2}blommorna 'the flowers'

H* L* H_Φ(L_ι)

(24) ^{2}skol-¸bok-¸hylla 'school book-shelves'

Bruce (1977) and Gussenhoven (2004) distinguish pre-nuclear, nuclear and post-nuclear contexts

(25) Pre-nuclear and nuclear positions

HL* HL* HL* H_Φ L_ι

a. [(man vill a^{1}namma några ^{1}längre ^{1}NUMMER)$_\Phi$]$_\iota$ accent 1
'one wants to accept some long numbers'

H*L H*L H*L H_Φ L_ι

b. [(man vill ^{2}lämna några ^{2}långa ^{2}NUNNOR)$_\Phi$]$_\iota$ accent 2
'one wants to leave some long nuns'

(26) Nuclear and post-focal positions

HL* H_Φ HL* HL* L_ι

a. [(man vill A^{1}NAMMA)$_\Phi$ några ^{1}längre ^{1}nummer]$_\iota$ accent 1

H*L H_Φ H*L H*L L_ι

b. [(man vill ^{2}LÄMNA)$_\Phi$ några ^{2}långa ^{2}nunnor]$_\iota$ accent 2

Roll et al. (2009) have a syntactic account. They proposed a left-edge boundary tone, written as a superscripted H, at the beginning of a main clause, which is absent at the beginning of an embedded clause. In (27)a, the word order of the embedded clause is that of a main clause, but not in (27)b.

(27) a. Berättaren^H menar alltså att vandalerna^H intog inte Gallien av en slump
the.storyteller thinks thus that the.Vandals conquered not Gaul by a chance
'The storyteller thus thinks the Vandals didn't conquer Gaul by accident'
b. Berättaren^H menar alltså att vandalerna$^\emptyset$ inte intog Gallien aven slump
the.storyteller thinks thus that the.Vandals not conquered Gaul by a chance
'The storyteller thus thinks that the Vandals didn't conquer Gaul by accident'

(28) [[De ^{2}andra skulle vara ^{2}ut¸klädda]$_{Clause}$ så [^{2}Anna ville inte vara ^{1}med]$_{Cl}$]$_{illocCl}$
the others would be dressed.up so Anna wanted not be with
'The others were getting dressed up, so Anna didn't want to join.'

Myrberg (2013:83) makes a distinction between *initiality* and *focal* accent, both written with H, see Figure 19. In general topics also have one, and all nuclear accents and usually pre-nuclear accents also have one. It can be interpreted as a phrasal tone H_Φ

(29) A: 'What's happening?'
B: [(Maria laser en bok om DATORER)$_\Phi$]$_\iota$
Maria reads a book on computers
'Maria is reading a book about computers.'

(30) A: 'What happened?'
B: [(Väskan med BÖCKER)$_\Phi$ (har blivit KVARGLÖMD)$_\Phi$]$_\iota$
bag.the with books has been forgotten
'The bag with books has been forgotten.'

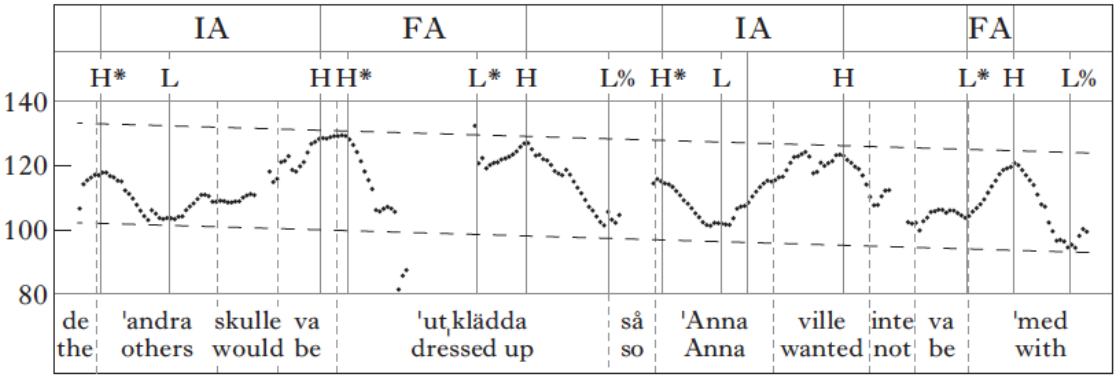


Fig.19 From Myrberg (2013:99). IA stands for 'initiality accent' and FA for 'focal accent'. Both are taken to be H_Φ here.

In sum, the sentence intonation of Swedish is derived compositionally from lexical tones, phrase accent (prosodic phrase level) and final boundary tone (intonation phrase level).

Norwegian: Kristoffersen (2000:264), see also Gussenhoven (2004:217-219) for discussion

(31)

Accent 1	Accent 2
σ	σ
	|
	H

Plus a purely intonational L*H tonal contour.

(32)

Accent 1	Accent 2
σ σ	σ σ
	|
L*H	H L*H

(33) a. ^{1}fe:br + ^{1}nɑt → ^{1}fe:bənɑt 'fever night'
b. ^{2}sɔmmr + ^{1}nɑt → ^{2}sɔmmənɑt 'summer night'

Central Franconian dialects are also pitch accent languages (see Hermans 1985, Schmidt 1986, Gussenhoven & van der Vliet 1999, Gussenhoven & Peters 2004)

7.2 Japanese and Turkish

7.2.1 Japanese

(34)

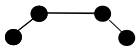
Initial accent	Penultimate accent	Final accent	Unaccented
H*L	H*L	H*L	
|	|	|	
ínoti	kokóro	atamá	sakana
'life'	'heart'	'head'	'fish'

(35)

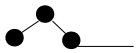
a. hána 'a name'	b. haná 'flower'	c. hana 'nose'
H*L	H*L	
| |	|⟋	

Words are 'accented' or 'unaccented', have a lexical tone or not. An accented ω-word carries a pitch accent H*L, and it forms a Φ-phrase by itself, see Gussenhoven (2004) and Vance (2008:142-54), a.o.
Japanese assigns tones to Φ-phrases. There is an initial L_Φ in the Φ-phrase, followed by H_Φ.

(36)

a. (garasudama)$_\Phi$ 'glass beads'	b. (kake -ro)$_\Phi$ 'break-off'
	
L_Φ H_Φ	$L_\Phi H_\Phi$ H* L
| |	| | | /

(37)

a. (hasi-ga)$_\Phi$ 'chopstick-NOM'	b. (hasi-ga)$_\Phi$ 'bridge-NOM'
	
H*L	L_ΦH* L
| |	| | |

Phrasing depends on the presence of an accented word: each accented word defines a so-called minor phrase (or minimal Φ-phrase for Ito & Mester 2012)

(38) (siró-i)$_\Phi$ (umá-no kubiwa)$_\Phi$ = a. [[siró-i umá-no]$_{NP}$ kubiwa]$_{NP}$
white-INFL horse-GEN collar 'the collar of the white horse'
b. [[siró-i]$_{AP}$ umá-no kubiwa]$_{NP}$
'the white collar of the horse'

(39)

a. ((Náoya-no)$_\Phi$ (áni-no)$_\Phi$ (wáin-o)$_\Phi$)$_\Phi$	b. (Naomi-no ane-no wáin-o)$_\Phi$
Naoya-GEN big.brother-GEN wine-ACC	Naomi-GEN big.sister-GEN wine-ACC
'Naoya's big brother's wine'	'Naomi's big sister's wine'

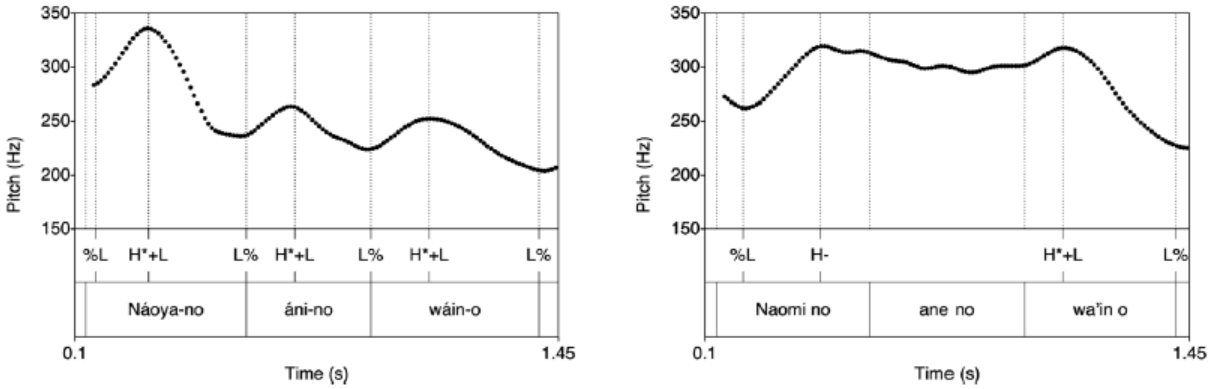


Fig.20 Japanese. AAA sequence, left, and UUA sequence, right (from Ishihara 2015:572)

As in Swedish, the sentence intonation of Japanese is derived compositionally from lexical tones, phrase accent and boundary tone. Additionally, phrasing is based on the kind of lexical tones tones present in the sentence.

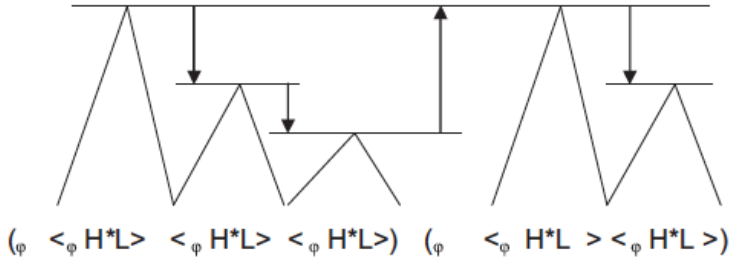


Fig. 21 Downstep in the Japanese Φ-phrase (from Ito & Mester 2013:25)

(40) $((\text{náoko-no})_\Phi\ (\text{áni-no})_\Phi\ (\underline{\text{aói}})_\Phi\ (\text{erímaki})_\Phi)_\Phi$
Naoko's brother's blue scarf

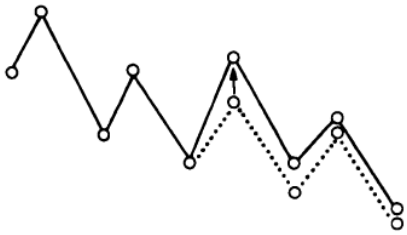
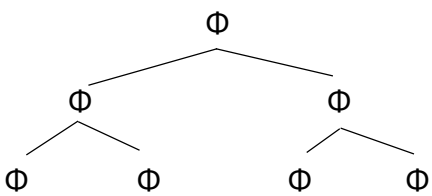


Fig. 22 Four minimal Φ-phrases (from Kubozono 1989:53)

Minor phrase and major phrase can be replaced by recursive Φ-phrases.



Maximal Φ

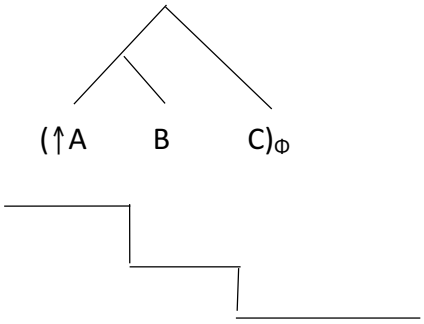
Non-minimal Φ

Minimal Φ

$(((\text{náoko-no})_\Phi\ (\text{áni-no})_\Phi)_\Phi\ ((\text{aói})_\Phi\ (\text{erímaki})_\Phi)_\Phi)_\Phi$
Naoko's brother's blue scarf

Fig. 23 Example (40) in the recursive model (Ito & Mester)

a. Left-branching [[A B] C] → (↑ABC)$_{\Phi}$



b. Right-branching [A [B C]] → (↑A↑BC)$_{\Phi}$

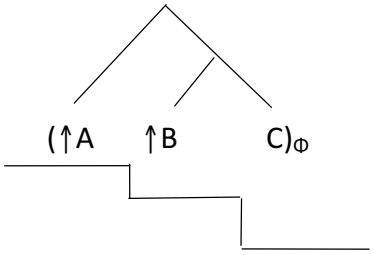


Fig. 24 Left- and right-branching patterns (adapted from Ishihara 2015:583)

(41) Focus Intonation (FI) in Japanese

a. P(rosodic)-focalization: Focus is realized intonationally by a raised pitch on the focused word (or on the first word of a focus domain).

b. Post-focus compression (PFC): Post-focal material is subjected to register compression. F0 peak is lowered.

(42) a. [Aóyama-ga aníyome-ni erímaki-o ánda]$_{F}$ (black line in Figure 8)

b. Aóyama-ga [aníyome-ni]$_{F}$ erímaki-o ánda (red line in Figure 8)

Aóyama-NOM sister-in-law-DAT scarf-ACC knitted

'Aoyama knitted a scarf for his sister-in-law.'

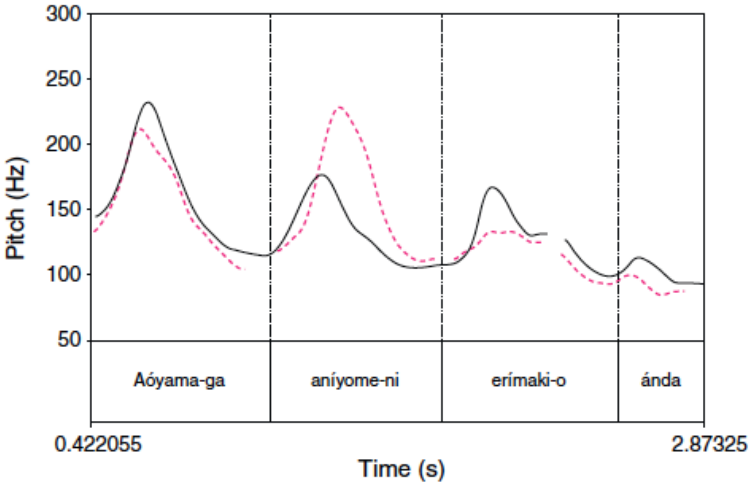


Fig. 25 Focus intonation in Japanese (from Ishihara 2011)

(43) Focus Intonation – wh-Scope Correspondence
The domain of FI corresponds to the scope of a wh-question.

(44) a. Náoya-ga nániko-o nomíya-de nónda
Naoya-NOM something-ACC bar-LOC drank
'Naoya drank something at the bar.'
b. Náoya-ga **náni**-o nomíya-de nónda **no**?
Naoya-NOM what-ACC bar-LOC drank Q
'What did Naoya drink at the bar?'

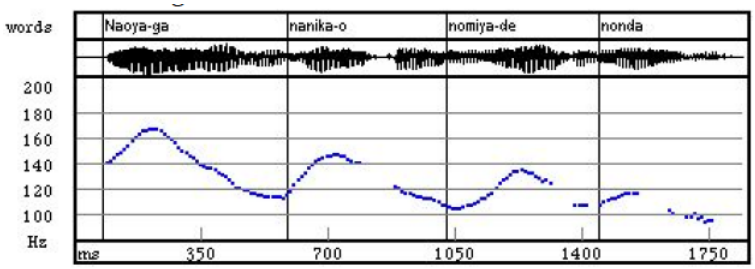


Fig. 26 An all-new sentence (from Ishihara 2004).

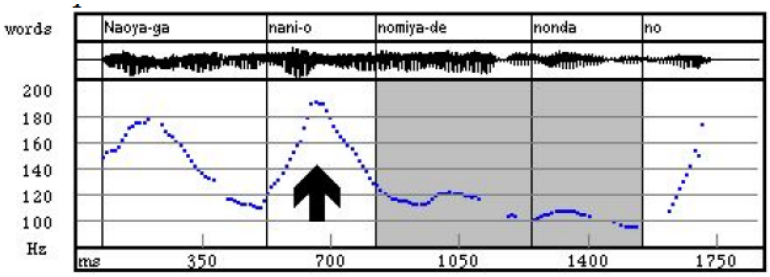


Fig. 27 Focus intonation in a wh-question in Japanese (from Ishihara 2004).

(45) a. [Náoya-wa Mári-ga **náni**-o nomíya-de nónda to ímademo omótteru **no**?]$_{\iota}$
Naoya-TOP MARI-NOM what-ACC bar-LOC drank that even.now think Q
'What did Naoya still think that Mari drank at the bar?'
b. [Náoya-ga [Mári-ga **náni**-o nomíya-de nónda **ka**]$_{\iota}$ ímademo obóeteru]$_{\iota}$
Naoya-TOP MARI-NOM what-ACC bar-LOC drank Q even.now remember
'Naoya still remembers what Mari drank at the bar.'

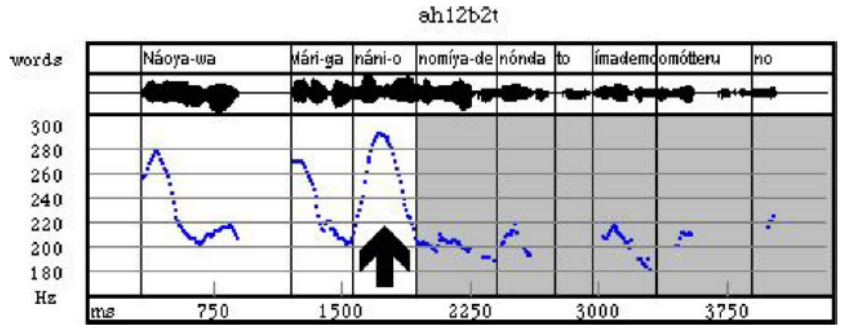


Fig. 28 Focus intonation in a wh-question with matrix scope (from Ishihara 2004).

It is not the case that the post-focal material is dephrased and compressed, compression is sensitive to the scope of the focus.

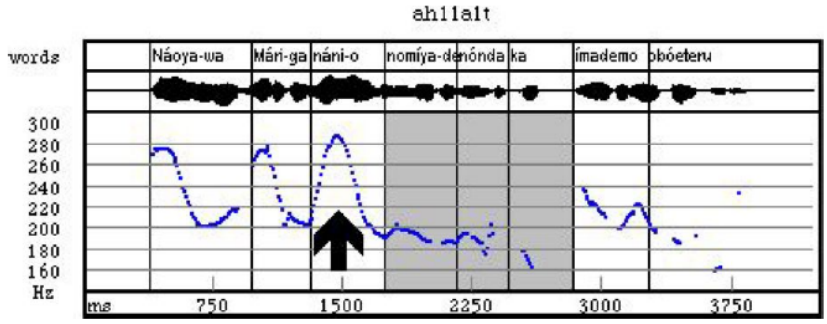


Fig. 29 Focus intonation in a wh-question with scope in the embedded clause (from Ishihara 2004).

7.2.2 Turkish (Levi 2005, Kamali 2011)

(46) Unaccented words
[év] house 'house'
[ev-lér] house.PL 'houses'
[ev-ler-ín] house.PL.2ND.POSS.SG 'your houses'
[ev-ler-in-dé] house.PL.2ND POSS.SG.LOC '(they are) in your houses.'
[ev-ler-in-de-kí] house-.PL.2ND.POSS.SG.LOC.PRON 'the one in your houses'
[ev-ler-in-de-ki-lér] house.PL.2ND.POSS.SG.LOC.PRON.PL 'the ones in your houses'
[ev-ler-in-de-ki-ler-í] house.2ND.POSS.SG.LOC.PRON.PL.ACC 'the ones in your houses'

H*L
| |
(47) pásta-cı-lar-ımız-da (accented word)
cake-DER-PL-POSS1SG-LOC
'among our cake chefs'

(48) Examples of minimal pairs from Levi (2005)

Mísir 'Egypt'	misír 'corn'
bébek 'name of a suburb of Istanbul'	bebék 'baby'
jázma 'don't write!'	jazmá 'writing'

(49) a. idiosyncratically stressed affixes -*ìyor* 'progr' -*índ*^{3}*e* 'when' and -*érek* 'by'
b. pre-stressing suffixes: -'*me* 'neg', -'*de* 'also' -'*mA* 'neg'

(50) a. yönlendir-íyor
direct-PROG 'is directing'
b. yönlendír-me-meli
direct-NEG-NEC 'should not direct'

Combination of two pre-accenting suffixes –'*mA* (verbal negative marker) and -'*ti* (past auxiliary): the leftmost stress survives (see also Basque).

(51) a. sinirlen-ed^{3}ék 's/she will become irritated'
b. sinirlén-me-jedʒek 's/she will not become irritated'
c. sinirlen-ed^{3}ék-ti 's/she will have become irritated'

d. **sinirlén-me-jed^{3}ek-ti** ‘s/she will not have become irritated’

(52) a. fabríka ‘factory’ +bad^{3}á ‘chimney’ → [fabríka bad^{3}a-sɪ]$_{\Phi}$ ‘factory chimney’
b. ajak ‘foot’ + kap ‘cover’ → [aják kab-ɪ]$_{\Phi}$ ‘shoe‘ (lit. foot cover)

Both intonation and pitch accent languages organize their tonal structure around the pitch accents, predefined tonally in the case of pitch accent languages, and assigned pragmatically and syntactically at higher levels in the case of English.
Tone languages have even more predefined tones at the ω-word level, not only on the stressed syllables but also on the unstressed ones. They are thus expected to have less freedom in adding sentence intonation.
Main question of this handout: Do tone languages have intonation?
Due to the density of lexical tones, there remains little space for additional tones expressing pragmatic meanings.
All tone languages often rely on morpho-syntactic reflexes or phrasing for the expression of information structure, but not on pitch accents.

9. Tone languages: Asian languages

• Mandarin: individual tones may be strengthened or weakened. Crucially though, the individual tones are not changed. Register effects, post-focal compression
• Cantonese: additional ɪ-phrase final tonal boundaries and associated with a discourse particle. Addition of tones, but only at the end of ɪ-phrases and on especially inserted morphemes. Here, too, individual lexical tones are not changed.

9.1. Mandarin Chinese

In MC, tones are lexical and intrinsic to syllables. They present only few tone sandhi effects, which apply in morpho-syntactically motivated prosodic domains. Tone sandhi is not part of sentence intonation, but rather it is a ω-word or Φ-phrase effect. Tone sandhi seems to be unrelated to information effects.
Sentence intonation can be concretized in two ways in Asian languages. First by register phenomena: the high tones of specific tones can be realized with more intensity and with higher F0 when the ω-word or Φ-phrase containing it is focused. There may be post-focal compression.

The tonal contour of a sentence is the result of the lexical tones and their concatenation, plus phenomena associated with register and phrasing.

<u>Some instances of tone assignment at the level of the Φ-phrase and the ɪ-phrase</u>

Few syllables unspecified for tones can be assigned tone at a phrasal prosodic level.
• syllables with *neutral tone*, in (53)a
• modal particles, in (53)b.

Notation: mā1 (Tone 1, 55, H), má2 (Tone 2, 35, R or LH), mǎ3 (Tone 3, 214, L) and mà4 (Tone 4, 51, F or HL).

(53) a. grammatical morphemes: *làde* ‘something spicy’, lexical item: *bōli* ‘glass’, diminutive terms: *mèimei* ‘sister (diminutive)’, reduplication: *xiángxiang* ‘to think for a little while’
b. particles: *-ba* ‘agreement-soliciting’, *-ma* and *-a* ‘pragmatic particles’, *-le* ‘verbal suffix’, *-zi* ‘nominal suffix’

Syllables with neutral tones seem to acquire their phonetic value from the preceding syllable (Yip 1980, Shih 1997, but see Chen & Xu 2006 for a different interpretation). After tone 1 or 2, they fall to mid-level. In the case of tone 3, the fall-rise of this tone is distributed over the lexically specified syllable, thus the one carrying this tone, and the following unaccented syllable. In the same way, when a neutral tone follows, the fall of tone 4 is spread over two syllables. The behaviour of neutral tones following tones 3 and 4 is thus not compatible with tone assignment per se; rather it is just a description of how syllables without tone acquire their phonetic contour. However, the addition of a falling contour in the case of tones 1 and 2 may suggest the presence of an L_L in declarative sentences, which can only be realized when neutral tone syllables are there to carry this boundary tone.

Particles can have an assigned pragmatic tone: (54) can end in a high or in a low tone (Peng et al. 2005:248).
• high tone, the speaker is asking a yes-no question: ‘[the] boundary tone suggests a presupposition that the store should sell umbrellas. Thus, this can convey surprise, if the addressee is someone who was sent to buy an umbrella and came back empty-handed.’
• low ‘boundary tone: statement. It might be produced by a speaker to soften an explanation of why he came back empty-handed. The English equivalent might be something like, “Well, but they don’t sell umbrellas.”’

(54) Tāmen bú mài yúsǎn ma
do NEG sell umbrellas PRT
‘Don’t they sell umbrellas?’

<u>Register and pitch range phenomena</u>

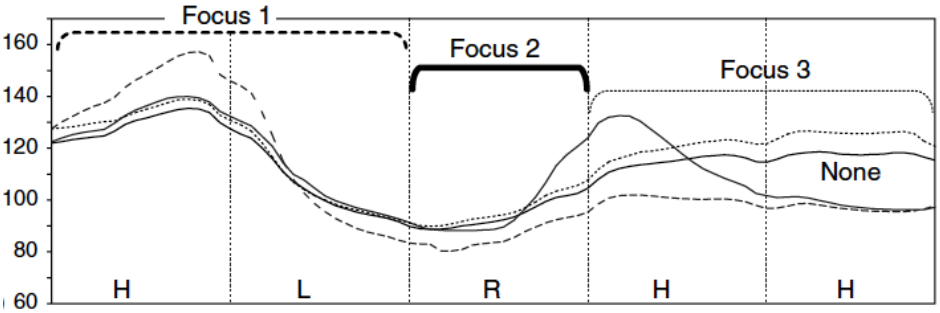


Fig. 30 The effect of focus in Mandarin in a sentence consisting of words with different tones (from Xu 2005:232)

Focus has an effect on the duration and on the pitch register and contour of lexical tones (Gårding 1987, Y.Chen 2010, Jin 1996, Shih 1988, Xu 1999, 2005, Y.Chen & Gussenhoven 2008). Enhancement of the distinctiveness of the contrasts among the lexical tones (Y. Chen & Gussenhoven: 2008744). Tone quality is crucial.

Conclusion for Mandarin:
Intonation is materialized by neutral tones, tones on particles and register changes. No pitch accent, but hyperarticulated phonemic features and tones. Post-focal compression is present, but not on all tones.

9.2. Cantonese

• Cantonese has 6 lexical tones, and that nearly every syllable is specified for tone.

• Flynn (2003): Lexical tones are able to maintain their contrast in spite of intonation-driven declination, because, even at the end of the prosodic domain, room is still available for generating pitch differences with relative heights within the shrinking pitch range in the intonation group. At the beginning of a new Φ-phrase, F0 is often reset.

• Flynn (2003:45-46) and Lin (2002:89): while stress does not occur in Cantonese, pragmatic contrast can be achieved through prominence. The duration of a selected syllable is lengthened, and this is often accompanied by expansion of pitch range.

• Law (1990:107) suggested that Cantonese has boundary tones which can be added after the last lexical tone of an intonation phrase. These boundary tones elicit pragmatic meanings. Depending on the tone on the final particle (55=high, 11=low, 33=mid), the sentence can be translated in different ways. In (55), part of the glossing and translations are from Sybesma & Li (2007), and the rest is from Law, i.e. the tones and some of the translations

(55) ngo-dei jat cai heoi tai-hei ɛ
we together go see-movie PART
'How about we go see a movie ɛ^{55}?' [what do you think?]
'How about we go see a movie ɛ^{11}' [would be fun]
'Let's go see a movie ɛ^{33}!' [I won't take 'no' for an answer]

10. Conclusion
Pitch accent languages assigned tones at all relevant levels: ω-word Φ-phrase and ι-phrase. Either Culminativity applies in all words (Swedish, Norwegian) or only in part of the vocabulary (Japanese). These tones are invariable.
Other tones are assigned at the higher levels: L_Φ H_Φ in Japanese, H_Φ in Swedish
Register plays an important role in phrasing and in the expression of information structure (Japanese). In Swedish and Norwegian as well, but these languages also resemble other Germanic languages.
Compositionality of tones is clearly visible in these languages.

Exercise
Realize the sentence *It will be colder in Graz by the end of the week* in different ways, making it a declarative or a question, and putting first no special focus and then a narrow focus on

colder, Graz and *week*. Using Pierrehumbert's tone sequence model provide all eight realizations with a tonal structure.

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