Phonological Theories

Autosegmental/Metrical Phonology

Session 6

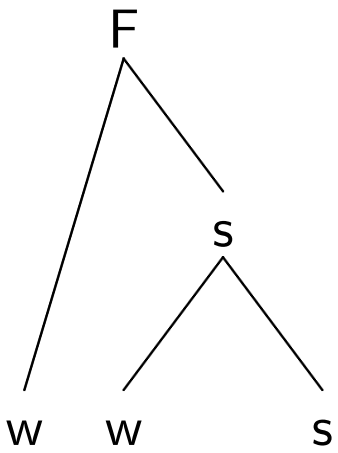
Non-linear stress allocation

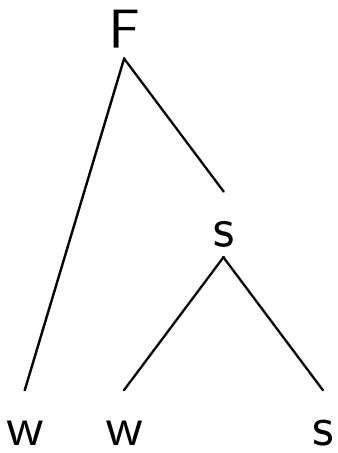
- *Metrical phonology* was an approach to word, phrase and sentence-stress definition which (a) defined stress as a *syllabic* property, not a vowel-inherent feature, and allowed a more flexible treatment of stress patterns in i) different languages, ii) different phrase-prosodic contexts.
- The prominence relations between syllables are defined by a (*binary branching*) tree, where the two branches from a node are labelled as *dominant* (*s* = strong) and *recessive* (*w* = weak) in their relation to each other.
- *Four (quasi-independent) choices* (are assumed to) determine the stress patterns that (appear to) exist in natural languages:
  1. *Right-dominant-foot* vs. *left-dominant-foot* languages
  2. *Bounded* vs. *unbounded* stress
  3. *Left-to-right* vs. *right-to-left* word-stress assignment
  4. *Quantity-sensitive* vs. *quantity-insensitive* languages

Right-dominant vs. left-dominant

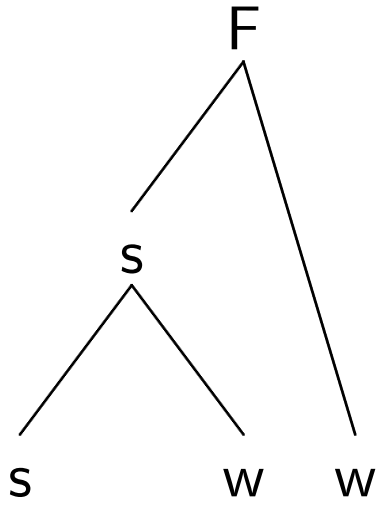
Languages differ in the tendency for the feet to have the strong syllable on the right or the left:

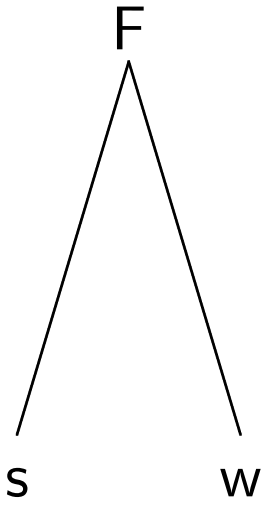
Fr. *sympho'nie fantas'tique*





Engl. *'Buckingham 'Palace*





Bounded vs. unbounded stress (1)

"Bounded" (vs. "unbounded") is a concept that applies to the number of subordinate units that can be dominated by a higher node

In metrical phonology it applies usually to the number of syllables that can be dominated by a Foot node (*bounded = 2*; one strong, one weak syllable to the left or the right; *unbounded = no limit*).

This implies that bounded-stress languages have *binary* feet.

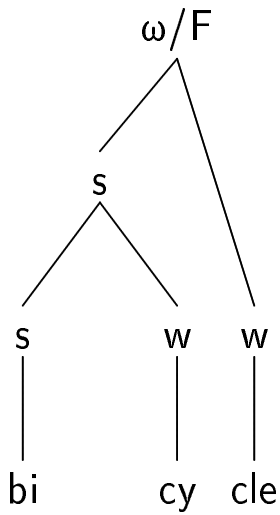
It also implies that bounded-stress languages have the word stress *close to* the (left or right) word-boundary.

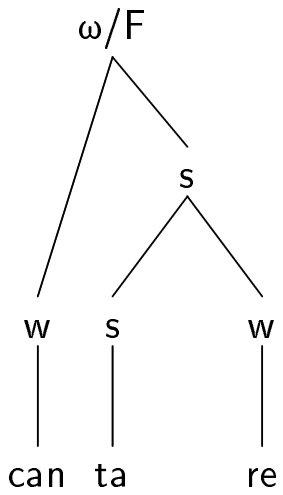
However, it is sometimes applied to the stress pattern within a *word*, i.e., that a word has ONE stress (either at the left or right boundary), and can have mored than one unstressed syllables.

This is *NOT* always understood as a *non-binary* tree; some assume binary branching, but the tree is *left-* or *right-dominated*.

Stress assignment (left/right)

Independent of the left or right dominance in the foot, *word stress* can be assigned (in unbounded languages) from the left or right edge of the word.
The consequences of this would be noticeable in words with an odd number of syllables with the same foot dominance. . .





(. . . or with a different dominance and the same assignment direction)

Which *dominance condition* in the foot, and which *stress assignment direction* can we deduce for English and Italian from the two words?

Bounded vs. unbounded stress (2)

In *bounded* languages the location of the main stress is determined by the combination of *Foot Headedness* and the direction of stress assignment (from left or right).
In the languages of the world, the *default position* appears to be one syllable away from the left (post-initial stress) or right boundary (penultimate stress).
This would appear to suggest that languages with left-headed feet favour assignment from the end of a word, and languages with right-headed feet favour assignment from the beginning of a word.

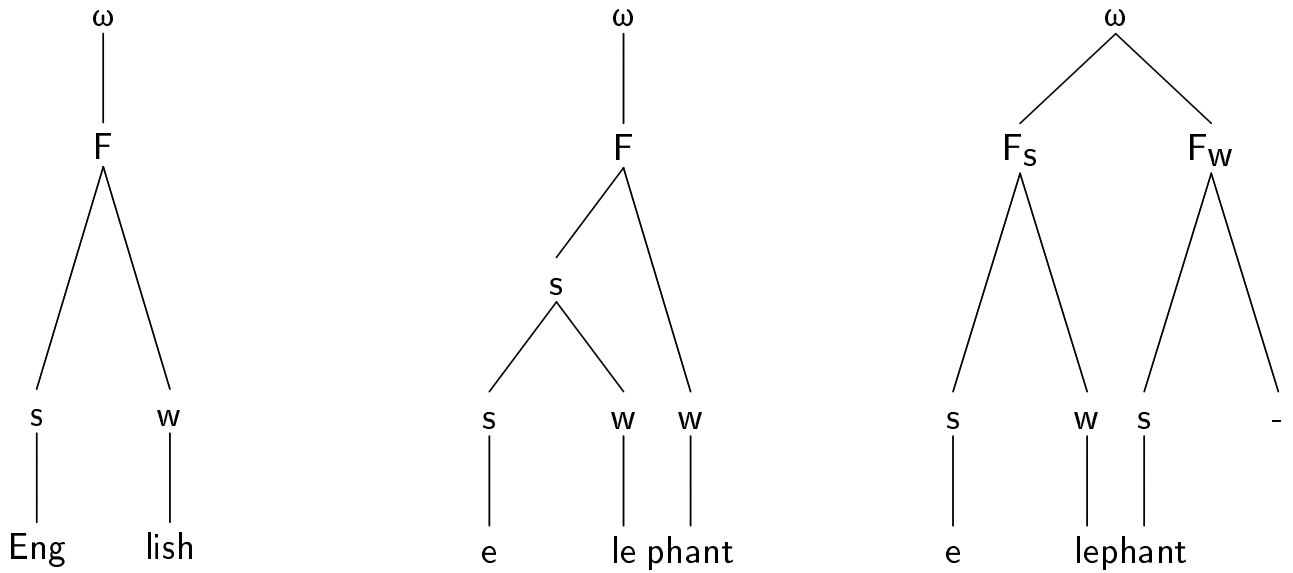
Quantity sensitive languages

Languages that are quantity sensitive assign the stress to a heavy syllable (if present)
English (and German) are considered quantity-sensitive languages; French is considered to be quantity-insensitive.
This requires a stressed syllable to be a heavy syllable
= either CVV or CVC(C)
Draw metrical trees, compare and comment on the syllable structure:

German:	*philosophisch* [fiːloˈzoːfiʃ]	vs.	*Philosophie* [fiːlozoˈfiː]
English:	*solid* [ˈsɒlɪd]	vs.	*solidify* [səˈlɪdɪfaɪ]
French:	*contrat* [kõˈtʁa]	vs.	*contractuel* [kõtʁakˈtɥɛl]

Metrical Structure

LIBERMAN & PRINCE (1977) proposed a tree structure for representing word (and phrasal, see later) stress patterns.



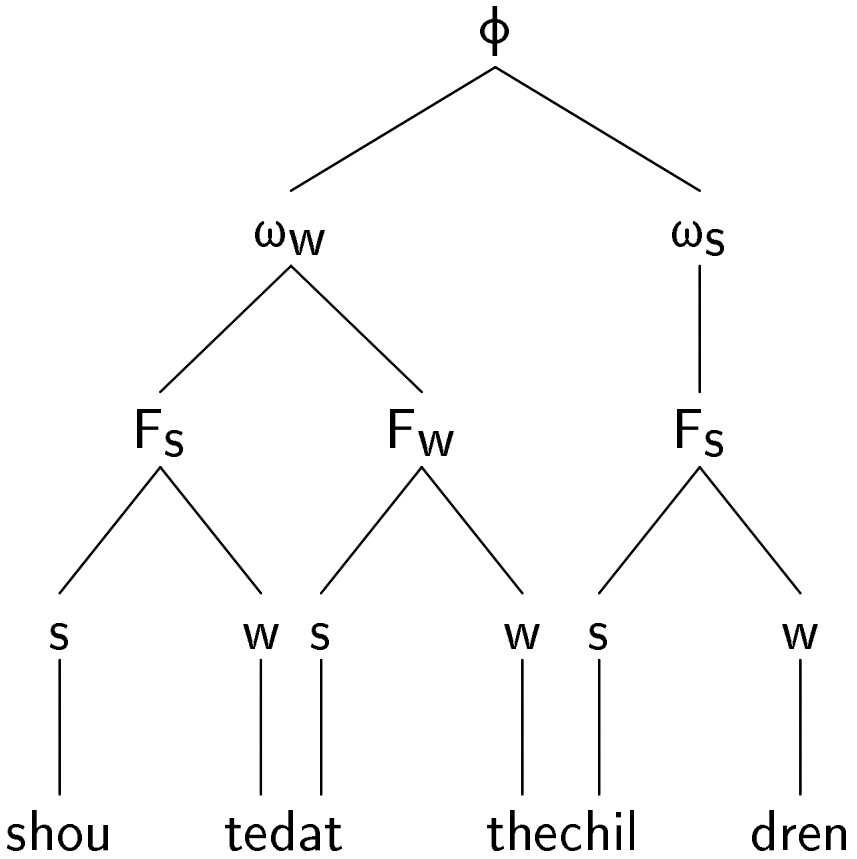
How could we represent *Heidelberg*, *Statthalter*, in terms of the above choice between one- and two-foot phonological words?

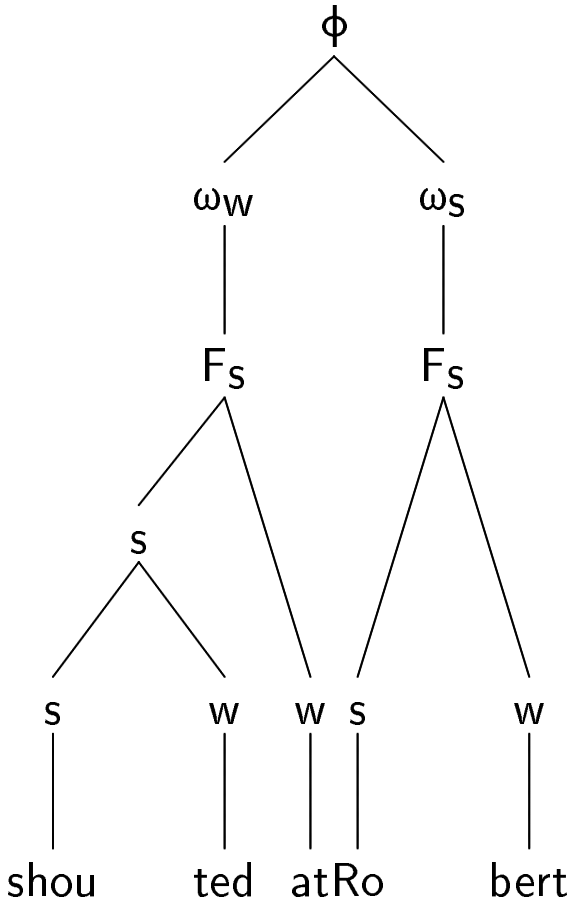
Extrametricality

Sometimes the rules do not lead to the stress pattern that the words have in reality (what a surprise!).
It was found that by making the final consonant or final syllable of some words *"transparent"* to the rules, the correct result is arrived at.
Whether a unit is extrametrical is considered part of the lexicon.
a) America and b) Mississippi may be considered to differ only in the fact that a) has an extrametrical last syllable, b) does not.
What about the following words?
Teppich, *Kontakt*, *Stapel*, *Cabrio*, *Kohlrabi*, *Kalender*, *Elephant*, *Krokodil*, *Albatross*, *Lexikon*

Metrical (Tree-) Structure

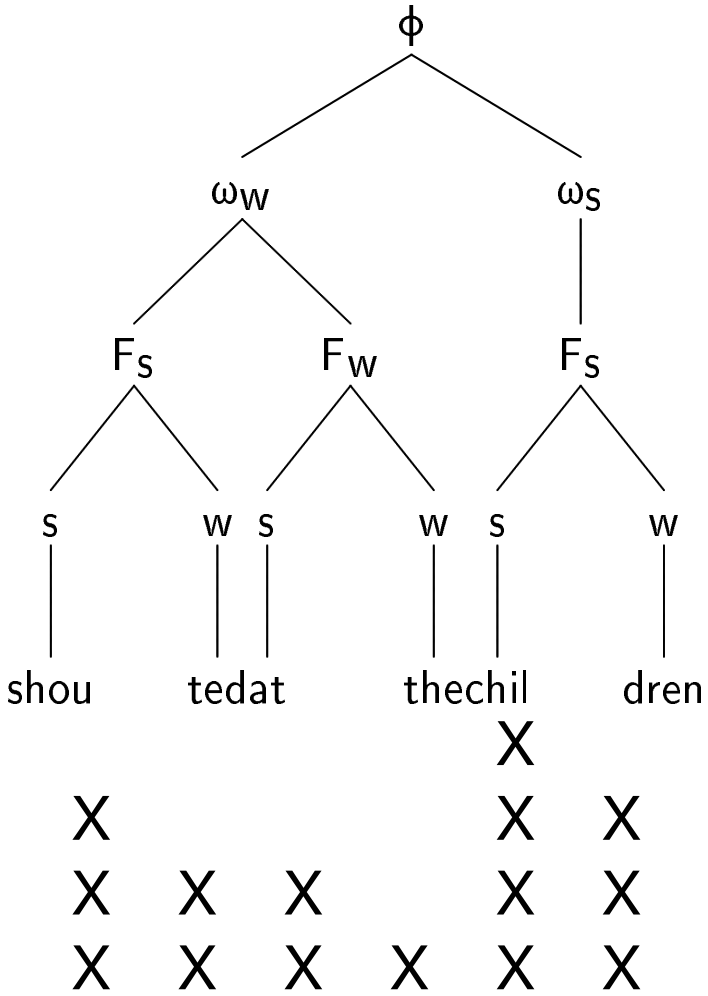
The tree structure hierarchy is assumed to follow the principle of the Strict Layer Hypothesis.

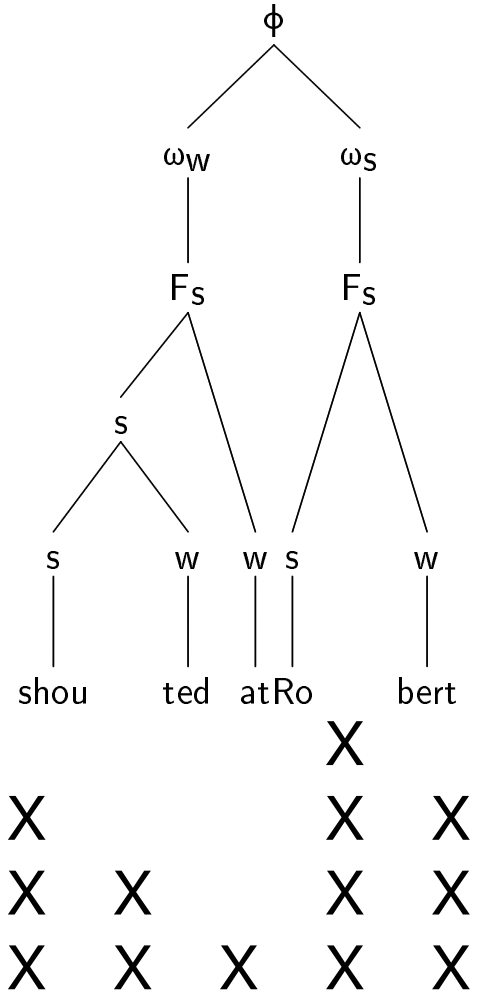




Metrical (Grid-)Structure

One way of seeing the grid structure is the sum of the strong and weak nodes along the branches to the end-leaf.





SELKIRK's stress rules (1)

SELKIRK (1984) proposed two sets of rules:

1. Text-to-grid alignment rules (*TGA*)
2. Grid euphony rules (*GE*)

Text-to-grid alignment rules:

- word-level rules
  1. each syllable receives a demibeat
  2. heavy or root-initial syllables receive a beat (*Basic Beat Level*)
  3. the rightmost 2-beat syllable receives a beat (*Main Stress Rule*)
- higher-level rules
  1. the leftmost constituent of a compound (i.e. 2 or more word units) receives a beat (*Compound Stress Rule*)
  2. the rightmost constituent with lexical stress receives a beat (*Nuclear Stress Rule*)
  3. pitch accent syllables receive an additional beat to raise their prominence (*Pitch Accent Prominence Rule*)

UHMANN's stress rules

SUSANNE UHMANN (1991, p. 176ff) proposes very similar rules for German:

					X	Tier 4 (Nuklearakzent)
X					X	Tier 3 (Akzentton)
X		X			X	Tier 2 (Wortakzent)
X	X	X		X	X	Tier 1 (Alle Silben außer ə)
X	X	X	X	X	X	Tier 0 (Silben)
Ot	to	te	le	fo	niert	

Try them out on the following words:

1. *interessant*
2. *Interesse*
3. *Lavendel*

SELKIRK's stress rules (2)

Grid euphony rules:
These adjust the output of the grid alignment rules to achieve an *ideal grid*.
The principle of the ideal grid is:

> *The Principle of Rhythmic Alternation*
>
> - *every strong position should be followed by a weak position*
> - *no weak position should be preceded by more than one weak position*

Rules of *Beat Addition*, (filling rhythmic gaps) *Beat Movement* and *Beat Deletion* (both removing stress clashes) can be applied.

The autosegmental approach in general

Metrical phonology is a part of a more general approach to language description which claims that different aspects (or levels) of language are structured in their own way but are associated with (all) the other levels. The approach is called *autosegmental* (= its own segmentation)
The Text-to-Grid rules are the way in which the *rhythmic* structure is related to the *syllabic*, *lexical*, *morphological* and *syntactic* structure.
The origin of the approach was the independent description of the tonal structure of languages (African tone languages at first), and it was then developed to cover all aspects of the sound structure, including the association of syllabic structure to sound segments.

Autosegmental description of tone

Tones are associated with syllables, where one tone can be associated with several syllables or several tones can be associated with one syllable:
E.g., from Mende (Sierra Leone)

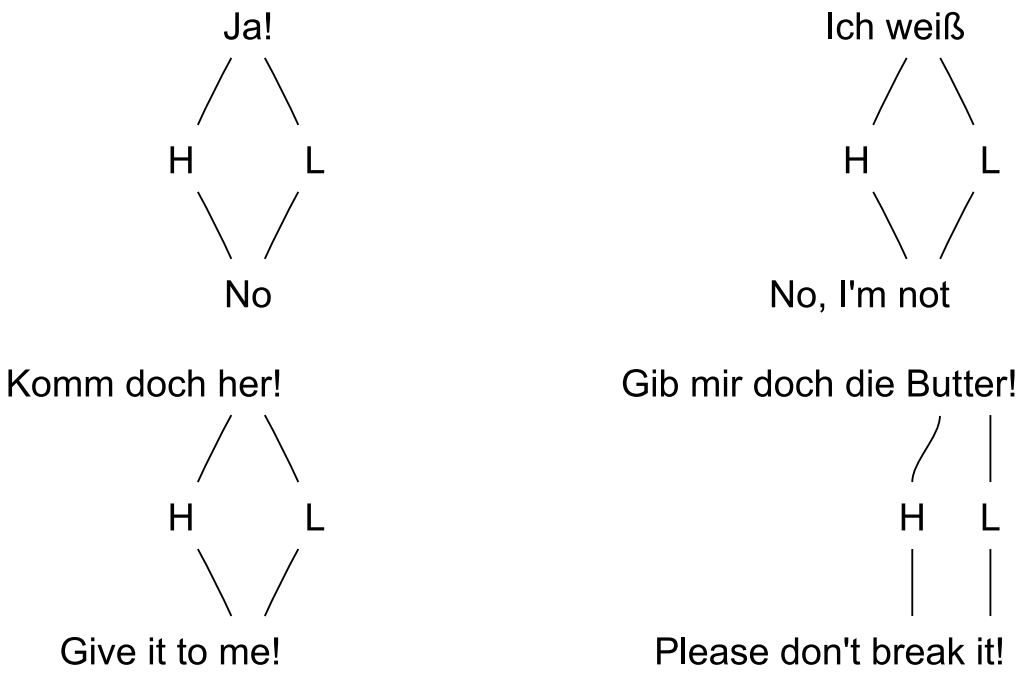
	“was”	“house”	“waistline”			
1	ko	pe	le	ha	wa	ma
	H	H			H	

	“owl”	“dog”	“junction”			
2	mbu	ngi	la	fe	la	ma
	H	L	H	L	H	L

	“companion”	“woman”	“monkey-nut”					
3	mba		nja	ha		ni	ki	li
	L	H	L	L	H	L	L	H	L

Autosegmental description of intonation

The same sort of *association* with syllables can be assumed for intonation languages, where a particular tonal accent can be associated with utterances of one or more syllables (and words).



Boundary marking

Intonation phrases (IPs) are defined not only by the tonal contour they have, but also by their *separation* from other IPs. The boundary markers are systematized as *Break Indices* which are accompanied either by pauses (plus lengthening of preceding segmental material) and/or by tonal features accompanying the final segmental material. These are called *boundary tones* and can be high (H%) or low (L%).

Komm	doch	her!		Gib	mir	doch	die	Butter!	
H*		H*	L%	H*				H*	L%

Complex Intonational Phrases

IPs have long been observed to have a sort of subordinate structure: two or more minor phrases together form a main IP. The term *intermediate phrase* (ip) has been coined to express this sort of substructuring:

E.g.	Tom's	elder	brother	was	always	arguing	with	him	
	H*		L* H-		H*	H*		L-	L%

The logical formal implication of this substructure is that every *IP* must contain at least one *ip*. An IP-boundary is therefore always accompanied by an ip-boundary (see L- L% above).

Tonal accent categories (1)

A source of ongoing discussion is *how many* (and which) distinctive tonal accents characterize a language's intonation system.

One issue is that the boundary tones contribute to the overall tonal contour of an utterance.

E.g.	Tom's	elder	brother	was	always	arguing	with	him		
	H*		L* H-		H*	H*		L-	L%	
vs.	Tom's	elder	brother	was	always	arguing	with	him		
	H*		L*+H		H*	H*+L		L-	L%	

Therefore it can be debated whether a nuclear (= IP-final) accent is complex (i.e. falling: H-L, or rising: L-H) or whether the movement comes from its combination with the boundary tone.

The present majority opinion appears to favour a *combination view* for the falling tone but a *separatist* view for the rising tones.

Tonal accent categories (2)

One of the big advantages of the autosegmental approach is the possibility of looking at the *tonal transition* from the syllable *preceding* the nucleus.
This was impossible in the traditional (British School) division of an intonational phrase into (prehead), (head), nucleus and (tail). The nucleus began with the onset of the nuclear syllable, and the prehead or head were described as separate entities.
There are cases, though, where the height of a *preceding* (unstressed, therefore non-tone-bearing) syllable is part of the tonal accent:

Tom's	elder	brother	was	always	trying	to argue	with	him
H*		L*+H		L* H		H+L*		L- L%

Tonal accent categories (3)

The basic inventory of distinctive tonal phenomena thus comprises

- 5 tonal accents: H*, L*, H+L*, L+H*, L*+H
- 2 ip phrase-boundary tones: L- and H-
- 2 IP-final boundary tones: L% and H%
- 2 IP-initial boundary tones: %L and %H (default %L is never marked)

These categories are supplemented by modifications of the H tone: when a sequence of tonal accents occur in an IP, there is a *natural declination* of tone height.
If the downward shift from one tonal accent to the next is greater than the natural declination it is marked by a *downstep* (!H*)

Tom's	elder	brother		always	tries	to	argue	with	him	
H*		L*	H-	H*			!H*		L-	L%

Phrase accents

Arguments for H* L-L% instead of H*+L L-L% to represent the falling nuclear accent (in German as well as in English and a number of other European languages) have led to a discussion of the status of the L (and H), i.e. of the *phrase accents*.
Evidence for H*+L could be that we find a fall from H* at a more or less fixed interval from the peak of the H tone, independent of the structure of the material following.
Some people claim that they have found this sort of evidence.
Evidence for H* L-L% could be that we find a fall from H* that varies as a function of the following material.
Many people claim that they have found this sort of evidence.
In addition, some have found that the L is reached on a post-nuclear (non-tonally) accented syllable, if there is one.

Tom's	elder	brother	always	tries to	argue	with his	little	sister
H*		L* H-	H*		H*		L-	L%