2.6 Relationships among pitch accents within a phrase: !H*

As we have seen, Intonational Phrases frequently contain more than a single pitch accent. In previous sections we have seen four pitch accent labels: the two single-tone accents (H* and L*) and two bitonal accents (L+H* and L*+H). Theoretically, there are no constraints within the ToBI system on how these pitch accents may combine in an Intonational Phrase: any pitch accent label of the set seen so far may precede or follow any of the pitch accent labels in that same set. For example, H* may be followed or preceded by another H*, or by L* or L+H* or L*+H. In fact, as we will see later, multiple prenuclear pitch accents are possible within a single Intonational Phrase.

However, the !H* ('downstepped H star') pitch accent label is dependent on the immediately preceding labels. It indicates that there is a specific tonal relationship between the prominence labelled !H* and the preceding pitch accent. Specifically, a downstepped H pitch accent indicates that the tone of the prominent syllable is realized by a perceptually lower f0 than that of an immediately preceding High tone: the tone has 'stepped down' from the preceding High. While the !H* is realized by a lower pitch than the preceding High, it is distinct from the L* pitch accent, which is characterized by a pitch excursion down towards the bottom of the speaker's pitch range (for that utterance). The !H* does not necessarily approach the bottom of the speaker's range. For example, in <banana4>, the H* on the *–noth–* syllable of *another* is followed by !H* on the *–nan–* of *banana*. The phrase ends with a Low phrase tone and a Low boundary tone (L-L%), which are realized by additional lowering of the f0 in the final syllable (*–na* of *banana*). Note that the pitch track shows what looks to be a rise in the f0 at the very end of *banana*, but this is a pitch-tracking error; it occurs well after the regular vertical striations in the spectrogram (corresponding to regular vowel-like pitch periods in the final syllable) have ended.
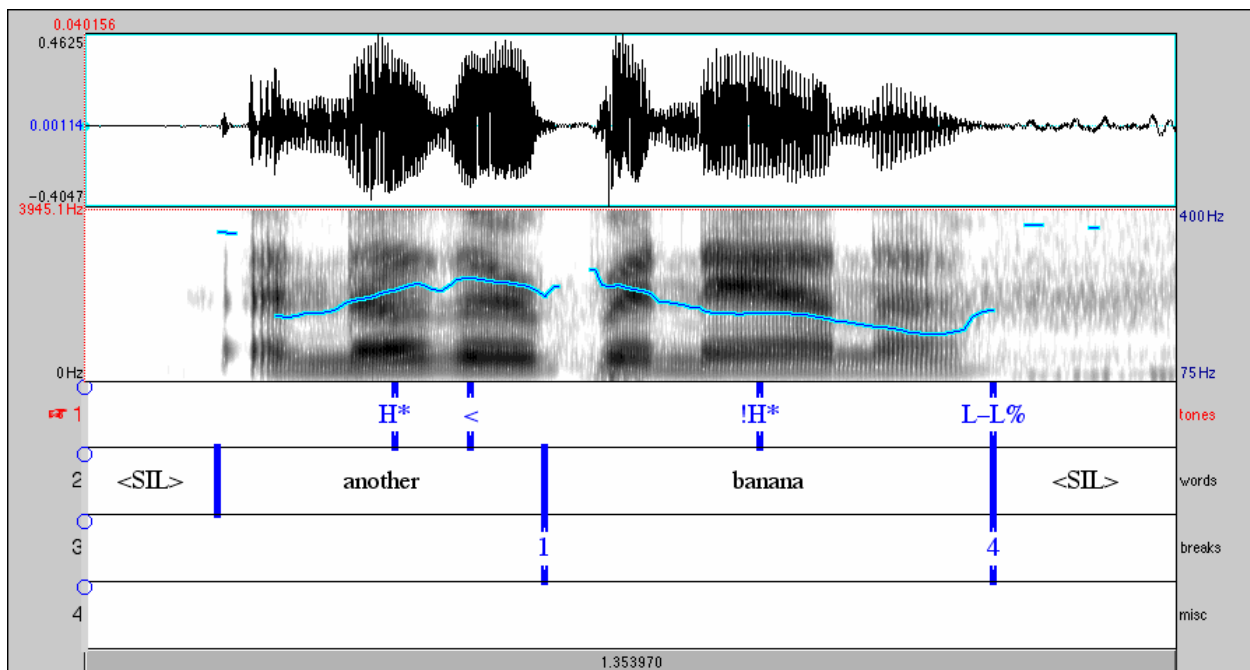

Figure 2.6.1 H* !H* L-L%   <banana4>

The example <clean_slate> below shows another instance of the same tone sequence (H* !H* L-L%), this time realized on two single-syllable words, *clean slate*. Here, the pitch track shows a nice 'step down' from the word *clean*, labelled with H*, to the word *slate*, labelled with !H*. (The audible fall in pitch into creaky voice at the end of the vowel in the word *slate*, which is the realization of the L-L% phrase tone-boundary tone combination, is not captured by the pitch tracker, and the voiceless release noise of the final /t/ is without any pitch track at all.)
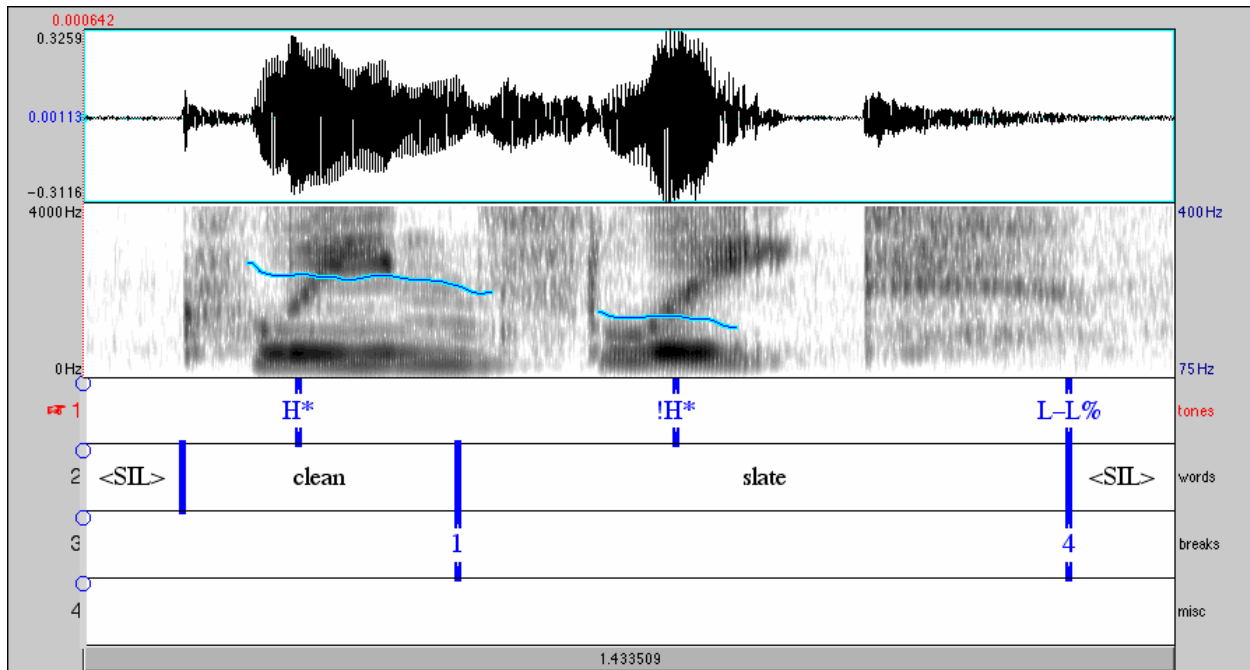
Figure 2.6.2: another example of H* !H* L-L%   <clean_slate>

The !H* label may follow any of the pitch accents which contain an H target, such as H*, L+H* or L*+H. The !H* label will therefore never immediately follow a (single-tone) L* pitch accent, as that pitch accent has no High tone target. The !H* label will likewise never be the first pitch accent in a phrase.

In general, pitch accents labelled !H* are realized in the middle of the speaker's pitch range for that Intonational Phrase, but in this system they are not considered 'mid' tones. Like L+H* and H*, the !H* is a pitch accent for which the prominence is considered to be signalled by a High tonal target, which is why the H symbol is used with the star symbol. As with the other pitch accents with H* targets, the actual realization of the High tone in a !H* can vary quite a lot (i.e. speakers can speak in a relatively low pitch range or a high pitch range, but still produce High tones). This is particularly apparent in cases where one !H* pitch accent is followed by another !H*. The second !H* means that the target of this prominence is lower relative to the target of the first !H*.

For example, in *Figure 2.6.3* <private_ryan1> (*Saving Private Ryan*) the last prominent (pitch-accented) syllable of the phrase (the *Ry–* of *Ryan*) is produced with a lower f0 than that of the previous prominence (on the *Pri–* of *Private*), which is in turn lower than the f0 of the first prominent syllable of the phrase (the *Sav–* of *Saving*). This relationship in the pitch height is reflected in the use of the !H* labels on the last two pitch accents of the phrase, giving the tone sequence H* !H* !H* L-L%. Notice that the pitch range (50-200 Hz, indicated on the right vertical axis in the f0 pane) for this speaker is much more compressed than the range seen in other examples. It is useful to adjust the range for each speaker in order to see the f0 excursions. If the range selected for display is too large (e.g. 75-400 Hz for this example), then the f0 may appear nearly flat, as is shown in *Figure 2.6.4*, below.
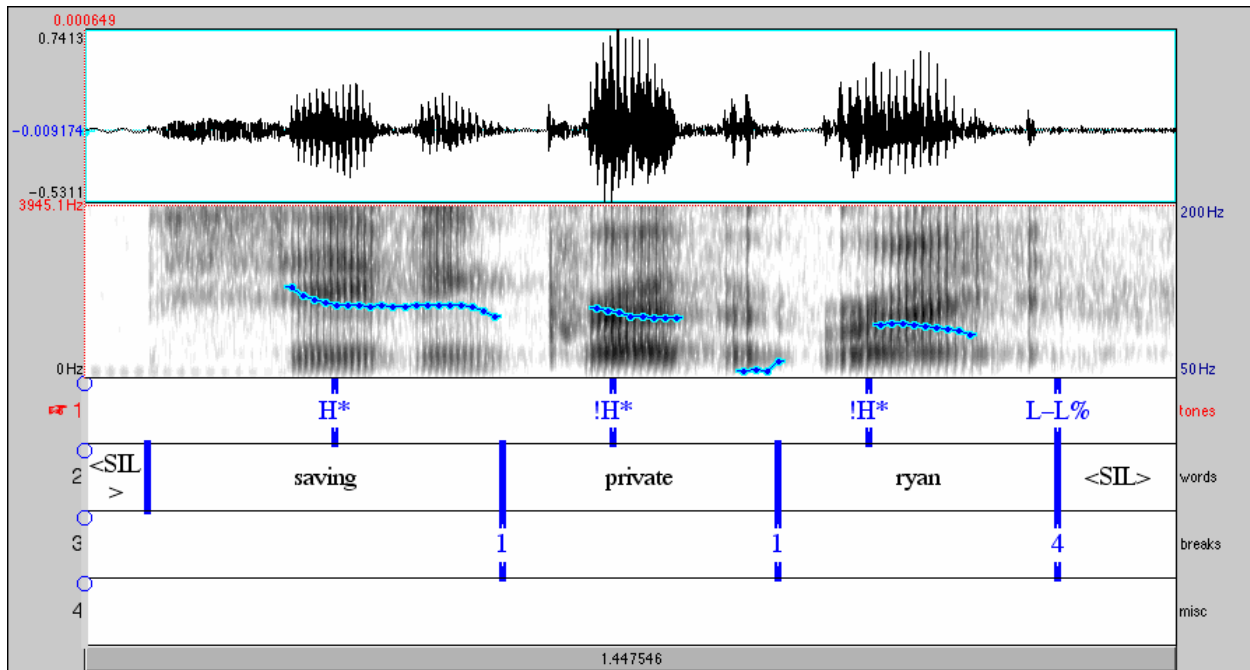
3

Figure 2.6.3a Two sequential !H* pitch accents   <private_ryan1>
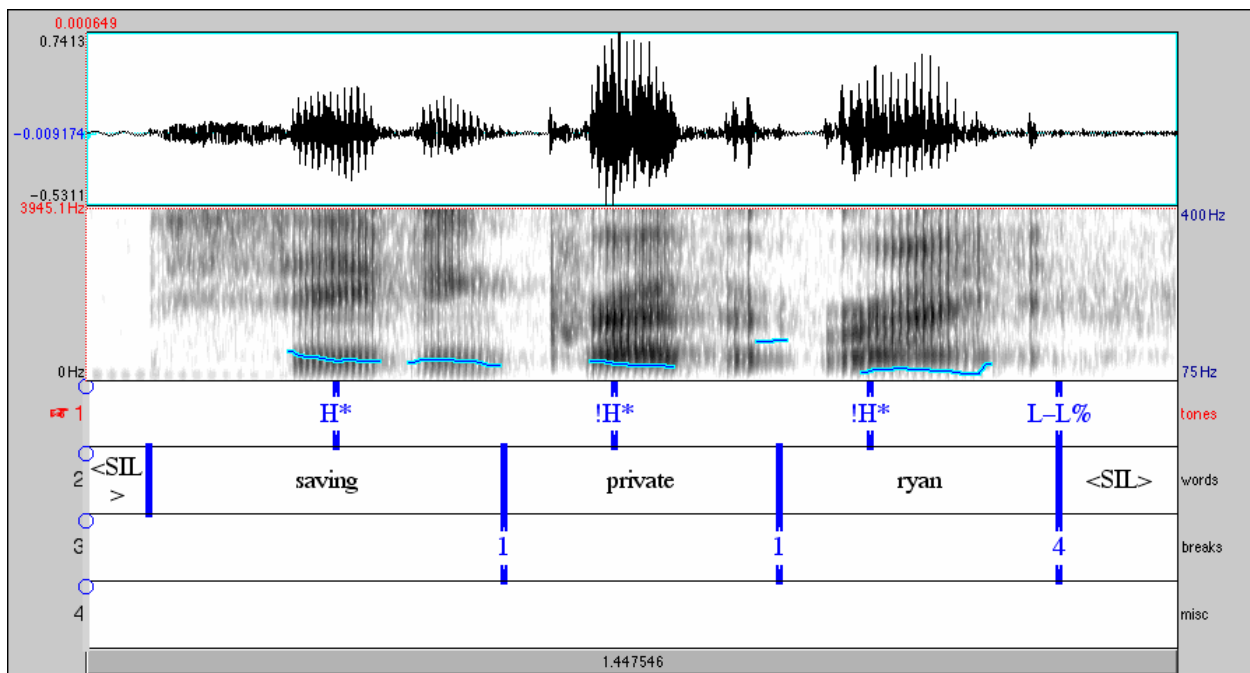

Figure 2.6.3b The example private_ryan1 shown with the pitch range in Praat set too wide for this speaker.   <private_ryan1>

The same tone labels (an H* pitch accent followed by !H* followed by another !H*) can be seen in the example *Figure 2.6.5* <fenced_meadow>. There are no theoretical limits within the ToBI system as to how many times such downstepping can occur within a phrase.
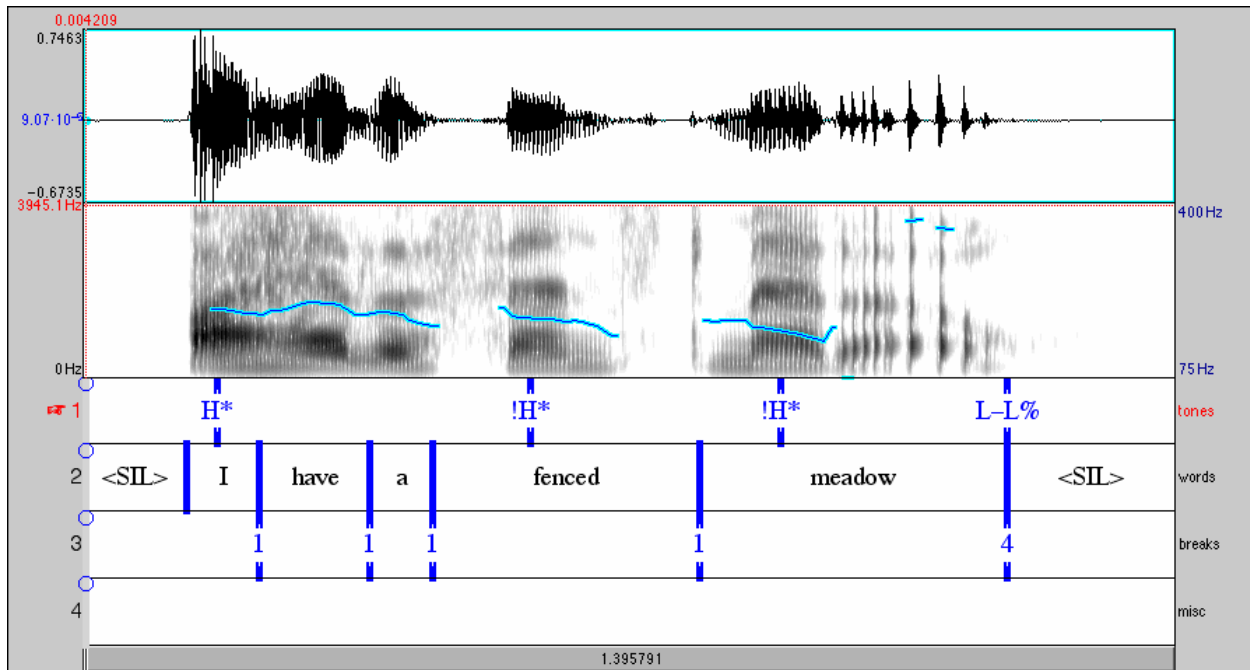
Figure 2.6.4 Another example of two sequential !H* pitch accents   <fenced_meadow>

On the other hand, there is no special term or diacritic for a second High pitch accent that is realized with a higher f0 than its immediate predecessor. In this case, the second, higher pitch accent would be simply labeled as another H*, as in the following examples:
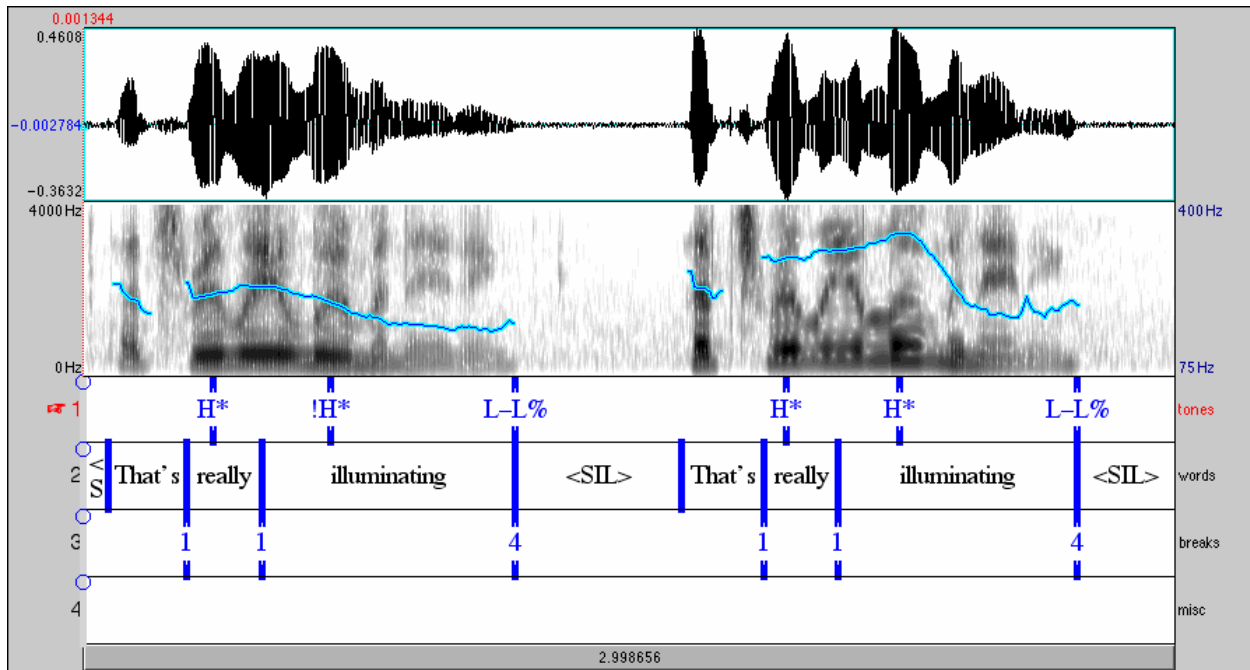
Figure 2.6.5 H* !H* L-L% compared to H* H* L-L%   <illuminating1>

In this example, the first rendition of *That's really illuminating* has two pitch accents, an H* on *real-* and a !H* on *–lum-*, similar to the examples of downstep shown above. However, the second rendition has an H* on *real-* followed by a higher H* on *–lum-*. The differences in height of H*'s in an intonational phrase are not distinctive; that is, H*'s with medium-high f0 don't convey different information than H*'s with higher f0. However, the term 'upstep' is sometimes used casually or in other contexts (see box).
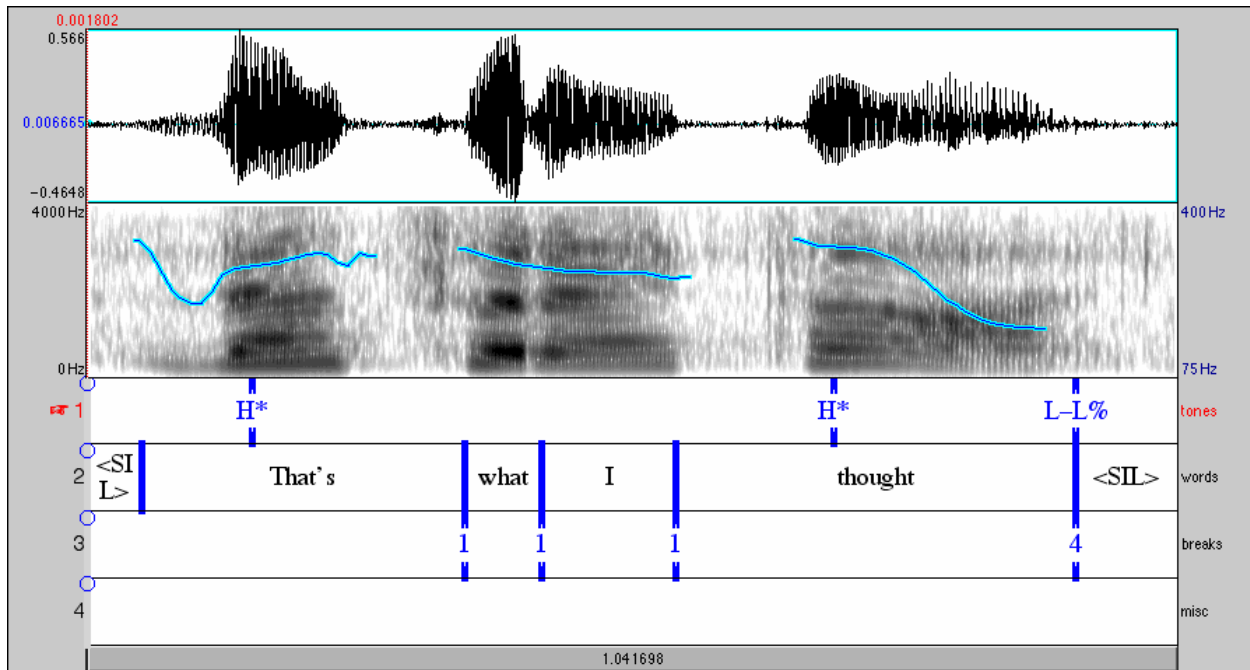
Figure 2.6.6 An example of H* followed by another H* realized with a higher f0: <thought>
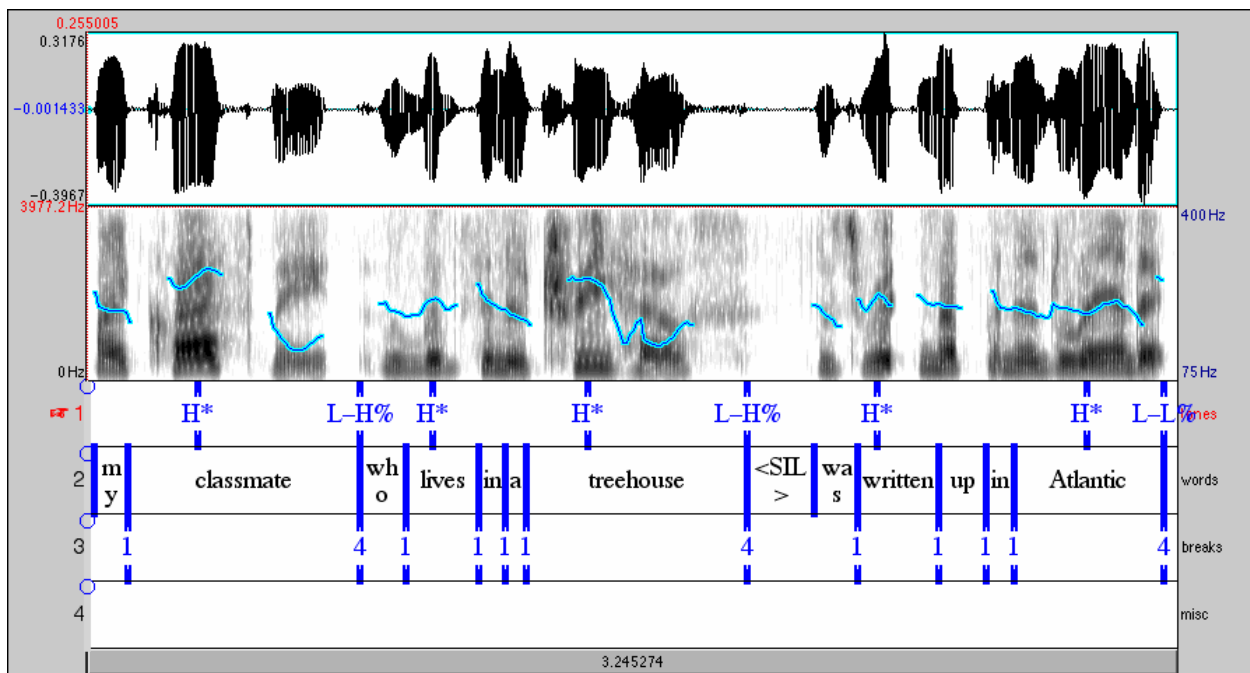

Figure 2.6.7 Another example of H* followed by another H* realized with a higher f0:
< treehouse >

In this last example, note the middle Intonational Phrase (*who lives in a treehouse*) where the H* on *treehouse* is higher than the H* on *lives*.

In addition, once a speaker has produced a !H*, there is no requirement to continue to downstep for the rest of the Intonational Phrase. A speaker can produce a !H* and follow it with an H*, as in the following example:
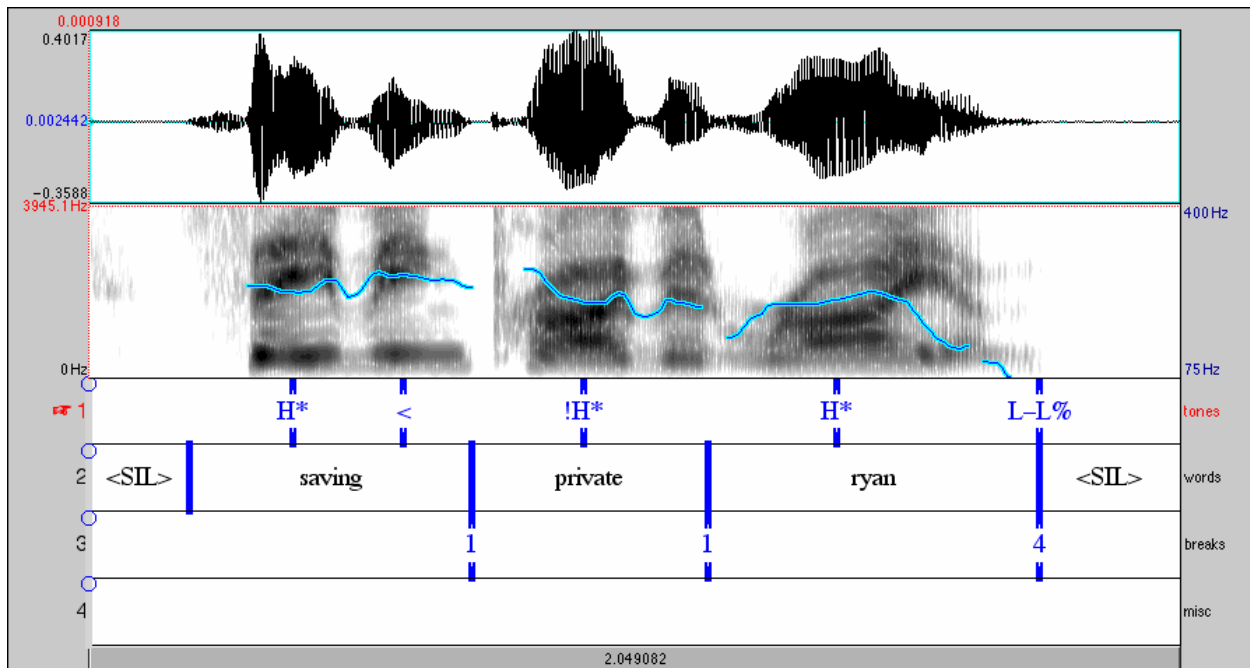
Figure 2.6.8 H* following !H* on *saving private ryan*   <private_ryan2>

Here, the speaker produces an H* on *Sav-*, a !H* on *Pri-* but follows with an H* on *Ry-*. Although the last H* (on *Ry-*) is produced with a lower f0 than the first H* (on *Sav-*), downstep is relative to the proceeding pitch accent only, so here it would be relative to the !H* on *Pri-*. Of course, the sentence can be produced in many different ways; for example, it could be produced with a series of !H*, as in earlier examples and the example below.

8

Figure 2.6.9 a sequence of !H* produced by the same speaker as the previous example.

<private_ryan3>

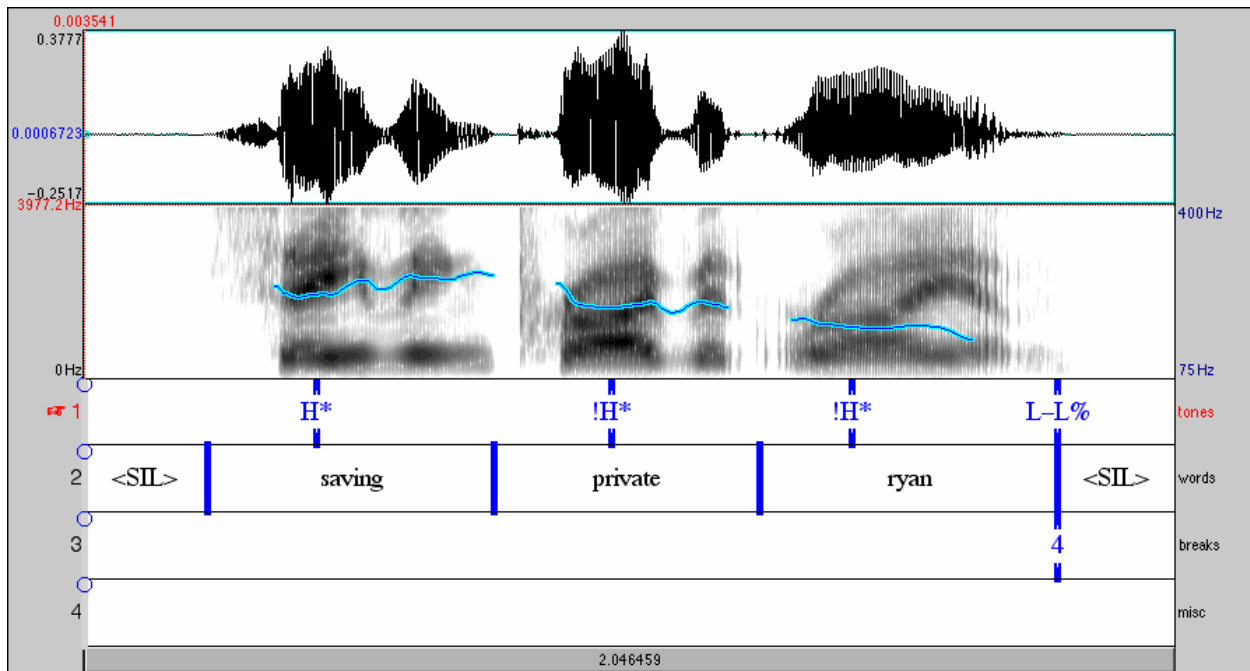One other optional ToBI label was used in <private_ryan3>: the < in *Saving.* As you may have noticed, the peak of the High Tone doesn't always align with, e.g. the center of the accented syllable's vowel. Many labelers wish to note when a peak is particularly late with respect to the vowel and will mark the < to indicate a late peak. This label is optional and therefore not consistently marked throughout the ToBI community; the question of whether this alignment distinguishes different pitch accent categories in Mainstream American English is still under investigation. (A good way to remember which symbol to use is that the sharp end of the angled bracket points in the direction of the associated accented syllable.)

In earlier discussions of pitch accent (whether in the single-tone H* or L*, or in the bitonals L+H* and L*+H), we have tried to give examples where the pitch movement associated with the pitch accent is clearly visible in the pitch contour. However, it is not the case that each pitch accent will have a clearly distinguishable pitch movement. Sometimes the pitch event associated with a pitch accent is not a movement, such as a High or Low culminating in a "peak" or "valley," but an absence of movement toward another target. For example, in an Intonational Phrase with an H* ending in a Low phrase tone-Low boundary tone combination (L-L%), the fall into the L phrase tone is expected immediately after the high pitch associated with a High pitch accent (H*). This is the case in <armani2>, shown below, where the F0 begins to fall rather sharply immediately following the end of the pitch-accented syllable (the –man– of *Armani*). Notice that by the time the speaker reaches the word *millionaire*, the f0 has nearly reached the bottom of the speaker's pitch range for that utterance. In contrast, <armani3> the f0 between the H* on the –man– of *Armani* and the !H* pitch accent on the *mil–* of *millionaire*, stays comparatively high. This second pitch accent, while it doesn't have a 'peak' of its own,

9

effectively prevents the f0 from falling into the L- phrase tone until later, i.e. until after the second pitch accent. In this example, even the first H* pitch accent does not have a clear 'peak' in the f0. Many single-tone H* pitch accents are realized with fairly flat (but still high) f0 regions.
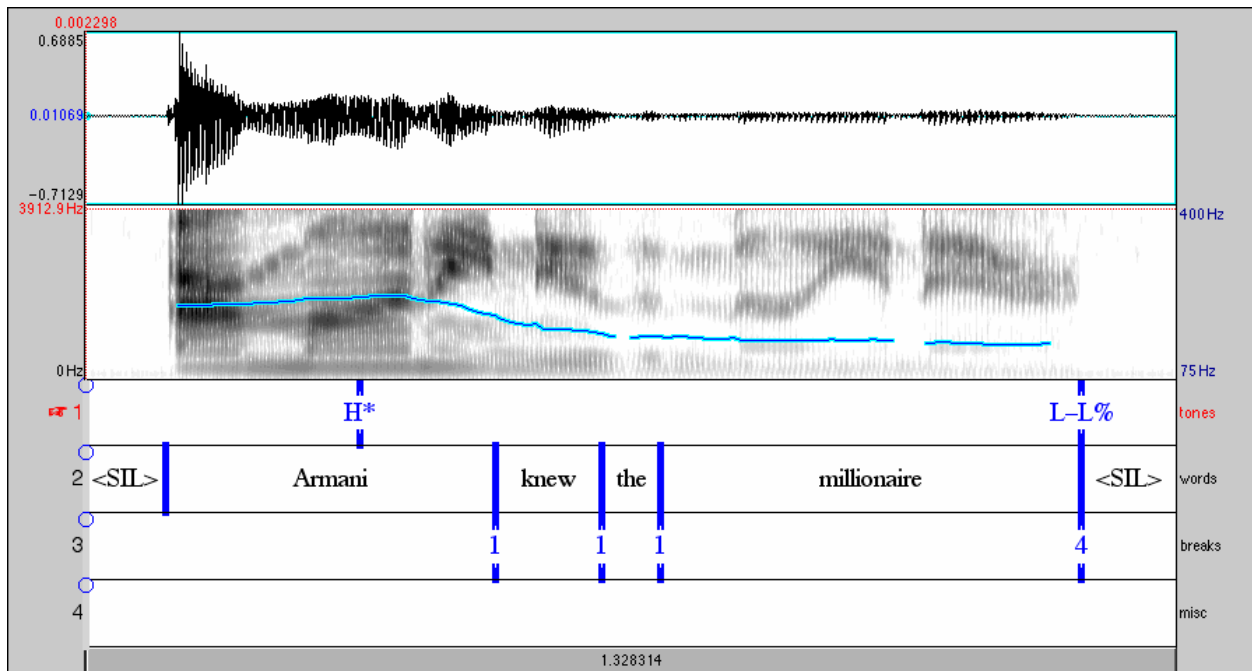

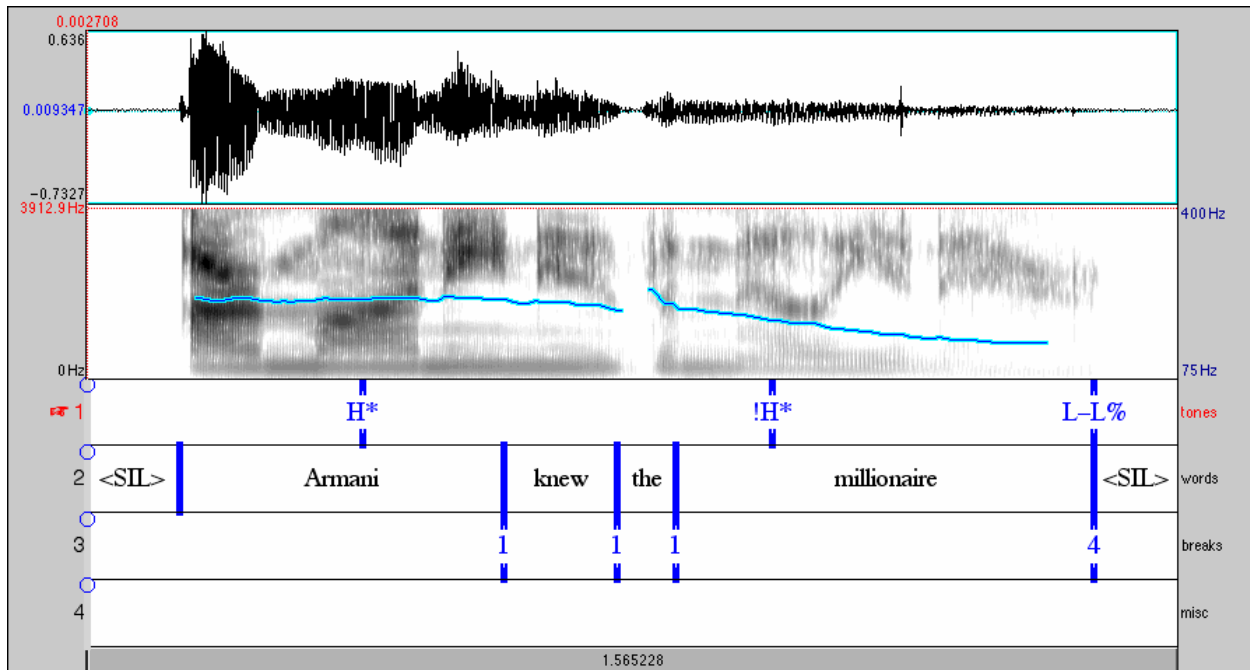Figure 2.6.10a and 2.6.10b: H* L-L% vs. H* !H* L-L%   <armani2>

Figure 2.6.10b   <armani3>

Summary of ToBI labels introduced so far:

Tones:
H*: high pitch accent
L*: low pitch accent
L+H*: bitonal pitch accent with low tone followed by high tone prominence
L*+H: bitonal pitch accent with low tone prominence followed by high tone
!H*: downstepped high pitch accent
L-L%: low phrase tone, low boundary tone
H-H%: high phrase tone, high boundary tone

Break indices:
0: word boundary erased
1: typical inter-word disjuncture within a phrase
4: end of an intonational phrase

Optional labels:
<: late High Tonal peak

End list must be added.
<heyAlejna-L>

What triggers downstep?

This section is taken from notes by Mary Beckman, used at the ToBI clinic at Ohio State University.

The trigger for downstep in English is very controversial. Pierrehumbert (1980) first proposed that downstep is triggered by any sequence of alternating L and H tones (as in the African tone languages where it was first described), whereas Beckman & Pierrehumbert (1986) proposed that it is only the alternating sequences of bitonal pitch accents that triggers it. Note that in both of these models, there is a bitonal accent H*+L which is missing in ToBI, for which the trailing "L" target is not very low in the pitch range. So an Intonational Phrase contour that in ToBI would be transcribed as **H* !H* L-L%** would be represented in the Pierrehumbert (1980) or Beckman & Pierrehumbert (1986) models as **H*+L H* L-L%,** with the downstep that is explicitly marked in ToBI being understood as an automatic consequence of the choice of a bitonal H*+L accent.

Ladd (1983, 1986) objected to this characterization of downstep, because it meant positing this H*+L accent that typically doesn't have an obvious L target. Gussenhoven and his colleagues have also objected to this, and have always maintained that downstep is a facultative choice that a speaker can make to signal greater cohesion within a prosodic phrase (see, e.g. van den Berg, Gussenhoven, & Rietveld (1992) in LabPhon2). They have a way of representing it that differs from ToBI, in terms of a combination of a H*L accent type for which the L tone typically represents the L- phrase tone, but in cases where the accent is not the nuclear tone, it detaches and reattaches to the following H*L accent, or simply detaches and is a 'floating' tone that is realized as downstep. In this system, downstep is represented not as a mark on the accent tones, but as the choice of 'float' among the three-way opposition among ways to deal with the L tone (i.e., 'spread' for a nuclear accent vs. 'reattach' for a what we would transcribe as the leading L tone of a L+H* accent vs. 'float' for what we would transcribe as a H* or L+H* accent before a downstepped !H* accent).

Ladd (1986) proposed a different representation again -- namely that downstep be modeled as one term in a binary opposition between two different "register tone" relationships -- adopting Clements's tree model of downstep in African tone languages. So the short story is that no one is sure what triggers downstep. There are competing theories, but no definitive data to decide among them.

Since there is this controversy about the theory, what we decided to do back in 1990, at the first workshop where we started to devise the English ToBI system, was to sidestep the controversy completely, by explicitly marking downstep on the first H tone that is realized in the downstepped pitch range. So downstep can follow any pitch accent that has a H target in it. If you want to read the description of how we decided this, by the way, you can look at the Beckman, Hirschberg, & Shattuck-Hufnagel chapter Jun's (2005) book.