

The composition of tunes

Looking relatively closely at Pierrehumbert & Hirschberg (1990) and Hobbs (1990)

1 The basic components of tune in English

Pierrehumbert (1980), and later, proposed that intonational tunes in English can be described in terms of sequences of *low* (**L**) and *high* (**H**) tones. There are six possible stress-aligned tones (*pitch accents*), allowing for two-tone sequences (where either one is aligned with the stress, and where contrast between them is required). The symbol * indicates which tone is aligned with the stress.

Pierrehumbert & Hirschberg (1990) lay out a proposal about how these work, but I will incorporate the reinterpretation proposed by Hobbs (1990) as well as we go along.

In addition to the pitch accents assigned to stressed syllables, there are also tones that mark the end of more abstract groupings. The more abstract groupings are *intermediate phrases* (which group together some number of pitch accents), and *intonational phrases* (which group together some number of intermediate phrases). Either of these phrases can be marked with either a **H** or an **L**—a *phrasal tone* on an intermediate phrase is referred to just as **H** or **L**, and a *boundary tone* on an intonational phrase is referred to as **H%** or **L%**.

Part of the proposal here is that *this is all we need*. We can describe the possible tunes in English sufficiently with these two tones aligned as they are, without predicting the existence of other combinations that don't occur (or are not distinct). In support of this idea, Pierrehumbert & Hirschberg (1990) attempt to show that a “meaning” of sorts can be attributed to the individual tune components.

Hobbs (1990) distills out in a fairly clear way what Pierrehumbert & Hirschberg (1990) are proposing and makes some amendments that seem promising.

2 Mapping Hs and Ls onto pitches

There are some general principles that need to be considered when we try to go from a tune assignment to an actual pitch track.

As one might guess, complex tones like L+H rise, H+L fall. H is generally higher than L. But there are also some other generalizations:

- Upstep: After a phrasal H, the reference point for a following boundary tone is raised. This results in the following: H L% has no drop at the end, the H raises the

pitch, and then the L% raises it no further. H H% tips upward, there is a high pitch, and then a higher pitch at the end.

- Downstep: After any of the two-tone accents, the pitch range is lowered. Successive H*L accents, for example, descend in pitch, and a phrasal H after a two-tone accent comes out at kind of a middle pitch.
- Reset: At the beginning of each new intermediate phrase, the pitch range is reset, whatever downstep had occurred goes away.
- A phrase L seems to generally take the pitch back down to the baseline, whereas an H pushes the pitch up off the baseline.

An example they give which I think is relatively judge-able is (1).

- (1) A round windowed , sun illuminated room
 (H* L) (H* L) (H* L L%)

Another example that can be phrased in two ways that they give is (2) (though I'm not 100% sure I have the pitch accents transcribed correctly). In (2a) there is just one intonational phrase, whereas in (2b) there are two and the duration of *I* is longer.

- (2) a. I means 'insert'
 (H* H* L) L%
- b. I means 'insert'
 (H* L) (H* L) L%

3 Mapping tune to meaning

There have been various ideas about what the contribution of tune to meaning is. It doesn't seem to be possible to say that a particular tune corresponds to something like speaker uncertainty, incredulity, politeness, irony, because the same tune can result in any of these effects. Nor emotion. And it doesn't seem to be able to be tied to what the speaker believes to be true either. They give an example that I will reproduce but can't swear to be able to pronounce. Their claim is that (5) corresponds to a situation where the speaker believes the proposition with the indicated tune, whereas (6) corresponds to a situation where the speaker do not believe the proposition—and the tune is the same: L*+H L H%. Which means: low tone on the stress, rising, then low again, rising at the end. It's quite complex.

Their examples are in (5) and (6), but let me start with something that might be a bit easier to say/judge—the examples in (3) and (4) have more syllables across which to

distribute the complicated tone pattern. I don't really get these judgments, I don't think. At best, I have differing accents on *I* in the two cases—it seems like H*+L in (3)/(5) and H* (H) in (4)/(6).

(3) a. Who ordered the carrots?

b. I'm having vege- ta- bles
 L*+H L H%

(4) a. Here are your roast carrots, sir.

b. I'm having vege- ta- bles.
 L*+H L H%
 But I'm a carnivore, there must be some mistake.

(5) a. Who ordered the veal?

b. I'm having beef
 L*+H L H%

(6) a. Here's your roast beef, sir.

b. I'm having beef.
 L*+H L H%
 But I'm a vegetarian, there must be some mistake.

More promising is an approach that takes the tune to be related to the background beliefs. That is: "We will assume that a basic goal of a speaker S is to modify what (S believes) a hearer H believes to be mutually believed." And we think that we can build up the meaning of complex tunes from component pieces of meaning.

Pitch accents convey information about the status of the individual discourse referents, modifiers, predicates, and relationships specified by the lexical items with which the accents are associated. Higher level tones seem to convey something about the connection between phrases.

(7) a. The train leaves at seven

 H* H* H* L H%

b. There's a full moon tonight

 H* H* H* L L%

'The train leaves at 7—and, in unrelated news, there's a full moon tonight.'

(8) a. The train leaves at seven

 H* H* H* H H%

b. There's a full moon tonight

 H* H* H* L L%

'The train leaves at 7—because there's a full moon tonight.'

4 The H* and L* pitch accents

Pierrehumbert & Hirschberg (1990) propose that items made salient by H* are to be treated as “new” in the discourse. The proposition is to be added to H’s belief space.

When followed by an L, this can be a neutral declarative, conveying information. They don’t give an example of this—instead, they give an example of another situation, where they say that it is being used by S to convey that something is mutually believed. I’m not sure I follow this exactly—is it not just pretending that information is being conveyed? In any event, their example:

- (9) You turkey. You deliberately deleted my files.
H* L L% H* H* H* L L%

In combination with an H phrasal tone, there is an added sense that there is “more to come”—which in this case seems to translate to an anticipated response from the hearer.

- (10) My name is Mark Liberman
H* H* H H%
‘My name is Mark Liberman, am I in the right place?’

- (11) I thought it was good
H* H* H H%
‘I thought it was good, but do you agree?’

If the H* is not used, but instead L* (which does not mark something as “new”), then it comes out as sounding like confirmation is being asked about whether this is really old information, as if ML had suffered amnesia.

- (12) # My name is Mark Liberman
H* L* H H%
‘My name is Mark Liberman—? Really?’

In yes-no questions, the difference between a H* and an L* pitch accent seems to correspond to a presumption about the answer.

- (13) May I interrupt you?
H* H H%
‘I may interrupt you, yes?’

- (14) May I interrupt you?
L* H H%
‘May I interrupt you, or not?’

It's all kind of vague, but still: H* is supposed to go with an attempt to add information to H's mutual belief space.

On to L*. The idea with L* is that it is not an attempt to add information. Either because there's no basis:

(15) Do prunes have feet?

L* L* H H%

'I ask you this: Do prunes have feet?'

or because it's actually taken to be incorrect.

(16) a. I was wrong

L* H L* H H%

b. And Stalin was right

L* H L* H H%

c. I should apologize

L* H L* H H%

or because it's believed already to be part of the hearer's mutual beliefs

(17) Well, I'd like a Pavoni...

L* L* L* L H%

or because it *should* have already been part of the hearer's mutual beliefs

(18) a. Let's order the Chateaubriand for two.

b. I don't eat beef

L* L* L H%

While the participation of the H* accent seems relatively clear under this story, the L* accent is a bit fuzzier. Hobbs (1990) refines it as follows:

- H* marks the proposition (involving the thing marked) as new.
- L* marks the proposition (involving the thing marked) as *not* new—that is, either because it is given or because it is believed to be false.

So, (17) is a case where L* marks “given” and (16) marks “false.”

5 Complex pitch accents: The prefixes

Here is where I would like to turn to follow Hobbs (1990) first. Pierrehumbert & Hirschberg (1990) propose that the complex pitch accents $L+H^*$ and L^*+H should be grouped together as evoking some kind of “scale” in the discourse, while H^*+L and $H+L^*$ should be grouped together as meaning something about the inference path being short (it is somehow obvious). But this does not seem to come at all from the component parts L^* and H^* that we already figured something out about—it does not seem “compositional.”

Hobbs (1990) proposes that in complex tones H^* and L^* mean just what they mean alone— H^* means “new” and L^* means “not new.” A complex tone can be formed on a basic H^* or L^* tone by adding a prefix or a suffix.

A prefix (which will necessarily mismatch in tone) conveys something like “you might believe otherwise”—so, $L+H^*$ is “you might think this is not new information, but it actually is” and $H+L^*$ is “you might think this is new information, but it’s actually not new.”

One kind of “not new” is “given”—the context: baby wakes up in the middle of the night. Discussion with mother-in-law as to why. According to the mother-in-law:

- (19) She’s teething
 $H^* \quad H+L^* \quad H \quad L\%$

That is: this is old information, you just erroneously think it’s new. (This is what Pierrehumbert & Hirschberg (1990) were attributing to a “short inference path” but this other way of saying it sounds better.)

Another kind of “not new” is “false”—the context: an analysis of some bit of discourse was proposed, and a suggestion was raised that the analysis was a Freudian account.

- (20) a. It’s not a Freudian account
 $H+L^*$
b. It’s a cognitive account
 H^*

Similarly, $L+H^*$ conveys “this is new, you seem to think otherwise.” On the “false” kind of “not new,” we have

- (21) a. It’s awfully warm for January.
b. It’s even warm for December!
 $L+H^* \quad L \quad H\%$

And on the “given” kind of “not new,” we have:

- (22) a. It’s Raymond and Janet on the phone.
b. They want to know if we can come for dinner
L+H* L H%

That is, there was something “in the offing,” and the new information is that it’s dinner. (This one is less clear to me, though.)

6 Complex pitch accents: The suffixes

A complex pitch accent can also be created by taking a basic pitch accent (H* or L*) and adding a tonal suffix (again, this has to mismatch in tone—and here I wonder why. It seems to be a restriction in the grammatical system that is actually limiting the space of possible expressions). In any event, an H suffix indicates that the question is still open somehow, and the L suffix indicates that it is not.

For example, H*+L: The proposition is conveyed as given or false, but the question is still open.

- (23) a. Alan’s such a klutz.
b. He’s a good badminton player.
(L*+H L) H%

“It is mutually known that he’s a good badminton player, but it is open in that the hearer might not have believed it relevant.”

- (24) a. Did you take out the garbage?
b. Sort of
L*+H L H%
c. Sort of!?
L*+H L H%

The first one is “given in that the hearer should have known that the speaker would carry out the trash, but open in that it’s not really an adequate answer” while the second one is given “because the hearer just said it, but open in that it is uninterpretable.”

- (25) a. We don’t have any native speakers of German here.
b. Jurgen’s from Germany
L*+H H H%

Here, Jurgen’s existence is given, but the proposition is open because the speaker wonders why the hearer didn’t think of it. (With just a L*, it would be flat contradiction—leaving it open with L*+H “mitigates the implied criticism.”)

Here, Hobbs (1990) points out that there is possibly a confound with the fact that H*+H can’t exist—so you’re stuck choosing between expressing the openness and expressing the newness. This might require us to revise the theory a bit, so that H* signals “new” but L* signals given, false, *or* uncommitted.

The remaining suffix, is L on H*+L, which should mean something like “this is new, and true, and that’s that.” This explains perhaps the “pedantic tone” you have with such examples.

- (26) a. Hint gives you hints if you need help.
 b. Hit the hint key
 H*+L H*+L L L%

An assertion might be “not open” not just because it is obvious/inferable, but also from expertise or authority.

- (27) Dig that hole
 H*+L H*+L L L%
- (28) Inflation isn’t why that happened
 H*+L L L%

7 The phrasal tones

One nice thing about Hobbs’s (1990) account of this is that the suffix tones seem to carry the same meaning as the phrasal and boundary tones—a H means that there is “more to come” and an L is more final. “More to come” can also give a feeling of causal connection.

- (29) George ate chicken soup and got sick
 H* H* H* H H* H* L L%
- (30) George ate chicken soup and got sick
 H* H* H* L H* H* L L%
- (31) Eat another cookie and I’ll kill you
 H* H H* L L%
- (32) I opened the door and the rain poured down
 H* H* H H* H* L L%

Similarly, it can help tell us what the “constituency” of the discourse is:

- (33) a. My new car manual is almost unreadable
L L%
- b. It’s quite annoying
L H%
- c. I spent two hours figuring out how to use the jack.
- (34) a. My new car manual is almost unreadable
L H%
- b. It’s quite annoying
L L%
- c. I spent two hours figuring out how to use the jack.

8 Back to Pierrehumbert & Hirschberg (1990)

Returning now to Pierrehumbert & Hirschberg’s (1990) own discussion of these, I just want to make a couple of comments about why I like Hobbs’s (1990) account better.

Primarily, I think they didn’t get the grouping right. Pierrehumbert & Hirschberg (1990) tried to group L^*+H with $L+H^*$, and H^*+L with $H+L^*$ —whereas Hobbs (1990) groups L^*+H with $H+L^*$, and $L+H^*$ with L^*+H . The basic meaning seems to come out more clearly under Hobbs’s (1990) grouping.

Under Pierrehumbert & Hirschberg’s (1990) groupings, they suggest that the $L+H$ pattern evokes some kind of “scale”—although I can’t for the life of me figure out what these scales are supposed to be.

Re the badminton player—This is supposed to convey uncertainty about a scale in the discourse—about whether being a good badminton player provides relevant information about degree of clumsiness. This sounds very imprecise to me. And re the garbage? And Jurgen? And December? It kind of seems like what they are calling a “scale” is really just a set of alternatives.

Similarly, the $H+L$ pattern is supposed to go with “short inference,” but not in a way that I find computable.

I’m not quite sure what to make of some of the examples that Pierrehumbert & Hirschberg (1990) use for H^*+L , though. “This is new and true and that’s that” doesn’t quite seem to get these—does it? Their own suggestion was something like “Jimmy should be able to infer the reason that lunch is being called to his attention”

- (35) a. Jimmy
H^{*}+L H L%

b. Your lunch
H*+L H L%

Also, it's not clear to me why this isn't good (but it isn't):

(36) # Fire
H*+L H L%

References

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