THE CONTEXT-DEPENDENCE OF "INTONATIONAL MEANINGS"

Anne Cutler
University of Sussex

As is characteristically the case with papers on intonational topics, the examples which follow would be better heard than read. The intended intonation contour of each example sentence is represented as a line above it; this line in turn represents the variation of fundamental frequency against time (give or take a little slop due to the mismatch between acoustic duration and orthographic spacing of segments) on a Kay SonaGraph spectrogram of the utterance; it is to be hoped that this information will suffice to enable readers to reconstruct the intonation contours (and hence be convinced by the examples).

There is a long tradition in the intonational literature for the claim that intonation contours - certain sequences of pitch levels, or certain "tunes" - have meanings in themselves. One of the most enthusiastic exponents of this view has been Kenneth Pike (1945), who stated "In English, many intonation contours are explicit in meaning. Whenever a certain sequence of relative pitches is heard, one concludes that the speaker means certain things over and above the specific meanings of the words themselves. A change of pitch contour will change the meaning of the sentence" (p. 20). More recently, and in this forum, Liberman and Sag (1974) have identified a sentence intonation shown here on one of their examples:

(1) Elephantiasis isn't incurable!

which they claim to have the meaning of "contradiction". In a subsequent paper (Sag and Liberman 1975) they described the contour shown on (2):

(2) The blackboard's painted orange!

which, according to their analysis, is ambiguous between "surprise" and "redundancy". Similarly, Ladd (1976) described the fall-rise contour in English, as exemplified in (3):

(3) I fed the cat

as having the meaning of "focus within a given set". Liberman

(1975) takes the logical next step from the hypothesis that contours have meanings and postulates an "intonational lexicon" in which are listed the "intonational words" of a language.

Supposing, for a moment, these claims to be justified, what are the implications for a psycholinguist attempting to construct a model of, say, sentence comprehension performance? Firstly, it is important that a mechanism exist for processing intonation contours holistically, and, most importantly, independently of the interpretation of the text on which they are imposed. Secondly, evidence must be gathered about the intonational lexicon - its structure and the way in which it is accessed. A description of sentence comprehension will not be complete without an account of how the meaning of the suprasegmental contour is extracted and combined with the meaning of the text.

It necessarily holds that extraction of intonational meaning must be a part of all sentence processing. Suppose it to be the case that only some contours - those mentioned above, for instance - carry meaning, while others are neutral with respect to meaning. The task of the sentence processing device might then be thought to be even more complex, since it would be necessary to determine whether or not the applied contour were a meaningful one in addition to identifying its particular meaning. However, the question of meaningfulness or not surely cannot be decided unless the contour is first isolated as a whole and a search instituted in the intonational lexicon; thus the processing load involved would presumably be equivalent irrespective of whether the contour were meaningful or neutral. What would remain to be determined (and could be determined experimentally) would be, for example, whether neutral contours were listed in the intonational lexicon as such (with the meaning "declarative", perhaps), or whether they were not listed, so that the lexical search in such a case would be fruitless. An argument in favor of the former possibility is provided by those cases in which neutral, e.g. declarative, intonation can in itself effect a discourse function:

> (4) Child: Mummy, mummy, guess what, I won
>   first prize in the competition.
>
> Mother: Very good. You're a very clever girl

There is a sense in which the proposal that intonation contours have meaning might be a very attractive one to the psycholinguist interested in comprehension. If contour meanings were fixed and listed in a lexicon then the task of the contour-processing component would presumably be of a less terrifying order of complexity than the task of, for instance, the component which determines the contributions of context to the interpretation of an utterance. As yet, however, very little is known about the way in

which suprasegmental aspects of an utterance are processed. A part
of the sentence comprehension process has been demonstrated to con-
sist in a search for those portions of the sentence which bear high
stress, and there is reason to understand this search for stress as
a search for the sentence's focussed portions (Cutler 1976). Al-
though it is so far not known which of the various components of
the suprasegmental contour - segment duration, fundamental frequen-
cy and amplitude - are monitored in this search, the most reliable
algorithm for the mechanical location of stressed syllables in
natural speech appears to be one utilizing pitch contour peaks (Lea
1973). The processing of holistic contours is, however, uncharted
territory.

Let us consider in detail the merits of this seemingly attrac-
tive proposal. It is immediately apparent that many of the "mean-
ings" attributed to intonation contours would be better termed
attitudes or emotions - rage, fear, surprise, etc. - and Pike, for
one, readily admits this to be true: "an intonation meaning modi-
fies the lexical meaning of a sentence by adding to it the speak-
er's attitude towards the contents of that sentence" (p. 21). Thus
the meaning of "a horse" spoken in a surprised manner might, accord-
ing to Pike, be given in conjunction with the text meaning as "Look
at the horse about which I am quite surprised at its unexpected
appearance". Liberman's description of the intonational lexicon,
however, is more elaborate, with the important characteristic of
the meanings listed being not the fact that they express attitudes
rather than more explicit features, but that they are ideophonic.
Ideophonic meanings are metaphorical rather than referential, and
to a certain extent at least non-arbitrary. Words can be, and in
many languages are, completely or partly ideophonic; Liberman cites
as an example of items in the English lexicon having ideophonic
characteristics the class of words beginning with el- and referring
to noises - clang, clunk, clomp, click, clank etc. Another example
is the large number of verbs ending with the (underlying most likely
identical) affixes -er or -le, and referring to actions or sounds
which consist of a rapidly repeating series of discrete segments:
mutter, hammer, stutter, giggle, rattle, jingle etc. The "mean-
ings" of intonation contours are, according to Liberman, analogous
to the "meanings" of the segments cl- and -er/-le in these examples.

No proponent of the contours-have-meanings proposal is fool-
hardy enough to claim that contour meanings are specific, referen-
tial, and analogous to word meanings. The analogy with ideophonic
meanings, however, is also unfortunate, since these are notoriously
subject to exception - claim, clerk, butter, struggle etc. etc.
Moreover, even the non-specific, non-referential effects exercised
by intonation contours can be shown to be context-dependent to such
a degree that the attempt to extract from them an element of common-
ality valid in all contexts must be reckoned a futile endeavour.
Take, for instance, the contour of (1) above. In the Liberman and
Sag presentation the following context was given: Ivan was asked by
Mark if he would mind dropping off Mark's pet whale at the aquarium

on the way to school. In what must surely be one of the all-time
high spots of the intonational literature, the contour alone was
then performed on the kazoo. It was perfectly clear that Ivan's
answer was an indignant objection to the request. But let us con
struct another context for this contour:

(5) Captain: Now that the colonel's been blown to
smithereens I'd better set about issuing some
orders.

Major: Are you the senior officer here?

How would we express the effect of the "contradiction contour" in
this case? What is being objected to, strictly speaking, is the
presupposition involved in the captain's assumption of a commanding
role. Furthermore, the contour - in particular, this contour as
opposed to one without the marked terminal rise - seems to imply a
definite sense of challenge.

A further instance:

(6) Father (to son who has been ignoring a friend's
attempt to attract attention from outside the
window):

Go and see what the fellow wants![2]

In (6) it is hard to identify any element of contradiction or
objection at all; what is common to the three situations might be
better paraphrased as an element of disapproval of the other's
attitude. (1), for example, uttered as a response to one who has
expressed fears of dying of elephantiasis, might be paraphrased
"Don't be silly, elephantiasis isn't incurable". Similarly, the
major's utterance in (5) might be paraphrased as "Don't be presump-
tuous, are you the senior officer here?", and the father's in (6)
as "Don't be lazy, go and see what the fellow wants". However, to
say that the meaning of the contour in these situations is "dis-
approval of audience's attitude" utterly fails to do justice to the
richness of its effect in each specific context.

The same is true of other contours, for instance the contour
which Sag and Liberman (1975) describe as expressing "surprise or
redundancy". They give the following contexts for (7):

(7) Where'd you get the rug?

(a) the speaker observes the new rug and exclaims (7) in amazement;

(b) the speaker is replying to the rug-owner's despaired query as
to how to find other floor coverings to match. In the latter case
the question in (7) is redundant, as obviously the place which sold
the rug would have similar goods as well. (Sag and Liberman also
point out that the redundancy effect is not necessarily separate
from the surprise effect, but may be, so to speak, a side-effect of
the expression of surprise in a situation in which surprise is in-
appropriate.) What, however, of the effect of the contour in the
following context:

> (8) a. What sort of a crummy sandwich is this
> you've brought?
>
> b. This is the best they had.

Expressed as succinctly as possible, it is something like₃self-
defense, or justification of the buying of that sandwich. In the
expression of this effect it is perhaps not as efficient, or does
not contain as aggrieved a protest, as strong an element of injured
pride, as:

> (9) This is the best they had

which contour itself in the following context expresses nothing of
the sort:

> (10) (Uttered while watching the inexplicable
> behavior of someone out of earshot)
>
> I wonder what he's doing

but rather puzzlement or bewilderment - which could be subsumed
under a very general heading of "surprise". Probably for this
reason Sag and Liberman consider the contours of (8b) and (9) to be
alternate forms of one and the same contour. However, the effects
are clearly not identical in the context of (8) and (9); further,
identifying the element common to (9) and (10) is, to say the least,
difficult. Once again the total effect of the contour in context
extends far beyond the supposed "meaning" of the contour.

To use yet another of Sag and Liberman's examples - but one
which we will see is closely connected to the last - they isolated
a contour which they called the "tilde contour", since its repre-
sentation over a written sentence resembled a rather stretched out
tilde; an example is given in (11):

(11) Who opened the restaurant?

This is a simple question, and at this point in their paper Sag and Liberman are concerned with the circumstances under which a question can be considered an indirect speech act, e.g. a suggestion or request. As they correctly point out, (12) with the contour of (11):

(12) Why don't you move to California?

is not a suggestion, whereas with the contour of (7), that contour which is supposed to express surprise or redundancy, it can be:

(13) Why don't you move to California?

They are wrong to conclude from this, however, that the tilde contour necessarily identifies the question on which it is imposed as a genuine question; (14) is certainly not a genuine question, equally certainly a suggestion, and quite natural with the tilde contour:

(14) Why don't you butt out?

Again, the contour of (9) can be applied to this utterance, also with the effect of an offensive suggestion:

(15) Why don't you butt out?

The "surprise-redundancy" contour in its pure form (e.g. as in (7)), however, does not have the same effect:

(16) Why don't you butt out?

miraculously, all of the offensiveness has disappeared. This one example is thus simultaneously an argument against Sag and Liberman's coupling of the contours of (15) and (16) under a single heading, a counter-example to their interpretation of the tilde contour as "meaning" a genuine question, and a further case in

which the generalised "meaning" of a contour is a quite inadequate description of its effects on a particular utterance.

The lesson to be drawn from this series of examples is this: extracting an element common to all the effects of a contour in various contexts ignores the richness of the effects in each situation. "Surprise", for example, is a grossly deficient description of the effects of the contour on the utterance in (8b); "contradiction" fails to do justice to the effect of the intonation in (5) or (6). Yet the effect which is more than the common element is not, it must be remarked, simply the common element provided by the contour plus some additional element provided by something else - it is an effect of the contour alone - remove the intonation as given from the utterance in (8b), for example, and replace it with a neutral contour, and the effect of self-defense or protest disappears entirely. This added element cannot be a part of the "meaning" of the contour if it won't transfer to other contexts; yet it is accomplished entirely by intonation.

Liberman and Sag, criticising Pike's efforts to break contour meanings up into an additive sequence of meaningful pitch morphemes, remarked that the meanings of Pike's morphemes were, "like good astrological readings, not demonstrably inconsistent with the facts, but far too vague to be of much predictive value" (p. 420). Alas, just the same malaise seems to befall meanings assigned to contours when they are abstracted from the contexts in which they occur.

The central claim of the present paper is that the effect exercised by the intonation contour of an utterance is dependent upon the context in which the utterance occurs. Return, for instance, to example (4) above. The effect of a declarative contour in this context is devastating - whereas the same utterance with a series of high pitch peaks:

(17) Very good. You're a very clever girl.

would convey the enthusiasm appropriate to the situation, the contour in (4) expresses an utter lack of interest in the child's news, or possibly the existence of some other, totally overwhelming, preoccupation - to decide between the two possibilities it is, typically, necessary to know more detail of the context. However, to assign such a meaning to the declarative contour in the vast majority of cases in which it occurs would be patently ridiculous.

Where does this leave the psycholinguist looking for a way to fit the processing of intonation into a model of sentence comprehension? In a bad way, obviously, since the extraction from an intonation contour of its effect on an utterance becomes part of, and as complex as, the determination of the effects of the context on the ultimate interpretation of the utterance. Worse still, it appears that there is more than one mode of interaction between inton-

ation and the rest of the interpretation process.

Liberman (1975) holds that tune and text are independent, and that the contribution of the intonation contour to the ultimate interpretation of an utterance is independent of and supplemental to the contribution of the words and syntax. Accordingly, Liberman and Sag (1974) dispute the commonly given description of sentences involving quantifiers and negation, as in (18):

(18) All the women didn't go

as involving the imposition of a disambiguating tune consequent up on the scope relations generated. The contour imposed on (18) for ces the reading "not all the men went", in which the scope of the negation covers the quantifier (the neg-Q reading), whereas (19):

(19) All the women didn't go

if it prefers one reading over another tends to favor the neg-V reading ("none of the men went") in which the scope of the negative is restricted to the verb. Liberman and Sag hold that the contour of (18) is in fact their "contradiction contour", and that its dis-ambiguating effect is due entirely to the natural assumption that if a negative statement is used as a contradiction, the negative itself is the vehicle of that contradiction, i.e. the scope of the negative is as wide as possible. If they are right, it is worth noting that this is yet another case in which the effect of the contour in context goes much further than the simple meaning ascri-bed to it independent of context. It has however been argued (Ladd 1976) that they are wrong, and that the analysis by Jackendoff (1972) of (18) in terms of focus differences is to be preferred. Ladd's analysis fits the disambiguation of quantifier-negative sen-tences in with other phenomena involving scope changes due to the fall-rise contour.

(20) I'd never met most of them

(20), he claims, is appropriate to a context in which a contrast is being drawn with the superset "all of them", for example as a reply to the statement "They weren't all strangers - you did know a couple of them", and is to be set against (21):

(21) I'd never met most of them

which is appropriate as a contrast with a subset, for example as a reply to "There must have been a few strangers". The "meaning" of the fall-rise contour, according to Ladd, is "focus within a given set". (It is immediately obvious that this "meaning" is context- and text-dependent for its realisation on a particular utterance, and in fact Ladd's concept of meaning of a contour is, it is clear from his paper - see especially his footnote 2 - exactly analogous to the "meaning" of a context and hence closer to the view presented in this paper than to the Liberman-Sag attempt to isolate text- and context-independent meanings.) What is important for our present case is that the effect of the contour in such examples is to determine the choice made between alternate readings of the utterance; the fall-rise intonation specifies a focus and effects disambiguation. In other cases its effect may be a little more complex, e.g. in (22):

(22) a. How do you like my new color scheme?

b. Not bad.

in which the result of applying the fall-rise contour is to negate the literal reading of the utterance and convey instead the speaker's opinion that the color scheme is not good. A similar effect, i.e. a conveyed meaning which is the converse of the literal meaning of the utterance, results from the application of ironic intonation (Cutler 1974) to such utterances as (23):

(23) Sue's real smart

The effect in this case is to impart the meaning that Sue is <u>not</u> smart. It is difficult to conceive of a way in which the intonational effects in these cases could be considered to be supplemental to the meaning extracted from the text; they are profound modifications of the literal meaning. On the other hand, the (context-specific) effect of the contour in certain of the examples given above - e.g. (8b) - is clearly supplemental, in that it does not affect the propositional content of the utterance. Thus, allowance has to be made in modelling the contour-processing component of the sentence comprehension device both for revision of the literal meaning obtained from the text processing and for its augmentation.

Again, this is analogous to the effects of context upon the interpretation of an utterance. The propositional content of (24):

(24) Looks like a really popular place

is effectively negated - i.e., the utterance is understood as

ironic - if the speaker and audience are in the process of entering
a restaurant otherwise devoid of custom. This effect can be accom-
plished by the context without assistance from ironic intonation.
On the other hand, suppose yourself to be tracking mud over your
kitchen floor, when the person in your household with Supreme Res-
ponsibility for Floor-Cleaning and the Prevention of Waxy Yellow
Buildup says:

> (25) I've just polished that floor.

In this case the context, with no aid from intonation, is suffi-
cient to exercise the pragmatic effect of a request to cease and
desist, to go back and wipe your feet; but the truth value of the
speaker's assertion remains unchanged.

Of course, there is again no sense in which these contexts
"have" the meanings which they convey in conjunction with the
utterances given; the various speakers might just as well have
said, respectively:

> (26) Terrific, we've got the place to ourselves,
>   we can have our little discussion uninterrupted.

> and (27) Ah, at last a chance to test how good this
>   new floor polish really is.

No more do contours "have" meanings, when their effects on other
utterances in other contexts are different. Accordingly, an "in-
tonational lexicon", in which contours are paired with their mean-
ings, is no more possible than a lexicon in which possible con-
texts are paired with their meanings.

Finally, a small amount of experimental evidence exists which
bears upon the question of independent intonational meaning.
Greenberg (1969) asked speakers to produce a given utterance in a
number of different ways, analysed the results spectrographically,
and then used the same subjects and others in a listening test. He
found (a) that there was reliable correlation between "meaning" and
acoustic contour only within, not between, speakers (i.e., while
one speaker might reliably use a particular contour to signal a
certain meaning, he did not necessarily use the same contour which
other speakers used for that context); and (b) that listeners were
not well able to tell in the absence of context which meaning was
being communicated by a given production. A large body of earlier
work on the expression of paralinguistic information is reviewed by
Crystal (1969); from the many findings, some contradictory of each
other, it seems possible to extract only the following conclusions:
experienced actors are capable of conveying such emotions as anger
or fear with a fair degree of reliability: the primary mode in
which such emotions are signalled is voice quality rather than in-
tonation. Uldall (1960) collected semantic differential ratings
(ratings on scales of which the two poles are opposing adjectives -

among her scales were agreeable/disagreeable, sincere/insincere, timid/confident, bored/interested) for sentences with different superimposed synthetic intonation contours, and isolated by factor analysis techniques a small number of general dimensions accounting for a large proportion of the variance in her subjects' ratings. She named these dimensions "pleasant vs. unpleasant", "strong vs. weak feeling", and "authoritarian vs. submissive". Such general labels do not go very far towards describing contour effects; techniques of this kind are incapable of capturing the full effect of intonation in context. Meagre as this body of evidence is, it certainly fails to provide any support for the existence of identifiable meanings associated with contours irrespective of context.

In conclusion, we should note that some of the differences between the position taken here, and the position of those whose work has been discussed, are more apparent than real. The basic Liberman-Sag claim in all the works referred to is the pragmatic status of intonation; this is also the position taken in the present paper. We have no argument with Liberman's claim that text and tune are generated independently, though from the point of view of a sentence comprehension model the effects of intonation must be held to include in certain cases a constraining of text interpretation.

However, the conclusion to a paper like this is never a satisfying one. It is always a little sad to be pushing the down-to-earth, feet-on-the-ground, bubble-pricking position; the strongest hypotheses are often the most interesting, and wouldn't it be nice if they turned out to be right. Alas, as Bert Brecht reminded us:

die Verhaltnisse, sie sind nicht so.

FOOTNOTES

1. I owe this observation to G. Kandler.
2. An alternative contour is clearly that of (7), with an unarguable effect of redundancy:

(6a) Go and see what the fellow wants!

3. See also Liberman (1975 p. 95) for the acknowledgement of some similar examples given by O'Connor and Arnold (1961).

REFERENCES

Crystal, D. Prosodic Systems and Intonation in English. Cambridge University Press, 1969.

Cutler, A. On saying what you mean without meaning what you say. In Papers from the Tenth Regional Meeting, Chicago Linguistic Society, 1974.

Cutler, A. Beyond parsing and lexical look-up. In Wales, R.J. &
    Walker, E. (Eds.) New Approaches to Language Mechanisms,
    Amsterdam, North-Holland, 1976.

Greenberg, S.R. An experimental study of certain intonation con-
    trasts in American English. UCLA Working Papers in Phonetics,
    1969, 13.

Jackendoff, R.S. Semantic Interpretation in Generative Grammar.
    Cambridge, Mass, MIT Press, 1972.

Ladd, D.R. The function of the A-rise accent in English. Revised
    version of paper presented to LSA Summer Meeting, 1976.

Lea, W.A. An algorithm for finding stressed syllables in contin-
    uous speech. Paper presented to ASA, 1973.

Liberman, M. The Intonational System of English. PhD Dissertation,-
    MIT, 1975.

Liberman, M. & Sag, I. Prosodic form and discourse function. In
    Papers from the Tenth Regional Meeting, Chicago Linguistic
    Society, 1974.

O'Connor, J.D. & Arnold, G.F. Intonation of Colloquial English.
    London, Longmans, 1961.

Pike, K.L. The Intonation of American English. Ann Arbor,
    University of Michigan Press, 1945.

Sag, I. & Liberman, M. The intonational disambiguation of indirect
    speech acts. In Papers from the Eleventh Regional Meeting,
    Chicago Linguistic Society, 1975.

Uldall, E. Attitudinal meanings conveyed by intonation contours.
    Language and Speech, 1960, 3, 223-234.