PROSODY, INTONATION AND MEANING

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Aim and Outline (1)

The main question addressed in the session is how prosody/intonation contributes to meaning.

In order to answer this question, it is important to understand:

• what is referred here as prosody and intonation;
• what are the various domains of prosody;
• what types of meaning are conveyed by prosody/intonation.
Aim and Outline (2)

I. Characteristics and Representation of intonation/ prosody
   1.1 Definitions
   1.2 Main features
   1.3 Summary and issues

II. The domains of prosody
   2.1 Phonological representation
   2.2 Phrasing
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III. What types of meaning are conveyed by intonational variation and how it is modelled
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IV Conclusion / perspective and open issues
I. Characteristics and Representation of intonation/prosody

1.1 Definition of prosody/intonation

Ladd (2008)
“Intonation refers to the use of suprasegmental phonetic features to convey ‘postlexical’ or sentence-level pragmatic meaning in a linguistically structured way.”

Nolan (2006)
“The term intonation refers to a means for conveying information in speech which is independent of the words and their sounds. Central to intonation is the modulation of pitch, and intonation is often thought of as the use of pitch over the domain of the utterance. However, the patterning of pitch in speech is so closely bound to patterns of timing and loudness, and sometimes voice quality, that we cannot consider pitch in isolation from these other dimensions.”

Wagner & Watson (2010)
“Prosody can be roughly defined as a level of linguistic representation at which the acoustic-phonetic properties of an utterance vary independently of its lexical items. This admittedly vague definition encompasses a variety of phenomena: emphasis, pitch accenting, intonational breaks, rhythm, and intonation. Some aspects of the prosody of an utterance are mere reflexes of processing during speech production, others have been conventionalized and encode grammatical information.”
1.2 Main features
Two major defining characteristics in these definitions:
• Suprasegmentals
• Postlexical

Suprasegmentals
Studies on prosody/intonation usually refer to three phonetic parameters considered as prosodic parameters (psycho-physical vs. physical)
  – Pitch / F0
  – Quantity / Duration
  – Loundness / intensity
Two points have to be mentioned concerning these parameters:

• These phonetic parameters come also into play for lexical phenomena such as phonemic distinctions (long vs. short vowels, tonal languages, etc.);

• No one to one relation between prosodic parameter and phonological categories/ domains used to account for intonation and prosody;

⇒ prosody/intonation is not totally restricted to suprasegmentals
Postlexical

Intonation/ prosody conveys meaning that apply to phrases, sentences and utterances (PP attachment, sentence modality, etc.). It thus excludes features of stress, accent or tone that are determined at the lexical level. Even if lexical and postlexical/ phrasal prosodic features are encoded by the same phonetic means, they have to be separated in the analysis.
But the third point mentioned by Ladd and Wagner & Watson is also crucial:

**Linguistically structured** (according to Ladd 2008) / **conventionalized** and used to encode grammatical information (Wagner & Watson 2010)

- Intonational / prosodic features are organized in terms of categorical entities (boundary tone, low tone, etc.) or relations (strong/weak, etc.).
- This exclude gradient and paralinguistic features, and allow for a phonological description.

The idea of developing a phonology implies a limited set of categories and entities and raises several issues.
1.3 Summary and Representational issues
From the various points just mentioned, a distinction is often made between the function of prosody and its form (see, among others, Wagner & Watson 2010).

Prosody as function
“‘Prosody’ is often used to refer to those phonetic and phonological properties of speech that are crucially not due to the choice of lexical items, but rather depend on other factors such as how these items relate to each other semantically and/or syntactically, how they are grouped rhythmically, where the speaker places emphasis, what kind of speech act the utterance encodes, whether turn taking in conversation is being negotiated, and they can reflect the attitude and emotional state of the speaker. While these factors can also determine the choice of lexical material, they can affect the signal directly without any mediation by a lexical morpheme with segmental content, and it is this kind of information that is often referred to as the prosody of an utterance.”
(Wagner & Watson 2010)
Prosody and form

It is possible to define ‘prosody’ is by its form, which includes its phonetic and phonological substance.

This point needs to be clarified:

**Acoustic phonetics and phonology**

- From the acoustic representation to phonetics and phonology:
Intonational realisation: Microprosodic effects

Intonation: Variations in pitch
Pitch: Auditory correlate of acoustic correlate F0

‘Cendrillon tells her of all her troubles’
Segments vs. prosody

“[The definition of prosody] presupposes an analysis that divides the information in the speech stream cleanly into a segmental and prosodic component, but at the signal level, there is no separation of prosodic and segmental information. Both use the same channel and encode information by the same phonetic correlates, e.g., fundamental frequency, duration, and intensity.”

Wagner & Watson (2010)

Gradience and categoricity / phonetic and phonology

Speech continuum and pitch track are clearly continuous and gradient, but it is important to find to extract discrete element/category in order to provide an analysis and build up a phonological model.

- From abstract formulas/ categories to their phonetic implementation
- Sequential structure
Phonetics versus Phonology in intonation/prosody: challenges

Functional categories and gradient variation are closely intertwined in intonation, since both can be used to signal linguistic as well as paralinguistic variation in meaning (e.g. Bolinger 1970).

- Categorical variation in form can signal paralinguistic meaning (e.g. rise vs rise-fall for surprise)
- Gradient variation in form can be categorically meaningful (e.g. height of a rise contrasting questions vs. continuations)

There is no minimal pair test to decide category membership (as for segments, e.g. tear vs beer)

We know very little about how acoustic cues interact in signalling different ‘types’ of meaning

• How do they carve up phonetic dimensions to convey meaning?
Summary concerning the different theoretical traditions and problems

Main points of divergence / source of problems:

• Defining features component units (primitives) and their organisation

• Intonation refers to non-linguistic as well as linguistically meaningful variation in prosodic correlates

• Phonological structure not formally distinguished from phonetic implementation
II. The domains of prosody / intonation

2.1 Phonological representation at the phrasal level

• At a phonological level, the prosodic representation associated with an utterance involves two/three types of elements (see also Ladd 2008 for a review):
  – a metrical representation that accounts for prominence relations among the syllables of an utterance. It may be represented as a metrical constituent structure or a metrical grid;
  – a tonal representation that accounts for the intonational profile associated with an utterance. This profile is represented by a sequence of tonal elements;
  – a set of rules that explains how the tonal representation is associated with the metrical representation.

• In addition, the prosodic structure can be considered as a primitive or as emerging from the different phonological phenomena, giving rise to a structure.
This leads to distinguish three components or domains to account for the intonation/prosody: phrasing or prosodic structure, accentuation or metrical structure and intonation or tonal structure.
2.2 Prosodic structure and phrasing

Prosodic structure theory (Selkirk 1981 and seq., Nespor & Vogel 1986)

• In Prosodic Structure Theory, the phonological representation of a sentence also consists of a hierarchically organized structure.

• The units of the prosodic hierarchy are considered as domains for the application of phonological phenomena, be they segmental, accentual or intonational.

• There are however controversies on the form of the structure (units at play, number of levels)

• A distinction can be made between two approaches (cf. Frota 2012):
  – in some studies (Selkirk 1981 and seq.; Nespor & Vogel 1986), the prosodic units are defined according to their relation to the morphosyntactic structure,
  – In some others studies (Pierrehumbert & Beckman 1988; Jun & Fougeron 2000, among others), intonation/prosodic realization plays a crucial role in the definition of the various units.
**Phonetic Correlates**

- **Duration**
  Lehiste (1973) identified duration as the most reliable cue in disambiguating syntactic structures based on their bracketing. The main durational cues affecting boundary strength perception are pre-boundary lengthening, pauses, and domain-initial strengthening.

- **Fundamental frequency or F0**
  A second important acoustic dimension in cueing prosodic boundaries is fundamental frequency and its perceptual correlate pitch. There are two major sources of information on prosodic phrasing in the pitch curve of an utterance: pitch excursions at prosodic boundaries and the scaling of pitch accents relative to each other.
2.3 Accentuation and Rhythm

Accentuation refers to the distribution of prominent syllables at the phrasal level:

- What motivates the occurrence of a prominent syllable:
  - Metrical patterns and lexical stress
  - Sentential stress and semantic/syntactic structure (nuclear stress rule)
  - Pragmatic stress and information structure/discourse function
- How is it related to phrasing;
- Phonetic realization of prominent syllables;
- Prominent syllable, speech rate and rhythm

At a phonological level, metrical structure or prominence relations are encoded by means of a metrical tree or a metrical grid.

Distinction between stress and accent: lexical vs. phrasal level
⇒ Accent is crucial for intonational phonology, but metrically strong position are anchoring points for tonal events
Phonetic correlates of stress and accentuation

- Pitch
- Intensity
- Duration which has been shown in many studies to correlate with prominence in English both to signal word stress, and, at the phrasal level, to signal phrasal prominence.

**Stress and accent** : **phonetic implementation** (see Ladd 2008: 49 and 50)

Words in isolation

(a) *permit* (noun)  (b) *permit* (verb)
Words in a question

(a) permit (noun)  
(b) permit

Words realized as unaccented in a sentence

(a) I TOLD you the permit had expired!

(b) I TOLD you they’d permit him to retire!
2.4 Intonation and tonal structure

• The tonal pattern associated to an utterance (the tonal representation) consists of a sequence of tonal events.

• In the AM Model: two types of tonal events are recognized:
  – Pitch accent (often noted as T*)
  – Edge tone (often noted as T- or T%)

• In AM Model, explicit distinction between events and transitions because it recognized that certain localised pitch features are linguistically important.

Example (from Nolan 2006):

But > Melanie’s · never been \ near the · manuscript

L*  *  H*+L  *  0%
• Arguments in favor of a sequential tonal structure

The same pitch events appear in a tune, but the overall pitch contour may change depending on the « segmental » structure


Never?!

\[ H^* + L \quad H^% \]

She’s never seen the manuscript?!

\[ H^* + L \quad * \quad H^% \]
Tunes are expressed at a phonological level, in terms of a tonal sequence. Note however that the same sequence can be differently implemented at the phonetic level, i.e. with a larger pitch range, etc.

- I’d LOVE to meet him
- I’d LOVE to meet him
- I’d LOVE to meet him

⇒ Question remains as how to deal with this inherently gradient phenomena.
III. Meanings conveyed by intonation / prosodic variation and how it is modelled
(see Hirschberg 2008, among others)

3.1 Prosody, phrasing and meaning
Since phrasing is encoded by means of tonal events (boundary tones), intonational variation can provide important information on syntactic phenomena such as PP/NP attachment

*I saw the man with the telescope*

*Les enfants sont partis en vacances – la semaine dernière – j’ai gardé leur chat.*

*Los chicos se fueron a la playa - con mucho gusto - su madre se quedó en casa.*

‘The children went to the beach with great pleasure, their mother stayed home’.

‘The children went to the beach. With great pleasure, their mother stayed home’.
3.2 Prosody/ Intonation, semantics and information structure

There is a long tradition of research on accent placement and semantic interpretation (see, among others, Jackendoff 1972, Rooth 1985, Gussenhoven 1984)

⇒ Changing the location of nuclear stress can alter the interpretation of an utterance.

*John introduced Mary to Sue.*

*John introduced MARY to Sue.*

*John introduced Mary to SUE.*

Pitch accent play an important role in semantic interpretation, but phrasing could also play, in particular for scope:

*Bil does’t drink because he is unhappy* (wide scope of the negation)

*Bil does’t drink | because he is unhappy.* (narrow scope)
3.3 Prosody/ Intonation and Discourse

Several prosodic events play a role in the interpretation of discourse phenomena:

• Given/ new distinction, new element being accented
• Topic structure: speech rate and pitch range may play a role in indicating topic structure
  – Resetting and wider range for a new topic
  – Final lowering at the end of a turn and/or a topic

Speech acts are also often considered as encoded by intonational contour (see, among others, Pierrehumbert & Hirschberg 1990).

Efforts has been made for instance to associate a given nuclear configuration to a sentence type/ speech act.

In American English: H* L-L% for declaratives and Wh questions, L* H-H% for yes/no questions, etc.
3.4 Prosody/ Intonation, speaker attitude and commitment

Some tonal configurations have been analyzed as indicating epistemic attitude of the speaker (doubt, certainty, etc.).

The notion of commitment has also been used by certain authors (see, among others, Gunlogson 2013).

This notion has several advantages
- integrating a dialogical dimension (see, among others, Beyssade & Marandin 2007; Portes & Beyssade 2012);
- it is compatible with any propositional attitude (belief, intention, etc.).
### Table 1

Hypothesized contour-reaction pairing tested in the forced-choice interpretation task.

<table>
<thead>
<tr>
<th>Contour</th>
<th>Prototypical meaning features</th>
<th>Reaction</th>
</tr>
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</table>
| L*L%    | S commits him/herself to the truth of p  
         | S signals that he/she anticipates no disagreement from A (about p)  
         | S proposes to A to update CG with p                                                        | *J’en prends note*  
         |                                                 | *I get it*                                    |
| H*H%    | S signals that he/she doesn’t commit to p  
         | S signals that he/she attributes a belief about p to A (that p or not p)  
         | S proposes to A to commit to p or to commit to not p                                       | *J’en sais rien*  
         |                                                 | *I’ve no idea*                                |
| H*L%    | S commits him/herself to p  
         | S signals that he/she anticipates a disagreement from A: S signals that he/she attributes to A the belief that not p.  
         | S proposes to A to update CG with p                                                        | *Tu dois avoir raison*  
         |                                                 | *I guess you’re right*                        |
| H!*H%   | S signals that he/she does not commit to p  
         | S signals that he/she anticipates a disagreement from A: S signals that he/she attributes to A the belief that p  
         | S proposes to A either to commit to p or to commit to not p                                 | *Si, si, je t’assure*  
         |                                                 | *No, really, it’s true*                      |

*From Portes et al. 2014*
3.5 How meaning is modelled
Intonation models have been divided into models that advocate for a decomposition of the contour into independent meaningful units and more holistic models which attach intonational meanings to the contour as a whole.

**Compositional approach** (Pierrehumbert & Beckmann 1990, Bartels 1997, among others)
Main components of intonation (pitch accents, phrase accents, and boundary tones) have separate and distinct contributions to discourse interpretation. Such approach has been challenged by Dainora (2006), who showed that some sequences of pitch events are more frequent than some others, and thus argued that a tune-based approach is better.

The realization of a tonal movement (H*L as fall, L*H as rise, etc.) can varied along several dimension: delay, stilization, etc.
⇒ Tone + modification = basic meaning
⇒ Compositionality in Gussenhoven (1984): tone and modification convey a specific meaning (fall is used to introduce a new entity into the background, peak delay signals that the utterance is very significant)
See also HRT in Ward & Hirschberg (1985)
Phonological categories and phonetic implementation (gradience and categoricity)

Studies on German intonation often argued for a distinction between two rising accent:
H* (peak on the vowel) Background, topic
L*+H (peak on the following syllable), contrast
Braun (2006) showed that the dichotomy was not as clear in perception.

“This makes it difficult to maintain an analysis in which two clear pragmatics categories (non-contrastive vs. contrastive) are associated with two clear phonological categories, but at the same time it suggests that we cannot dismiss the claim that the pragmatic distinction is signaled intonationally” (Ladd 2008: 152)
The direction we wish to pursue is in line with Gussenhoven (1984) and Ladd (2008)
« What seems to be needed is a Gussenhoven style phonology, with a small number of categories and a set of dimensions of meaningful gradient modification, rather that a system like that of Pierrehumbert & Hirschberg, which is based on a larger inventory of categorically distinct phonological elements. »
(Ladd 2008: 156)
Conclusions

• Intonation and Prosody have to be analyzed in a phonological perspective, at least to analyse the formal dimension.

• Domains of prosody/intonation: phrasing, accentuation and intonation (as tonal structure)

• Different types of meaning are conveyed by intonational/prosodic events:
  – syntactic structure
  – Information structure
  – Discourse structure

• Intonational meaning is a domain that needs to be further investigated, despite difficult issues regarding gradience and categoricity, linguistic ans paralinguistic meanings.


C. Gunlogson (2001). *True to form: rising and falling declaratives in English*. Ph.D. dissertation, University of California Santa Cruz, UCSC.

References


References


