PHONOLOGY OR NON PHONOLOGY?
THAT IS THE QUESTION (IN INTONATION)

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ABSTRACT

The paper would like to challenge the basic tenet of Autosegmental Theory of Intonation, i.e. that in non-tonal languages it is possible to deal with intonation in phonological terms. Therefore, the traditional criteria normally adopted in phonological tradition (discreteness and distinctiveness) are tested. The empirical evidence employed is taken from some Italian varieties. On the ground of the acoustic analysis, a crucial role is given to the new parameter of scaling in Pitch Accents.

The phonology of intonation is thus to be found not at the level of grammar, but rather at the sociolinguistic level, as pitch is a socio-phonetic marker for the discrimination among the different varieties of a language.

Keywords: *prosody, phonology, intonation*.

RESUMEN

Este artículo quisiera poner en discusión el principio básico de la Teoría Autosegmental de la Entonación, es decir si en las lenguas no-tonales se puede tratar la entonación en términos fonológicos. Por lo tanto, se ponen a prueba los criterios tradicionales que se suelen adoptar en la tradición fonológica (ser discreto y distintivo). Las pruebas empíricas utilizadas son tomadas de unas variedades del italiano. Sobre la base del análisis acústico, se atribuye un papel decisivo al nuevo parámetro de escalamiento en los acentos tonales.

Por lo tanto la fonología de la entonación no se encuentra en el nivel de gramática, sino en el nivel sociolingüístico, ya que el tono es un indicador sociofonético de la discriminación entre las diferentes variedades de una lengua.

Palabras clave: *prosodia, fonología, entonación*.

1. INTRODUCTION

The last decades have seen a growing interest in prosody. From an applicative point of view, the role of prosodic features in speech synthesis, as well as in speech recognition, has become clearer and clearer to the scientific community. We have known for a long time that the degree of naturalness of synthetic speech is directly proportional to the capability of reproducing natural prosody. Research in speech technology could progress inasmuch as it could be able to manage prosodic phenomena. From a more linguistic viewpoint, the advent of non-linear generative phonology has introduced the suprasegmental aspects of language within the strict domain of linguistics[1].

However, we would like to emphasize a relevant aspect concerning the sociology of science, in this specific case, linguistics: in the great majority of cases, all over the world, scholars devoted to the analysis of intonation have been, and still are, phoneticians, not phonologists. Therefore, they are people who read F0 curves more than building up formal devices or dealing with different levels of linguistic structure. This situation has not changed in the last decades, even after the adoption, widely shared within the scientific community, of the model of autosegmental phonology, since the dominant methodological context is still that of experimental phonetics.

There is no doubt that Pierrehumbert's (1980) thesis marked the beginning of a new direction in intonation research. It was the first time that a formal theory was adopted for the interpretation of prosodic phenomena, with the crucial separation of phonological representation from phonetic implementation.

As for intonation, in particular, the *Autosegmental Theory of Intonation* (henceforth, ATI)[2] is currently the most common framework among phoneticians,

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[1]   In the constellation of phonological models which have been proposed since the Seventies, a primary role has to be assigned to the Autosegmental Theory, which has been first developed for the study of tone languages (see Leben 1973, Goldsmith 1976), and then adopted for the representation of syllable and intonation (cf. Pierrehumbert 1980, Beckman & Pierrehumbert 1986, Pierrehumbert & Beckman 1988). In this respect, Metrical Phonology, proposed by Liberman & Prince (1977) and dealing with stress and rhythm, is also relevant.

[2]   The main references on ATI are Pierrehumbert (1980), Beckman & Pierrehumbert (1986), Pierrehumbert & Beckman (1988), Grice (1995), Ladd (1996), and Gussenhoven (2002, 2007).

not only in the USA, but also in Europe. The basic tenet of ATI is that in the grammar of any natural language there is a specific and autonomous tier of analysis and mental computation devoted to tonal structure. Therefore, the phonology of intonation becomes as possible as the phonology of segments is.

As Ladd (1996: 2) observes, the question is not whether pitch can have a phonological structure (we know that it can from tone languages), but whether it does have it in languages like English or Italian. According to ATI, the answer to this question is positive: in all natural languages we can find a discrete series of tonal categories (i.e. *Pitch Accents*) with a phonological value.

More recently, Gussenhoven (2007) has claimed that there is a phonological equivalence between lexical and intonational tones. Once defined intonation as the structured variation in pitch not determined by lexical contrasts as in tone languages, Gussenhoven believes that there is no theoretical motivation for a different consideration of *Pitch Accents* and *Lexical Tones*: in both cases, the perspective is the same, and it is phonological.

ATI's basic tenet is that in non-tonal languages it is possible to deal with intonation in phonological terms. In this paper we would like to challenge this tenet. Having such a goal in mind, we will try to verify the general criteria normally adopted in phonological tradition. The empirical evidence we will refer to is taken from Italian varieties. Italian shows a free and distinctive lexical stress. Regarding timing, Italian is normally considered a syllable-timed language, along with other Romance languages (Bertinetto 1981, Marotta 1985, Ramus *et al*. 1999). However, not all varieties share the same rhythmic properties. In particular, certain Southern varieties tend more towards stress-timing (Romito & Trumper 1989).

The criterion of falsification will show us how intonation cannot be dealt with in phonological terms except in tone languages. Although ATI seems to assume a point of view that is strictly internal to linguistic structure, since it was born and developed within a generative framework, the claim of distinctiveness in intonational structure in any natural language does not hold.

2. THE AUTOSEGMENTAL THEORY OF INTONATION (ATI)

Two basic attributes are normally recognized to prosodic features within the ATI framework. They are:

1. universal

2. phonological.

Once we have assumed that in every natural language a prosodic competence does exist and is part of the phonological competence of native speakers, a theory of intonation has to represent the meaningful prosodic differences of natural languages.

In traditional linguistic analysis, intonation has been considered a paralinguistic phenomenon. Moreover, tonal variations have been evaluated through the comparison among different points of the speech chain. This attitude occurs, for instance, in Jakobson's work. In particular, in Jakobson, Fant & Halle (1952) the class of prosodic features is clearly distinct from that of intrinsic features. Only the latter can contrast each other without any reference to the syntagmatic chain, whereas prosodic features, which are extrinsic, cannot disregard the phonetic context. For example, the modulation of melody as well as the perception of lexical stress always need a comparison.

The last thirty years have marked a quite radical change of perspective, in two different and complementary ways:

1. the growing interest in speech prosody

2. the advent of non-linear phonology.

In the ATI framework, prosodic phenomena are considered as segmental phenomena. Therefore, they are treated as structural properties, belonging to linguistic structure like phonemes, and no longer as additional and supplementary elements of the phonetic chain.

Tonal variations are represented with crucial reference to normalized levels of pitch. However, the empirical evidence in favour of such a perspective is taken from tonal languages, like Chinese or Vietnamese, while this perspective does not apply to non-tonal languages, *pace* Ladd (1996: 256-257).

Following the general framework of non-linear phonology, ATI recognizes multiple levels of representation, each of them is autonomous although related to the others through specific association principles. The tonal level is crucially associated with the segmental and metrical levels. The relation between the tonal level and the metrical one is quite completely isomorphic, despite the postulated autonomy of the tonal tier.

The *maxima quaestio* concerns the possibility of dealing with intonational phenomena in phonological terms, i.e. in terms of discreteness and distinctiveness. The criterion of discreteness implies the selection of variants and invariants, whereas the criterion of distinctiveness concerns the possibility of associating specific meanings to invariants, i.e. discrete elements.

3. DISCRETENESS IN INTONATION

Traditionally, meaningful categories of language are supposed to be discrete and binary entities, each of which is either present or absent in a given linguistic expression. For instance, morphemes or syntactic features cannot be represented on semantic scales. As Gussenhoven (1999: 283) observes, *The morpheme for «red» cannot be spoken or signed such that different degrees of some phonetic parameter cause it to mean lighter or darker shades of red*. The vowel duration of the English word *red* is not systematically correlated to degrees of redness, and neither is the energy with which the gesture for the ASL sign [RED] is executed.

There are some aspects of prosody which are inherently gradient, therefore not discrete. One is the inherent flexibility of the speech chain which may easily carry «expressive» meanings (or purposes). For instance, we can lengthen a consonant of a word to create specific (pragmatically constrained) effects. This is the case with the so-called «expressive gemination». As A. Martinet has already observed, a French speaker may pronounce the word *épouvantable* with a lengthened plosive [p] in order to strongly remark its pragmatic value. However, in this case, the different segmental durations cannot constitute a phonological scale, since in French two discrete categories of long and short consonants do not occur.

The second aspect which should not be treated in terms of discreteness is iconism. Iconic opportunities do not conform to discrete elements. As Gussenhoven (2007) claims, such iconism occurs when speakers of English lengthen the vowel in *big* in a way that would not make sense for the stressed vowel in *little*, where a possible equivalent might be pronunciation with a short, high-pitched vowel.

Last but not least, there are emotive aspects, which are strictly interwoven with speech. Emotions like anger, fear, excitement are usually detectable in the way the message is modulated. And this happens both intentionally and unintentionally. Once again, these emotive effects, like iconic and expressive ones, do not constitute discrete linguistic categories.

On the other hand, if intonation has a linguistic structure consisting of *a linear sequence of phonological events that occur at well-defined points in the utterance*, as Ladd (1996: 41) in principle claims, *Pitch Accents* should be conceived of as phonemes. Therefore, a discrete number of abstract and underlying categories may correspond to different and superficial variants, as it happens in the traditional dynamics «phoneme-allophone».

However, there are some arguments against such a correspondence.

First of all, consider the phonological inventory. The phonemes of a natural language are more or less twenty, whereas in intonation, more specifically in the autosegmental theory of intonation, tonal categories are much less numerous: there are two simple PA (H* and L*) and four complex PA (B*+A, B+A*, A*+B, A+B*). Even if we add demarcative tones, i.e. *Phrasal Tones* (H-, L-) and *Boundary Tones* (H%, L%), the number of tonal categories is in any case low. Furthermore, the PA realized in melodic patterns and employed by a specific language may be less than six. For instance, in Grice *et al.* (2002), only four PA are recognized as belonging to the phonological inventory of some Italian varieties.
Secondly, all in all, few categories in intonation should be able to express the phonological competence of speakers of every natural language. This seems to be possible inasmuch as we assume that the meanings associated with PA are similarly few and quite general. *En passant*, we believe that the idea of a tonal level including a few contrastive units could explain both the prematurity of intonation in L1 acquisition and its universal features. In particular, we are referring to the «frequency code» (cf. Ohala 1983, 1984, Gussenhoven 2002; see below, § 5).

4. DISTINCTIVENESS IN INTONATION

Before approaching the issue of the type and number of meanings conveyed by melodic patterns, it is necessary to underline a relevant aspect concerning the claim of distinctiveness, which is strictly connected with the phonological claim.

The possibility of speaking without pitch modulation (i.e. with a flat pitch contour) gives evidence against the assumption of distinctiveness of intonation. In other words, the lack of prosody does not compromise the mutual comprehension, thus showing that *in primis*, *nisi in toto*, the association between meaning and sound regards abstract forms and substantial elements of segmental type, that is the so-called *vox articulata*. At the same time, we can convey some meanings by using intonation only, without any segmental variation, but these meanings are all related to some language domains, in particular to the speaker's extralinguistic experience, for instance modality or attitude. Therefore, neither distinctiveness nor autonomy of intonation can be demonstrated within a theoretical paradigm centred on the linguistic system. A different conclusion could be reached if we had assumed a point of view oriented towards communication, where the prosodic dimension is a basic element.

We believe that these topics are able to challenge the claim of distinctiveness of intonation in non-tonal languages. One could object that in this case the phonology of intonation is located at the post-lexical level (cf. Ladd 1996: 5): for instance, in a language like Italian or Spanish, principles and methods typical of phonemic analysis do not apply to intonation. However, in postlexical phonology, we can normally observe the same phenomena and processes already observed at the lexical level, whereas in intonational phonology the same parallelism cannot be observed.

5. THE MEANINGS OF INTONATION

Once assumed that the tonal categories recognized within ATI are not numerous, it follows that the possible meanings associated with intonation will not be numerous as well. As a matter of fact, in linguistic tradition the role of intonation is restricted to some specific domains, i.e. the expression of modality (e.g., declarative vs. interrogative) and focalization. However, the burden of proof becomes heavier for a phonological theory like ATI. For instance, Ladd (1996: 39) explicitly acknowledges some general meanings to tonal structures, and at the same time he assumes that these meanings belong to a complex system of pragmatic interpretation. Following him, *linguists may have markedly different views about what the phonological categories of intonation are, but by and large they agree on how those categories contribute to the meaning of an utterance*. However, the crucial question we would like to put is: are the meanings associated with PA explicit, autonomous and not ambiguous?

Only a positive answer to this question may attribute a phonological status to intonation.

Within the autosegmental literature devoted to the possible meanings conveyed by tonal variations, Gussenhoven (1984, 2002) and Pierrehumbert & Hirschberg (1990) represent the most seminal works, at least in our opinion.

The approach proposed by Pierrehumbert & Hirschberg (1990) may be defined pragmatic and compositional. It implies that each PA has its own meaning and that the global meaning of the utterance is given by the combination of the individual meanings of the PA and demarcative tones. The compositional aspect of this approach rests with the phonological hierarchy: strength and scope of tones are connected with structure and depend on the node of association (cf. Pierrehumbert & Hirschberg 1990: 286-288).

The most traditional way of dealing with intonational meaning is limited to the association of tune with the speaker's attitude. However, Pierrehumbert & Hirschberg (1990: 284) argue that *attitude is better understood as derived from tune meaning interpreted in context than as representing that meaning itself*. At the same time, emotion cannot be considered as the most useful tool for the interpretation of tune.

In sum, two basic aspects emerge from Pierrehumbert & Hirschberg's (1990):

1. intonational meaning should be kept distinct from the speaker's beliefs and attitudes;

2. tune meaning can be viewed as compositional more than holistic.

Although there is awareness that *the question of how an accent becomes associated with certain material is not yet well understood* (Pierrehumbert & Hirschberg 1990: 309, footnote 4), Pitch Accents convey information about the status of discourse referents and predicates. In particular, High is a predicative accent, associated with lexical elements treated as «new» in discourse, whereas Low refers to words perceived as «given», since no new information is added to the knowledge shared by the interactants involved in the communication process. Complex PA are more difficult to analyze, because in this case the meaning of

simple Pitch Accents is combined with the hierarchy internal to PA and, in particular, it is determined by the position of the diacritic, which marks the prominent accent. Therefore, although complex PA can be considered predicative in general, they can be associated with «new» information only when the star diacritic is associated with a High tonal target, e.g. (L+) H* (+L)[3].

As far as Phrasal Tones are concerned, according to Pierrehumbert & Hirschberg (1990), H- indicates that the phrase is to be taken as forming part of a larger intonational and interpretative unit, whereas B- marks the separation of the current phrase from the following one. Lastly, Boundary Tones have scope over the entire intonational phrase and convey information concerning discourse segmentation and interpretation. In particular, the choice of a High or Low Tone indicates whether the utterance is forward-looking (= H%) or not (= L%). Coherently, H% occurs in continuation rise and questions, while L% in declarative sentences. At the same time, H% may signal a hierarchical and mutual relationship between the current utterance and the following one, with no strict dominance of the former over the latter, or vice versa.

The semantic and compositional analysis proposed by Pierrehumbert & Hirschberg (1990) appears to be grounded on the following general principle: a tonal raising identifies a point in the speech chain where the speaker intends to add some more information to lexical information. From a perceptive point of view, the points where high targets of f0 are realized are associated with words that are more salient to the speaker, since H% contrasts with the falling melodic contour, which is physiologically constrained.

However, we might wonder why in many Italian varieties L% instead of H% occurs at the end of questions (see next section). Indeed, when we ask something to somebody, communication is in progress, therefore, in any case and context we should expect a 'forward-looking' boundary tone (i.e. H%).

In sum, the meanings associated with melodic variations are not only limited in terms of number and type, but are also very general, if not vague.

The proposal by Gussenhoven (1984, 2002) appears to be more complex. Different meanings can be associated with intonation according to the level of analysis: tonal categories implemented at the phonetic level are indeed universal, but paralinguistic too, since not grammatical, therefore highly iconic and biologically codified.

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[3]   See Pierrehumbert & Hirschberg (1990: 301-302) and the relative discussion.

On the other hand, Gussenhoven assumes that:

1. tonal variations with a phonological value belong to the speaker's grammatical competence,
2. they are discrete and specific.

According to Gussenhoven (1984, 2002), the universal meaning of intonation is grounded on the shared knowledge of three mutually interacting biological codes:

1. the frequency code, which depends in primis on the larynx's dimension (cf. Ohala 1984);

2. the effort code, connected with the amount of energy spent in the production process;

3. the code of the phases of phonetic production, connected with specific aspects of breath (cf. Lieberman 1967).

Tonal variations depending on these three physiologically constrained codes receive a universal interpretation by speakers. That is, a voice with a high pitch range will be associated with a female more than with a male, in whatever language. Moreover, a greater intensity is normally interpreted as an emphasis mark, whereas a lower energy and fundamental frequency at the end of the breath group occurs in all the languages of the world.

If there are no doubts about the universal meanings of intonation which are constrained at the physiological level, phonological meanings appear much more complex to find out. Gussenhoven (1984) mentions intonational morphemes giving rise to the 'grammaticalization' of intonation (cf. Gussenhoven 2002: 48). However, he quotes only a few examples to support this presumed 'grammaticalization'. And these examples are the same that have been recognized as relevant in the linguistic analysis of intonation, i.e. the final raising of f0 in questions, or the increase of effort in the expression of focus.

The crucial point in intonation, as in other aspects of language, is to define the difference between what is phonetic, i.e. superficial and physically constrained,

and what is phonological, i.e. cognitive, deliberate and conscious. In particular, semantic effects are entirely depend on the meaning of the utterance, and it is hard to constitute a scale with different semantic values.

If the melodic contour of the utterance is at least in part constrained by the phonatory organs as well as by breath mechanisms, our human apparatus of production and perception might be considered as a kind of hardware. On the other hand, a functional consideration of intonation implies its transformation into software, i.e. into a cognitive and computational system with rules and autonomous principles, which could belong to the native speaker's competence. However, as Gussenhoven suggests, semantic meanings appear to be parasitic on the general meaning of the utterance. Therefore, it is not easy to create a semantic scale where the specific meanings of PA could be located.

In our opinion, in non-tonal languages like Italian or Spanish, information concerning the melody of speech occupies a marginal position in grammar[4] and does not really concern phonological competence. Therefore, we believe that intonation, though it is very important in expressing pragmatic functions, has to be located at the edges of language, as Bolinger (1964) clearly stated. The only functional value of intonation at the grammatical level is the expression of yes-no questions in languages not using specific morphosyntactic marks to that goal. This is indeed the case with Standard Italian as well as with Italian varieties.

Cruttenden's (1997: 131) slightly ambitious words may be a proper conclusion for this section: *intonational meanings are nebulous things involving all sorts of fairly arbitrary decisions*.

6. THE SOCIO-PHONETICS OF INTONATION IN ITALIAN VARIETIES

In this section, we will try to show how ATI does not succeed in representing the phonetic differences occurring in some Italian varieties. Moreover, we will see how the assumption of a limited number of tonal distinctive categories (PA and Demarcative Tones) implies an important series of consequences on the empiric domain.

Prosodic differences are relevant on the diatopic dimension too. Recent studies have clearly shown a large variation in the use of prosodic features within the same

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[4]   Otherwise, we could even say that intonation is outside grammar.

language. For instance, the IViE project (cf. Grabe & Post 2002) has revealed how certain intonational patterns are specific to some English varieties. Diatopic constraints on prosodic variation have been proved also for German (cf. Atterer & Ladd 2004) and Spanish (Sosa 1991, Prieto et al. 1995). Similarly, for Italian, some experimental research is now available showing different prosodic patterns with reference to different regions of the country (cf. Sorianello 2006: 118 ff.).

However, since there is a limited number of PA, it is highly probable that the same PA will carry different linguistic features within the same linguistic variety. But if intonation has a phonological status, its tonal representation must be specific and unambiguous.

Let us consider the Pisan variety of Italian: the same complex PA H+L* has been proposed both for interrogative utterances and instructions, and for declaratives[5] (cf. Gili Fivela 2002), whereas the distinctive function is carried only by boundary tones (Phrase Accent and Boundary Tone), with no warranty of total un-ambiguity. Actually, listening is the only way to identify the prosodic cue which is present in these contexts: the difference between questions and instructions is expressed not only by the tonal target (High versus Low), but also by the speaker's pitch range (see below, § 7).

We should also observe that in polar questions, target H of complex PA H+L* is not systematically produced by Pisan speakers, whereas the production of rising pitch followed by a lowering on the last unstressed syllable of interrogatives is more systematic. Thus, we could also propose an alternative transcription such as L*+H L-L%.

Moreover, we should remember that the choice of PA representing tonal profiles is often far from easy. Thus, different PA may be proposed for the same phonic string. Studies comparing different ToBI transcriptions stress an evident dissimilarity in the type of PA, whereas the position of PA and demarcative tones tends to correspond (cf. Syrdal & McGorg 2000).

In general, the association of the same PA to different modalities has the undesirable consequence of a loss of distinctiveness, while only boundary tones keep some pertinence. It is also worthwhile to remember that the theoretical status

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[5]   Indeed, questions are marked by H+L* H-L%, but assertions and instructions by H+L* L-L%. Thus, the various types of questions (polar vs. *wh-questions* or *tag-questions*) are not further distinguished, nor are instructions tonally different from assertions.

of the Phrase Accent is not yet completely defined: ATI itself is not completely confident with it, because the Phrase Accent is often a mere formal tool for solving empirical problems which can originate from a very rigid binary assumption[6].

Together with potential ambiguities within the same variety (as we have seen in the case of Pisan), we must take into account the problems arising from the comparison between different varieties of Italian. In our opinion, ToBI transcription is not able to take into account interlinguistic differences, because the melodic differences which are clearly perceived by speakers can be masked in autosegmental representation. Again, Italian varieties are useful to test ATI performance.

In their recent work, Grice *et al.* (2004) propose a schematic picture of the main intonation contours occurring in some Italian varieties (Naples, Bari, Palermo and Florence), with special focus on assertive and interrogative sentences. The theoretical and methodological famework followed is ATI.

In all varieties analyzed, the relevant PA can be nuclear or complex, and this latter can be either falling (H+L) or rising (L+H). The ToBI transcription proposed is shown in table 1.

	Naples	Bari	Palermo	Florence
Declarative - Broad Focus	H+L*	H+L*	H+L*	H+L*
Declarative - Contrastive Focus	L+H*	H*+L	H*+L	H*
Interrogative yes-no	L*+H	L+H*	L*+H	H*

Table 1. *Nuclear PA in different syntactic contexts of four Italian varieties (adapted from Grice et al. 2004).*

As this table shows, there are only small variations. In assertions, all varieties show the same PA. Therefore, we could conclude that there are no perceptible melodic

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[6]   On this topic, see the theoretical discussions by Ladd (1983, 1996: 88 ff., 100 ff., *passim*), and Grice, Ladd & Arvaniti (2000).

differences. However, *ceteris litteris paribus*, even in the case of assertions (i.e. in the unmarked context), Italian speakers and listeners can easily identify a native speaker coming from Naples or Florence on the basis of his intonation only[7].

Taking into account yes-no questions in the three Southern varieties of Italian considered in Grice *et al*. (2004), a different «pronunciation» is clearly perceptible, although the ToBI transcription always exhibits L+H, with a possible different position of the diacritic *****, associated with the first or the second tonal target. And it is not simple to define the diacritic's position, given the well-known problems related to the relationship between alignment and association[8].

In Naples and Palermo the ToBI transcription is totally identical (L*+H L-L%), whereas the melodic profile typical of questions does not sound the same in these two varieties.

On the other hand, the same rising contour (L+H) has been identified also in other Italian varieties, both Southern and Central, including North-western Tuscany. This fact implies a partial dissatisfaction with the use of the same tonal category (= PA) in diatopically different linguistic systems.

Another important question therefore arises: why are boundary tones in polar questions, in particular the ending one, Low and linked with the meaning of completeness in many Italian varieties such as the above-mentioned ones (made exception for Florence)? Indeed, we would expect a High tone, typically forward-looking, in consideration of the meaning associated with boundary tones (cf. above, § 5).

Moreover, it should be pointed out that even the melodic differences that are diaphasically constrained seem to be transcribed by the ToBI system in an unsatisfactory manner. For instance, it is not clear how the very common phenomenon of emphasis or focalization can be expressed by ToBI, especially in low registers or informal contexts.

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[7]   Many Italian varieties, e.g. in Tuscany, exhibit a lowering of the fundamental frequency at the end of utterances (cf. Grice *et al*. 2004, D'Imperio 2002). This lowering seems to be unmarked, in line with the physiologically verified restrictions illustrated by the *declination line*.

[8]   The literature on this topic is vast, as shown in Marotta (2000). In particular, see Arvaniti & Ladd (1995) and Arvaniti, Ladd & Mennen (1998).

Phenomena of focus and emphasis usually imply an increase in the strength of articulation as well as in the frequency range. But strength of articulation and pitch range cannot be expressed by the ToBI system.

Ladd (1983, 1996: 280 ff.) tried to solve this kind of problems through the introduction of two additional prosodic features: [downstep] and [raised peak]. These features should be used for an additional lowering of a Low tone and an increasing of a High target. These two new additional features show a gradual behaviour. For this reason, they should be considered as «expressive» categories, and not as true linguistic categories.

In summary, we have tried to highlight the real risk coming from the use of the same PA within the same variety of Italian in the expression of modality and stylistic differences. Ambiguity is basically due to the limitation of the standard list of tonal categories. Therefore, the distinctive claim of ATI seems to be strongly undetermined. At the same time, ToBI transcription may easily lose its hermeneutic efficiency. Being not capable of representing interlinguistic varieties, ATI and its tool (ToBI) may destroy melodic differences which are clearly perceived by native speakers. Finally, we would like to remember that the same critical points we have highlighted here with reference to some regional Italian varieties have alrealy been noticed for other languages[9].

7. SCALING REPRESENTATION

There is another and more serious limit in the ToBI transcription system: it is unable to represent scaling, i.e. the frequency range within PA.

In the experimental studies which follow the ATI model, pitch range is not taken into account, nor is it formally expressed. And this applies to the tonal distance both between the two targets of a complex PA target and between a PA and its nearby demarcative tones. Ladd himself (1996: 272) admits that ATI *still has important theoretical and empirical problems with pitch range*. In our opinion, similar or even identical transcriptions for different linguistic varieties strictly derive from the lack of information related to the frequency range used by speakers. In our opinion, the autosegmental model should be structurally integrated with information concerning the pitch range.

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[9]   See Grabe & Post (2002) for modern English, Sosa (1991) for American Spanish.

Again, Italian varieties provide strong evidence to support our opinion. As we have already stated, in polar questions many Central and Southern Italian varieties exhibit a final melodic contour made of a rising tone and a following falling one, which can be transcribed as the PA L+H, followed in their turn by low boundary tones L-L%[10].

Despite there is a clear difference between the various varieties, from both the acoustic and the perceptive sides, melodic profiles are transcribed by the ToBI system in the same way. It is worthwhile to emphasize that the differences we are referring to are not marginal, since they refer not only to tone alignment, but also to frequency range, which is a particularly relevant aspect. We believe that improving the transcription system with scaling notation could be a very efficient way for taking into account the perceptual differences occurring in Italian varieties. Clear evidence for this hypothesis comes from the analysis of Tuscan Italian. Tuscan varieties show similar melodic contours, with some slight differences. However, a different scaling in complex PA seems to be the main prosodic cue for discriminating between Pisan Italian and the other Tuscan varieties.

Before moving on, we would like now to make a digression. In the acoustic studies focussed on the regional varieties of Italian, segmental aspects are traditionally investigated, whereas no attention is normally devoted to prosody. However, some tentative analyses can be found, for instance, Marotta & Sorianello (2001) for the Tuscan area, Romano (2001) for the Apulian area, Interlandi (2003) for Turin Italian. The underlying hypothesis which is implicitly shared by phoneticians acknowledges a primary role to segments, but confines melodic variation to the edges of language. On the contrary, we believe that prosodic elements may function as socio-phonetic cues and that intonation can become an element of diatopic markedness.

Let us go back to the topic of this section. Some preliminary experimental analyses we carried out on Tuscan varieties indicate that frequency modulation can be considered as a true socio-phonetic marker[11].

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[10]   See Grice (1995) for Palermo Italian, Grice & Savino (1995) for Bari Italian, D'Imperio (1999), D'Imperio & House (1997) for Neapolitan, Sorianello (2001) for Cosenza Italian, Marotta & Sorianello (2001) for Lucca Italian.

[11]   See Marotta & Sardelli (2003), Marotta, Calamai & Sardelli (2004), Calamai & Ricci (2005).

Pisan speakers tend to use a wider frequency range, in comparison with other varieties of Central Tuscany. The nucleus of the final prominent syllable of the Intonational Phrase is the prototypical target of this special scaling value. The same segment results simultaneously extra-long and diphthongized. In particular, the [æ] vowel is the preferential target for the co-occurrence of the following phenomena: frequency modulation, lengthening and diphthongization. These prosodic phenomena are typical of Pisan pronunciation[12].

On average, the tonal excursion found in the prominent vowels of Pisan Italian is at least one Semitone higher than in Florentine in case of a rising movement, while it is two or three Semitones higher in case of a falling movement. Differences appear to be concentrated on middle-low vowels (cf. Marotta et al. 2004). A clear example of this special frequency modulation is given in figure 1.

Both prominent vowels of the phrase show a rising contour and are transcribed as L+H. The frequency range between the two adjacent tonal targets is 5.2 Semitones for the word destra [ˈdæːstra] and 4 Semitones for sotto [ˈsoːtːo].
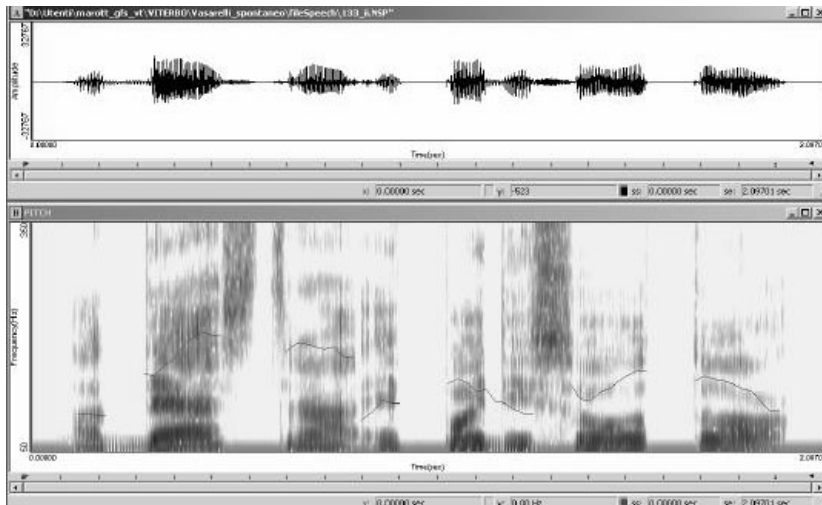

Figure 1. *Waveform, sonagram and F0 contour of the Italian phrase* a destra, e poi di sotto, *as produced by a male Pisan speaker (Map Task dialogue).*

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[12]   A similar effect is also present in Livorno: see Marotta, Calamai & Sardelli (2004), Calamai & Ricci (2005).

Frequency modulation can be considered a clear socio-phonetic marker used for the identification of the speaker's origin. Therefore, not only segments, but also suprasegmental aspects of language may play the role of 'shibboleth'.

In the example given in figure 1, the prominent vowels of the Pisan variety are much longer and show a wider modulation in comparison with other Italian and even Tuscan varieties. This extra modulation can be considered an important marker for the speaker's recognition.

We pass now to consider other varieties of Italian. The empirical evidence is taken from Roman, Milanese and Catanzaro Italian, three varieties of Italian spoken in the Center, North and South of Italy, respectively.

According to the results discussed in Marotta & Sardelli (2007), to phonetically detect different varieties in Italian, a tonal excursion of approximately 2 Semitones is needed, whereas a wider span is necessary for utterance typology information.

As shown in table 2, not only duration and scaling turned out being significant for variety detection, but tonal alignment too.

	Rome	Milan	Catanzaro
Pattern			
ST	3,6 1,4	5,5 3,2	5,6 1,6*
Pitch Range	6,63	8,84	9
Min F0	107	93	110
Fin F0	121	114	117
'V duration	112	109	138
ToBI	H*+L H%	H+L* H%	(H+L)*

Table 2. *Mean values of acoustic parameters analyzed in yes-no questions relative to the Italian varieties of Rome, Milan and Catanzaro (adapted from Marotta & Sardelli 2007).*

The relevance of alignment in the discrimination of different accents has already been demonstrated by Atterer & Ladd (2004) for German varieties. The PA notation reflects the different alignment in these three varieties of Italian: H*+L for Roman, (H+L)* for Catanzaro and H+L* for Milanese Italian (see Figure 2). The falling movement respectively starts before the stressed syllable left edge in Milan, at the beginning of it in Catanzaro and within it, in Rome. For Catanzaro variety, we adopted a special transcription to indicate the perfect alignment of both tonal targets with the stressed syllable, as suggested by Marotta (2000).
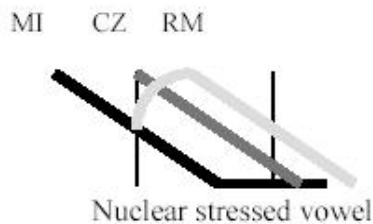

Figure 2. *Alignment of the PA H+L*, (H+L)* and H*+L, in Milanese, Catanzaro and Roman Italian in yes-no questions.*

Although the final boundary tone remains the same (i.e. H% for the three varieties), different scaling values come out as relevant for variety discrimination. In Catanzaro speech, less than 20% of yes-no questions show the production of final unstressed vowel (see the starred value in the first raw of table II).

In sum, if prosody can be a very strong marker not only from the diaphasic point of view, but also from the diatopic one, a new function, called socio-phonetic, has to be recognized to intonation. Only further studies, crucially focussed on the perceptive side of analysis could confirm this new experimental perspective, that we consider a very promising one.

The phonology of intonation should be therefore found not at the level of grammar, i.e. in the inventory of categories valid for a specific language, but at the sociolinguistic level, i.e. in the language use, as a marker for the discrimination among different varieties of a same language.

8. NEW PITCH ACCENTS AND NEW DIACRITICS

In order to overcome some general limits of ATI and, in particular, its deficiency in the representation of scaling, we believe it is necessary to increase the number of tonal categories, i.e. of PA. To achieve this goal, there are two basic strategies:

1. the introduction of new features

2. the introduction of tritonal PA.

The latter hypothesis implies the refusal of binarism, which can be considered as a true «Damocle's sword» for the generative approach.

For the representation of scaling, Ladd (1983, 1996) has proposed two gradient features, [upstep] and [downstep]. These new features could be used for instance in the case of yes-no questions in Pisan Italian, where the nucleus of the final prominent syllable reaches a very low frequency level, before final rising. The autosegmental transcription of this melodic contour could be ↓L*+H L-L%, or H+L*↓ H-L% [13], if we choose to associate rising to Phrase Accent (Gili Fivela 2002).

In his wide study on intonation in the Hispano-American varieties, Sosa (1991) has proposed a more drastic improvement of the autosegmental inventory of PA. Being conscious of the lack of a systematic and coherent treatment of the phenomenology of PA in the ATI approach, he introduced some new PA:

1. H*+H, already present in the first proposal by Pierrehumbert (1980),

2. H+H* for the representation of a very high tonal target from a high nuclear accent,

3. %H, a boundary tone reserved to yes-no questions and to be used in the initial position of the utterance for the representation of the general raising of the frequency range.

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[13] The diacritic ↓ (corresponding to [downstep]) indicates a further lowering of the *Low* tone, whereas ↑ (corresponding to [upstep]), an extra-raising of the *High* tone. See also Walters (2003).

Sosa's proposal is based on the hypothesis that the prosodic differences that are perceptively relevant for native speakers should be represented in the ToBI transcription. In our opinion, it is not by chance that the introduction of new PA and new diacritics follows from the empirical and comparative analysis of different regional varieties of the same language: as we have shown with reference to Italian varieties, also in Hispano-American dialects the standard inventory of PA given in the ToBI system is deficient, since it is too poor for representing the relevant differences among varieties.

Following Sosa's suggestions, we would like to introduce a new PA, L+L* (symmetric to H+H*), for the representation of a Low nuclear tone, where a minimum F0 is realized. This new PA could be used for the representation of extremely low scaling, which can quite often be observed in some Italian varieties, like Pisa, Livorno and Naples.

9. PHONOLOGY OR NOT PHONOLOGY (IN INTONATION)?

We are now going to approach the final milestone of our critical review of ATI and to answer the theoretical questions we put at the beginning of this paper.

If we observe the role of prosody in recent linguistic analysis, we should admit that it is no longer a marginal one: in the last decades, the high number of studies devoted to intonation in many different natural languages and language varieties has sine dubio increased our knowledge of prosody. For a long time, intonation has been kept at the boundaries of the main research fields, but nowadays it is fully acknowledged as an integral branch of linguistic theory. This change of perspective is partly due to the general and progressive drift towards pragmatics, together with the overcoming of the traditional logical and rationalistic paradigm in linguistics

However, an empirical analysis of intonation often appears to be quite superficial, because of an acritical and automatic application of the ATI model. It is not redundant to remember that the original inventory of PA was first proposed by Pierrehumbert (1980) for American English. Afterwards, a simple application of the same system has been applied to other languages, on the basis of a supposed (but still not proved) equivalence of categories in their different linguistic systems. Moreover, the number of languages of which fairly complete descriptions are available is still small. We hope that future research could provide information about the prosodic structure of a larger number of languages.

As we have tried to highlight in this paper, the ATI model shows some aporias, and the ToBI notational system, strongly linked with ATI, exhibits relevant gaps. This opinion is not new in phonetic literature,[14] thus confirming the vitality of the scientific debate about intonation and its representation. The most critical aspects seem to be those concerning the representation of the F0 curve and the PA identification. Syrdal & McGorg (2000) have clearly demonstrated that the score of agreement among different ToBI transcriptions is very high as for the identification of PA and Boundary Tones, whereas it is low as for the PA classification, since this latter task is much more difficult. For instance, a tonal falling followed by a rising cannot be described as H+L+H, because of the binary constraint. Therefore, it is normally described as H+L or L+H, with an evident impact on the interpretation of the global melodic pattern.

The second question we asked at the beginning dealt with the phonological status of tonal categories in non-tonal languages like Italian or Spanish. At the end of our critical analysis, we think that, despite the enthusiastic incoming of ATI and the wide amount of empirical data based on it, this question cannot have a positive answer. ATI is not able to describe intonational phenomenology in phonological terms, except in tonal languages, because intonation is not phonological in non-tonal languages. The two criteria of discreteness and distinctiveness are not satisfied by ATI. This critical evaluation is necessary if we consider grammar as the backbone of language, with special reference to the internal relationship among all the elements of the language structure.

From a transactional and grammatical (i.e. rationalistic) point of view, prosody itself should be confined to a marginal position, while from an interactional and pragmatic perspective, its position must be central and dominant. In non-tonal languages, frequency modulation has a very low functional weight, limited mainly to the expression of question and focus, whereas it becomes much more important at the pragmatic level.

The crucial question now is: is pragmatics really linguistics? In our opinion, pragmatics plays an important role in the linguistic game, given the high degree of information transferred from speaker to listener through prosody. But, we would like to draw a clear boundary between the language core, i.e. its grammatical structure, and its edges, where prosody and intonation should be placed.

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[14] See, among others, Nolan & Grabe (1997), Syrdal & McGorg (2000), Martin (2001), Mixdorff (2002), Wightman (2002).

In conclusion, although at present the pragmatic perspective dominates linguistic theory, we would like to lay emphasis on a more internal linguistic perspective, on the basis of the awareness that pragmatics is the linguistics of performance, or else, it is the description of the Saussurian *parole*, leaving the *langue* aside.

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