

# The Grammatical Monophonemes of Standard Italian.

## A Structural Isomorphism between Phonological and Semantic Oppositions?

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O matematici, fate lume a tale errore! Lo spirito  
non ha voce, perché dov'è voce è corpo, e do' è  
corpo è occupazione di loco.

Leonardo

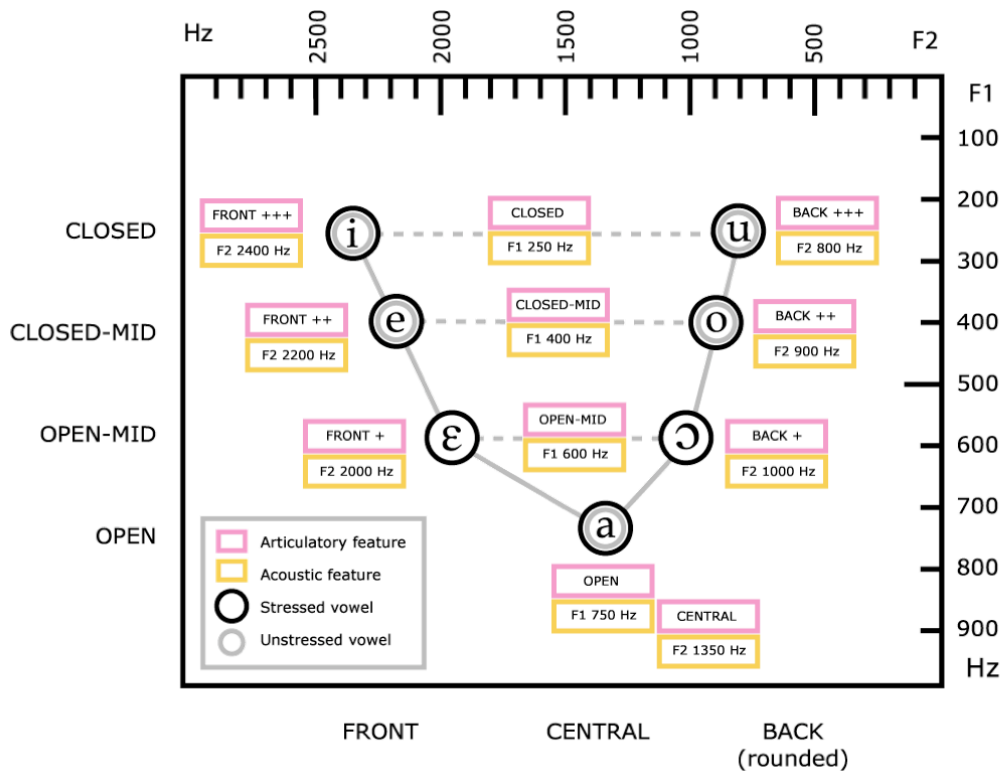
This paper analyses the relationship between the sounds and the meanings of the seven Italian grammatical words formed from a single phoneme. Its aim is to show that the system of the differences between their meanings can be described as isomorphic to the system of the differences between their sounds.

First, I will briefly describe the vowel system of the Italian language; second, the distribution of the monophonemes within the vowel system; third, the isomorphism between their morphological and phonological features; fourth, the general relationship between physiology and semantics. Finally, I will draw some conclusions.

As I essentially accept the Saussurean theory of the sign (Saussure 1916 : 155-169 ; Benveniste 1939), rather than the sounds, the meanings and their relationships, I'll be analysing the differences between the sounds, the differences between the meanings and the relationships between these differences in a particular linguistic system. Rather than the identity between a phoneme and an idea (like /i/ = "little", e.g. in Jespersen 1922), I'll affirm the proportionality between a pair of phonological features and a pair of semantic features (like [front] : [back] = [positive] : [negative] in Nobile 2003). Rather than the universal value of the sounds, I'll try to accurately describe the unconscious system of sound/meaning coupling which characterizes every language differently.

## 1. The vowel system of Italian

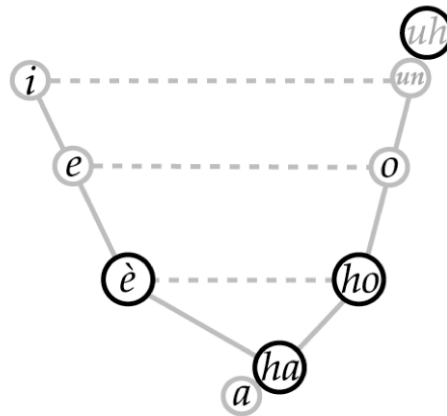
The Italian vowel system is relatively simple. It is a symmetric triangular vowel system (Canepari 1979 : 193 ; Mioni 1993 : 120). We can represent the relationships between his articulatory features and the relationships between his acoustic features using the same image (the absolute values are simplified).



The system is formed by 7 phonemes. They are distributed in 3 symmetric [front : back] pairs (/i-u/, /e-o/, /ɛ, ɔ/) sharing 3 different degrees of aperture, and in 1 [central; open] vowel (/a/). All the [front] phonemes (/i, e, ɛ/) are [unrounded] and their F2 is high, usually over 1900 Hz. All the [back] phonemes (/u, o, ɔ/) are [rounded] and their F2 is low, usually under 1100 Hz. Five phonemes (/i, e, a, o, u/) can be [stressed] or [unstressed], two (/ɛ, ɔ/) are always [stressed]. The [central; open] vowel (/a/) is [unrounded].

## 2. The monophonemes

Each one of these phonemes, except /u/, form a complete italian grammatical word. I called these seven grammatical lexemes the “monophonemes” of standard italian (Nobile 2003).

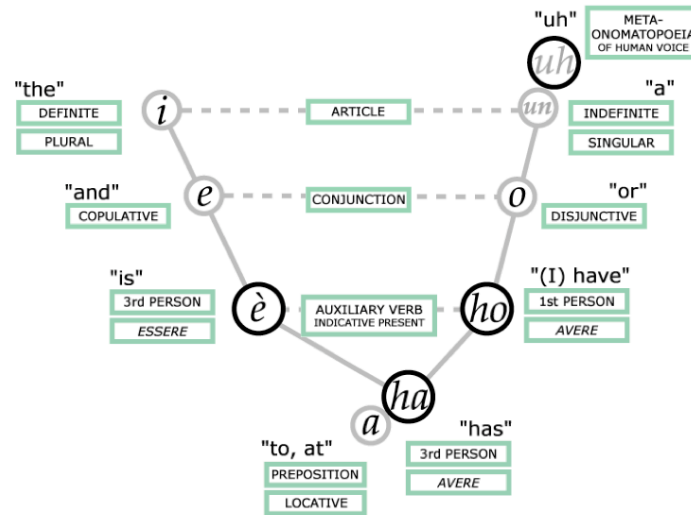


The monophonemes have four important properties. 1. They are all the italian grammatical words formed from a single phoneme: they represent a closed set. 2. They are the simplest phonological signifiants of the italian language: we can completely represent their two distinctive phonological features by a single bidimensional picture. 3. They are the smallest class of italian words of the same dimension: we can easily describe all their 10 basic oppositions. 4. They are on average the most frequent class of words of the same dimension of Italian: they form 7.7% of all the occurences in speech (LIP 1993). These properties make the monophonemes a good starting point for a scientific analysis of the sound/meaning coupling.

The morphological features of the monophonemes are: *i* /i/ [plural; definite; article] “the”; *e* /e/ [copulative; conjunction] “and”; *è* /ɛ/ [3rd person; verb *essere*] “is”; *a* /a/ [locative; preposition] “at, to”; *ha* /'a/ [3rd person; verb *avere*] “has”; *ho* /ɔ/ [1st person; verb *avere*] “(I) have”; *o* /o/ [disjunctive; conjunction] “or”. Only /u/ does not form a grammatical word. It is an onomatopoeia of the non-linguistic human voice (i.e. a meta-onomatopoeia): *uh!* To fully compare the value of this vowel with the others, we need to consider also the grammatical word nearest to it, that is *un* /un/ [singular; indefinite; article] “a”.

### 3. The isomorphism between phonology and morphology

If we write the morphological features on the image representing the phonological features, we can notice that their distribution is not merely random.



First, the two [articles] *i*, *un* face each other. They share the same grammatical category [article] as they share the same degree of aperture [close]. They are in opposition regarding their grammatical values [definite : indefinite] and [plural : singular] as they are in opposition regarding their articulation places [front : back]. Second, the two [conjunctions] *e*, *o* face each other. They share the same grammatical category [conjunction] as they share the same degree of aperture [close-mid]. They are in opposition regarding their grammatical values [copulative : disjunctive] as they are in opposition regarding their articulation places [front : back]. Third, the two [auxiliary verbs] *è*, *ho* face each other. They share the same grammatical category [auxiliary verb] as they share the same degree of aperture [open-mid]. They are in opposition regarding their grammatical values [3rd person : 1st person] and [*essere* : *avere*] as they are in opposition regarding their articulation places [front : back]. To sum up, all the morphological oppositions on the horizontal axis follow the structure of the phonological oppositions. Where we had three different degrees of aperture, now we have three different grammatical categories, and where we had three pairs of opposite articulation places, now we have three pairs of opposite morphological values.

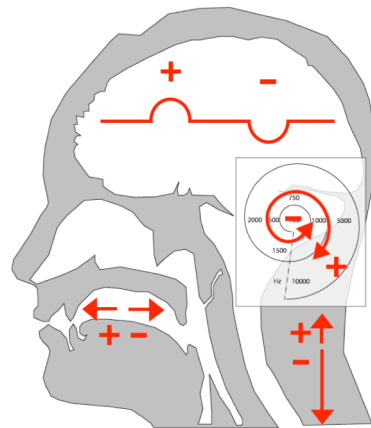
That's not all. Also the central position of /a/ has some important morphological similarities. First, the [central; open] vertex contains the only pair of homophones: the [auxiliary verb] *ha* and the [locative; preposition] *a*. Their only phonological opposition is [stressed : unstressed], and their diametrical morphological opposition is [variable : invariable]. There are two other cases of [stressed : unstressed] phonological opposition, that are *è* : *e* and *ho* : *o*. Both correspond to a [variable : invariable] morphological opposition. Therefore, the central [stressed : unstressed] feature has two secondary symmetrical instances and it always indicates a [variable : invariable] opposition. Second, we need to consider the [auxiliary verb] *ha*, placed between the [front] verb *è* and the [back] verb *ho*. The morphological features distinguishing these three verbs are: *è* [3rd person; *essere*], *ho* [1st person; *avere*], *ha* [3rd person; *avere*]. So, the morphological value of *ha* is formed from an half of the value of *è* and from an half of the value of *ho*. A central morphological position of *ha* corresponds exactly to the central phonological position of /a/. Third, the [open; central] area around the vertex is characterized by the presence of all the [auxiliary verbs] *è*, *ha*, *ho*. On the contrary, the [close] area on the base of the triangle contains all the [articles] *i*, *un*. Therefore, the verbal group is in opposition with the nominal group like the [open] side of the vowel system is in opposition with the [close] side. To sum up, also on the vertical axis, the morphological oppositions show some important similarities with the phonological ones. Notably, the [central] phonological position of /a/ can be recognized in three different aspects of the morphological position of *ha* and *a*.

#### 4. Physiology and Semantics

Until now, we considered the similarity between the axis of the morphological oppositions and the axis of the phonological ones. We can now complete our analysis considering the semantic orientation of each pair on its axis. For instance, we can ask why we have [front] : [back] = [definite] : [indefinite], and not the contrary ([front] : [back] ≠ [indefinite] : [definite]). I would respond that the physiological gestures are semantically oriented, and that this orientation is used by the Italian language to build semantic oppositions between the words.

#### 4.1. The [front : back] physiological gesture.

The [front : back] tongue position means a [forward/convex : backward/concave] physiological gesture. This gesture produces a [high F2 : low F2] sound, perceived in a relatively [external : internal] region of the cochlea and in a relatively [high : low] region of the thorax (Pierantoni 1996 : 231). The opposite pairs [forward : backward] and [high : low] are currently used as popular metaphors to signify a [positive : negative] opposition. The opposite pairs [convex : concave] and [external : internal] can be considered [positive : negative] in a “localist”, topological perspective. So, the general semantic orientation of [front : back] can be described as a [positive : negative] spatial opposition.



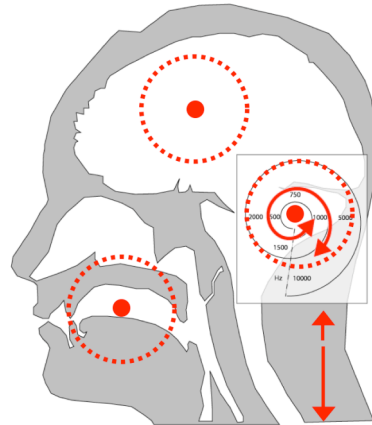
In fact, among the Italian monophonemes, the [front : back] phonological feature always corresponds to a [positive : negative] semantic feature.

| POSITIVE                   | NEGATIVE                   |
|----------------------------|----------------------------|
| [definite]                 | [indefinite]               |
| [plural]                   | [singular]                 |
| [copulative]               | [disjunctive]              |
| [3rd P] (forward)          | [1st P] (backward)         |
| [ <i>essere</i> ] (convex) | [ <i>avere</i> ] (concave) |

Please note that the [verbs] require a “localist”, topological perspective. Altogether, the [positive : negative] physiological feature corresponds to a [positive : negative] semantic feature.

#### 4.2. The [open : close] physiological gesture.

The [open : close] mouth makes the body [related : unrelated] to its environment (eating, breathing, talking). This gesture produces a [high F1 : low F1] sound, perceived in a relatively [external : internal] region of the cochlea and in a relatively [high : low] region of the thorax. The opposite pairs [open : close] and [external : internal] are currently used in popular metaphors to mean someone or something [related : unrelated]. To be bodily [open] and [related] means often to create a [complex] “content-container” topological structure (like eating an apple). So, the general semantic orientation of [open : close] can be described as a [related/complex : unrelated/simple] spatial opposition.

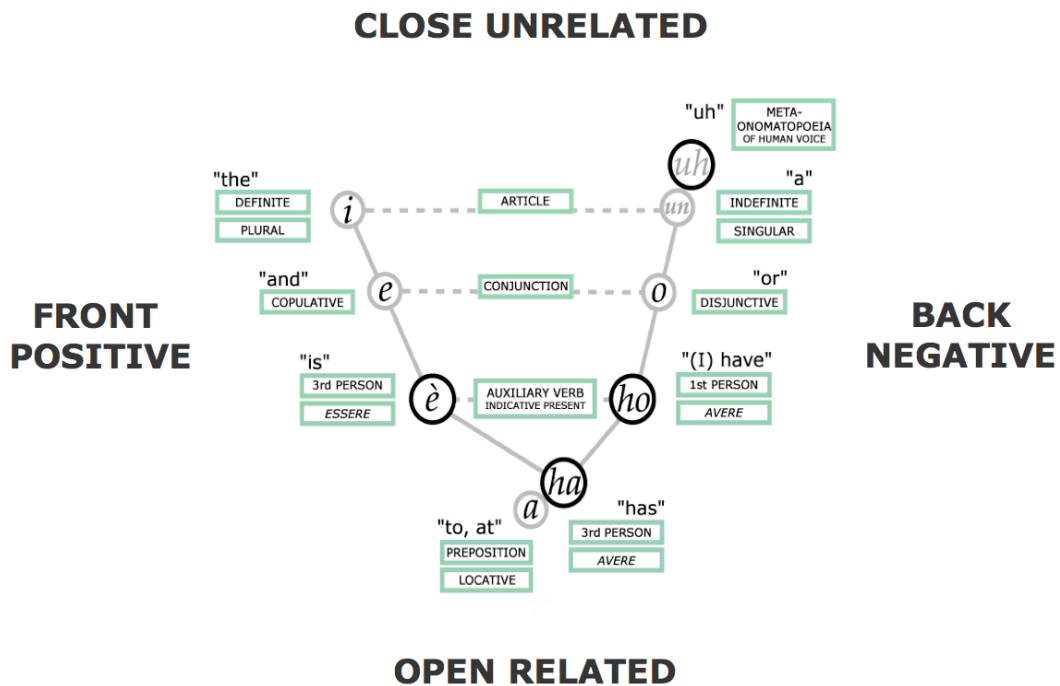


In fact, among the Italian monophonemes, the [open : close] phonological feature always corresponds to a more [related/complex : unrelated/simple] semantic feature.

|                       |                        |
|-----------------------|------------------------|
| + RELATED<br>/complex | + UNRELATED<br>/simple |
| [verb]                | [conjunction]          |
|                       | [article]              |

A [verb] can imply 3 arguments placed in 3 different physical places (like “I have you there”): it is more [related/complex]. A [conjunction] can imply 2 arguments placed in 2 different physical places (like “Me and you”). An [article] just implies its noun.

To sum up, the semantic orientation of the morphological oppositions seems to follow the orientation of the physiological gestures.



## 5. Conclusions

The system of the Italian monophonemes exhibits a structural isomorphism between the phonological oppositions and the morphological oppositions. The physiological orientations of articulation and audition can be easily described as images of the semantic differences among the words. Extending the analysis to the 200 monosyllables in Italian, we find that the basic polarities of the sound/meaning coupling still the same (Nobile 2008). These results seem to confirm the role of gestural mimesis in the neurophysiology of language, as it is suggested for example in the Mirror System Hypothesis (Rizzolatti and Arbib 1998).



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