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Analysing the sensorimotor interface
between phonetics and semantics
in Italian

by

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Analysing the sensorimotor interface between phonetics and semantics in Italian

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1   Theoretical and methodological aspects

1.1   Echo-mirror neurons and arbitrariness

The discovery of the mirror neurons by Giacomo Rizzolatti's team in the mid-1990s revealed a physiological, automatic connection between the perception of others' actions and the execution of one's own. Indeed mirror neurons fire both when one performs an action and when one sees or hears someone else executing it. As they were specifically found in the Broca's area, the well-known zone of the left hemisphere involved in the production of language, they were presented as evidence of a strong neurophysiological and evolutionary contiguity between gestural mimicry and language articulation (Rizzolatti and Arbib 1998).

In particular, there is evidence that hearing the speech sounds of others evokes motor potentials in the muscles required to articulate them (Fadiga et al. 2002), and that < p. 102 > the wideness of the articulatory gestures is influenced by the wideness of simultaneous hand gestures, whether one's own or that of others (Gentilucci and Corballis 2006; see Figure 1). It has thus been hypothesized that such an 'echo-mirror neuron system' could explain not only the ability to imitate speech sounds but also the capability to understand their meanings. Indeed, the original 'meaning' of speech sounds seems to have been the motor pattern they share with simultaneous, analogous hand gestures; therefore their semantics and phonetics should originally be coded together:

> In other words, [mirror] neurons appeared which coded phonetics simultaneously with semantics. In this way, heard speech produces not only a tendency to imitate the sound but also an understanding of the accompanying body-action gestures (Rizzolatti and Craighero 2007: 783).
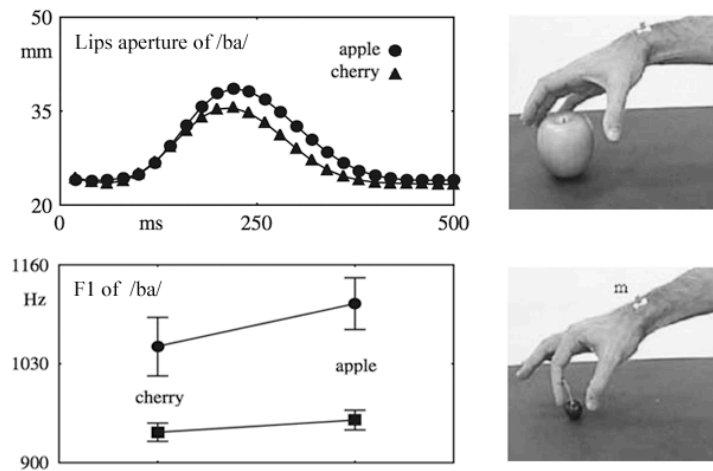
Figure 1. Grasp observation influences vowel aperture (Gentilucci and Corballis 2006). A speaker articulating the syllable /ba/ while observing someone grasping an object (on the right) articulates a more open syllable if the object is bigger, a more closed one if the object is smaller (on the left, top). This modifies the acoustic formant F1 (a distinctive feature of the vowel quality) strongly if the speaker is a child, weakly if he is an adult (left, bottom).

Such a naturalistic explanation of the link between phonetics and semantics is traditionally refused by linguists. For example, in his paper tellingly entitled 'Language beyond our Grasp' (2004) James Hurford criticizes Rizzolatti's and Arbib's 'Language within our Grasp' (1998). Citing Saussure, he merely draws attention to the fact that the word 'apple' is not similar to the image of an apple. This traditional argument is considered sufficient to conclude that the relationship between signifier and signified is arbitrary and that, consequently, the mirror neuron hypothesis will not explain the efficiency with which children acquire semantic distinctions by means of phonetic ones.

< p. 103 > Hurford's paper reflects a widespread position among linguists, one that Sylvain Auroux (2007) argues for with particular clarity. Introducing a recent number of *Histoire Epistémologie Langage* entitled 'Le naturalisme linguistique et ses désordres', he maintains that "arbitrariness is not a fact, but the theoretical principle at the origin of history and culture". The Enlightenment would introduce it as a foundation of both human freedom and the humanities, while its denial by 19th century linguistic naturalism would prepare the arrival of Nazism. So, one of the most authoritative European theorists of linguistics presents the relationship between arbitrariness and naturalism as a war between civilization and barbarism.

The aim of the present paper is to propose a theoretical, methodological and descriptive framework for combining the gestural-mimetic principle implied by the mirror system hypothesis and the principle of arbitrariness of the sign required to explain the diversity of languages and the freedom of human consciousness. Moreover, this paper offers some evidence to falsify Hurford's prediction concerning language acquisition and it shows how the mirror system hypothesis could explain children's rapidity in acquiring semantic distinctions by means of phonetic ones.

First, the paper briefly draws attention to the history of the question, discusses its theoretical core and presents a method to analyse analogies between phonological and

semantic structures. In section 2, this method will be applied to Italian grammatical monosyllables, focusing on a complete description of the words formed from one phoneme ('monophonemes'), of the words distinguishing grammatical persons and of the adverbial pairs. In section 3, a number of conclusions will be drawn, particularly about the difference between linguistic 'values' and psychological 'concepts'.

1.2   An ancient question

The relationship between sound and meaning is one of the original problems in Western philosophical tradition. Indeed it constitutes the topic of one of the dialogues by Plato, the first philosopher of whom tradition gave us the *corpus*. In the *Cratylus*, the character of Socrates discusses Hermogenes' and Cratylus' thesis on the relationship between names and things. Hermogenes is a sophist who considers it a contractual and arbitrary relationship (384c-385e), Cratylus is a Heraclitean who considers the relationship natural and iconic (422d-427d). Although tradition attributes Cratylus' ideas to Plato, some recent interpretations have placed him in an equidistant position. His distance from Cratylus would be a distance from the sacred, oral, poetic, traditional knowledge and it allowed him to base the secular philosophical thought on the prose (Fresina 1991: 75-110; and cf. Genette 1976: 11-37). So the question of arbitrariness seems to be linked to the origin of abstract thought as being based on the practice of writing. One may ask if the current technological change in this practice could be a reason for the renewed relevance of the issue. As it is, since Plato the debate continues through the entire tradition.

< p. 104 > Hermogenes' thesis is reformulated by Aristotle in the first pages of *De interpretatione* (16a). It is transmitted from there to Augustine, who includes it in *De Doctrina Christiana* (II, 26). Thomas picks it up from there and puts it in his *Summa Theologica* (PII-II Q85 A1), making it the official doctrine of Christian Aristotelianism. So one can find it in Dante's *De vulgari eloquentia* (ca. 1305; I, 3), in Arnauld's and Nicole's *Logique* of Port-Royal (1662: 98; 1683: 58), in the cartesian *Discours physique de la parole* by Gérard de Cordemoy (1668: 23), and finally in John Locke's *Essay Concerning Human Understanding* (1690: III, 2), which problematizes it in a decisive manner. Franz Bopp implicitly accepts Hermogenes' idea in the preface of his *Vergleichende Grammatik* (1833: iii) and makes it one of the foundations of new comparative linguistics.

Cratylus' thesis is reformulated by Epicurus in his *Epistula ad Herodotum* (75-76). It further emerges in different forms in the Stoa, as Augustine says in *De Dialectica* (VI) and as one can read in *Noctes atticae* (X, 4), where Aulus Gellius reports the ideas of the Latin grammarian Nigidius Figulus. The indirect nature of these statements suggests, however, that the doctrine does not pass the filter of Christianity. It is not by accident that in the Middle Ages it rather characterized Jewish tradition, beginning with the anonymous founder of the Kabbalah, the *Sepher Yezirà* ('The Book of Formation'; about 6th century AD), up until the classic by Abraham Abulafia, *Or ha-Śekel* ('The light of intellect' VIII, 5; about 1280). Only with the rediscovery of Epicurus, between the *editio princeps* of Diogenes Laertius' *Vitae philosophorum* (1533; X, 75-76) and Pierre Gassendi's *Animadversiones* (1649: 54-55 and 700-706),

did cratylism reappear in lay clothing. First, in the fourteenth chapter of John Wallis' *Grammatica linguae anglicanae* (1653), next at the opening of Gottfried Wilhelm Leibniz's *Brevis designatio... ex indicio linguarum* (1710: 2) as well as in his famous answer to Locke's *Essay* (1765: III, 2), then assuming an important place in Giambattista Vico's *Scienza Nuova* (1744: 92 and 181), and finally providing a foundation to French materialist linguistics, with the *Traité de la formation méchanique des langues* by Charles de Brosses (1765: I, 195-294). Hence in various ways, including Etienne Bonnot de Condillac's *Grammaire* (1775: 18-22) and Dieudonné Thiébault's *Grammaire philosophique* (1802: I, 14-18), the theory joins Wilhelm von Humboldt, the political godfather of Bopp. Humboldt presents a well-known reformulation of Cratylus' theory in his *Verschiedenheit des menschlichen Sprachbaues* (1836: 81-106).

1.3   Two notions of arbitrariness

Even if we can call Hermogenes-like positions 'conventionalist' or 'arbitrarist' and Cratylus-like positions 'naturalist' or 'iconicist', it should be pointed out that, inevitably, each theory also covertly includes its opposite, which the other one exhibits in full light. Indeed, if Hermogenes' theory (in Aristotle's formulation) can claim that speech sounds are conventionally associated with ideas, it is only because ideas are considered natural products of perception: the same for all people, independent from < p. 105 > languages ; this represents Hermogenes' naturalism. Conversely, if Cratylus' theory (in Epicurus' formulation) can claim that sounds are naturally associated with ideas, it is only because ideas are considered relatively arbitrary products of perception, different for people in accordance with their language; and this represents Cratylus' arbitrarism.

In both cases, one must account for a certain adherence and non-adherence of language to reality. If the idea perfectly fits the object, then the sound cannot fit the idea, given that different languages use different sounds to signify the same thing. But if the idea does not fit the observed object perfectly, then the sound can fit the idea, given that different languages will use different sounds to signify different ideas of things. Behind the opposition between 'conventional' and 'natural' then lies an opposition between two different theories of meaning, which are also two different notions of arbitrariness.

As is well-known, both concepts are present in *Cours de linguistique générale* (see Figure 2): an Aristotelian Saussure, with introductory intention and pedagogical caution, says that the association between sound and concept is arbitrary (1922: 100-102) ; an Epicurean Saussure, with more daring investigative ambition and the intention of studying in depth, says that, even if paradoxical when compared to the above (1922: 159), arbitrariness concerns the segmentation of both semantic and phonetic fields from which signifiers and signifieds emerge (1922: 155-169).
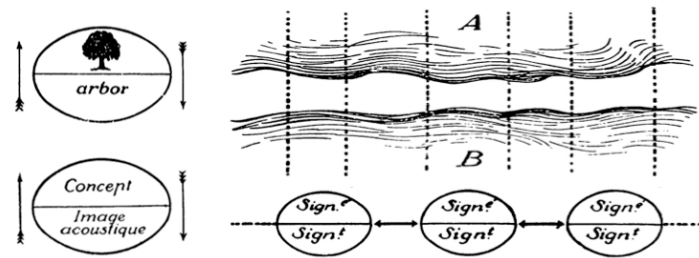
Figure 2. Representations of two types of arbitrariness in Saussure's Cours*. The Aristotelian-like arbitrariness (on the left) concerns the relationship between the sound and the concept within each word. The Epicurean-like arbitrariness (on the right) concerns the relationship between the cuts the sign produces simultaneously, on the one hand, in the psychological* continuum *of the concepts 'A' and , on the other hand, in the physiological* continuum *of the sounds 'B'. In the latter perspective, one cannot say that the relationship between signifier and signified is arbitrary, because neither of them exists independently from their reciprocal relationship.*

As Emile Benveniste (1966) underlined, Saussure's formulation of Epicurean arbitrariness destroys the foundation of Aristotelian arbitrariness. Indeed the concept of *langue* as a system of values requires the relationship between signifiers and signifieds to be necessary. The *langue* does not work with individual 'sounds' <p. 106> arbitrarily associated with individual 'concepts', but with differential systems of 'signifiers' structured by their coupling with differential systems of 'signifieds'. Signifiers and signifieds are fields of sounds and concepts the boundaries of which are defined by their oppositions to other fields. Even if each individual association between sounds and concepts seems arbitrary, the way *langue* differentiates it from other associations is not. It is this differentiation - rather than its acoustical or psychological contents - which characterizes the language faculty and defines the object of linguistics. Thus, in the *Cours,* the signifier and signified are presented as 'aspects' of the same 'value' (1922: 158-165), and the theory of value is enunciated as the theory of a systemic link between phonetics and semantics:

> A linguistic system is a series of differences in sounds combined with a series of differences in ideas, but this putting together of a certain number of acoustic signs with corresponding cuts made in the mass of thought gives rise to a system of values; and it is this system which constitutes the effective link between the phonic and psychic elements on the interior of each sign [Saussure 1922: 166; translation by Paul J. Thibault].

1.4   *Two notions of iconicity*

Starting from Saussure's perspective, Roman Jakobson accepted Charles Sanders Peirce's theory of iconicity. After reminding us that Peirce's triad of symbol, index and icon refers to three semiotic dimensions simultaneously present in each sign, Jakobson (1965 : 28) focused on Peirce's distinction between two subtypes of icons: images and diagrams. While images depict things, diagrams depict relationships between things. For example, two rectangles represent the relationship between the production of steel in the US and the USSR: the rectangles are not similar to the production of steel, but the ratio between their sizes is similar to the ratio between the two productions.

Jakobson (1949, 1965) has repeatedly shown that language employs not only imagic iconicity (onomatopoeia, synaesthesia and the like) but also this more abstract kind of iconicity in which the signifier tends to appear as a diagram of the signified. Canonical examples: the time sequence pictured in the syntactic order of Caesar's phrase *veni, vidi, vici* (1965: 27); the largest amount shown by the increased length of plurals and superlatives (1965: 30); the smallness of objects depicted by acute sounds and closed articulations (1965: 34; 1980: 224-230, with Linda Waugh).

The concept of diagram was subsequently developed by several scholars including Talmy Givón (1985 and 1995), Linda Waugh (1993), Olga Fischer (1999 and 2001, the latter with Max Nänny), Marianne Kilani-Schoch and Wolfgang Dressler (2005: 39-57), and it seems today to constitute the prevailing sense of the term *iconicity*. Nevertheless, research into imagic iconicity was also renewed in several directions, for example by Ivan Fónagy (1983 and 2001), Maurice Toussaint (1983), Kawada Junzo (1988), < p. 107 > Margareth Magnus (2001), Didier Bottineau (2002), Philippe Monneret (2003 and 2004), Dennis Philps (2006), and Federico Albano Leoni (2009).

Sometimes scholars opposed imagic and diagrammatic iconicity as if they excluded each other. This is not our purpose.

1.5   *Working hypothesis*

This paper aims to propose a framework for combining naturalism and arbitrariness. To do so, it problematizes the notion of arbitrariness: it accepts the Epicurean variant as reformulated by Saussure (arbitrary segmentation of phonetic and semantic *continua*) and rejects the Aristotelian-Thomistic variant (arbitrary relationship between sound and meaning). In other words, it assumes that both phonetic and semantic fields are internally differentiated in a relatively arbitrary way with respect to reality (as evidenced by the diversity of languages), but it denies that within every language the relationship between the phonetic differentiations and the semantic differentiations is arbitrary. In particular, this paper hypothesizes that, if one limits the analysis to a single language, the relationship between the differential system of signifiers and the differential system of signifieds can be described systematically as a diagrammatic relationship. This diagrammatic relationship, however, is more concrete than usual: even if it is purely differential, it clearly shows some 'imagic' properties. Olga Fischer (1999: 347) already pointed out this "other type of diagrammatic iconicity", comparing some Max Nänny's examples with John Haiman's. Below, I will try to distinguish these two types of diagrams, which result from successive levels of analysis. I will use the term 'iconic diagram' for the more abstract and accessible pattern, and 'imagic diagram' (with an intentional oxymoron) for the more concrete and hidden one, the analysis of which depends on the former.

1.6   Methodological remarks

Accepting a neo-Saussurean perspective (see Saussure 2002, Rastier 2005, Bouquet 2008) means aiming to achieve a systematic comparison between the whole system of phonetic differences and the whole system of semantic differences of a language, before starting comparisons with words in other languages. Indeed, the same sound (or the same meaning) can have different values in different languages, depending on the internal differential system of each.

While the whole system of semantic differences does not have a formal organization allowing a systematic description, the whole system of the phonetic differences does: it is the phonological system with its combinatory rules. Thus, if one intends to analyse systematically the signifier-signified relationship, one can base the analysis on the phonological organization of the lexis.

Besides, words are naturally organized with respect to their size. Shorter and phonologically simpler words are on average more frequent, less numerous and < p. 108 > semantically more generic than the longer ones. Moreover, in shorter words the relationship between signifiers and signifieds can be analysed more easily and precisely because their linguistic value depends on a smaller number of distinctive features. So, if one intends to achieve the analysis of a whole differential system, one has to start with monosyllabic words. This method is not only epistemologically efficient but also ontologically justifiable: it locates the starting point of the analysis at the space-time origin of the neuro-cognitive experience, that is the perpetuity of the now-here, and then it progresses towards the temporal duration of the syllables.

For these reasons the initial corpus of our research is constituted from all the grammatical lexemes of Italian formed from one, two or three phonemes, excluding interjections, onomatopoeias and any other special type of word (see Tab. 1). These two hundred forms alone represent about 43% of all tokens in an average utterance (data extracted from De Mauro et al. 1993).

Table 1. *The corpus includes Italian words formed from one, two or three phonemes.*

Monophonemes	
V	i e è ha ho o uh
C	v' t' d' s' l' l' c' c' gl' ch' ch' m' n'

Biphonemes	
VV	io ai hai
VC	il in ed al ad han od un
CV	po' fa fa fa' fo fu vi vi ve ve va va' vo ti te te tè tu di dì di' da dà da' do sì si se sé se sa so su su li lì le le le la la là lo lo re ci ci ce ce ciò già giù sci scià gli gli gnu chi che che che mi me me ma ne né no

Triphonemes	
CVV	pio… poi bei bèo... bai boa… bui bue bua fio fai fui via via vai voi tuo... dia Dio dèi… dei dai dài due duo zio… zoo sii sia sèi sei sai suo... lei lui rio… rio… reo… ciao cioè scio... scia coi cui mio... mai nei nèo… noi
CCV	più può pro fra tre tra sfo... sta sta' sto qui qua gru
CVC	per pan bel ben bar far fan val van tal dir del dal dar dan don ser san san son son sub sud sul lor can col con gas men mal mar nel non

< p. 109 > This paper describes the entirety of only three subsystems of this corpus: the words formed from one vowel, the words distinguishing the grammatical persons and the adverbs. In order to study the relationship between signifiers and signifieds in these subsystems, we will spatialize them by means of a 'phonosemantic diagrammer' (see Figure 3). A phonosemantic diagrammer is a schema representing the phonological system of a language within the oral cavity of a speaker placed within a speech act. This allows the articulatory differences among the words with their logical-semantic differences to be compared taking the point of view of the speaker's body. For simplicity, the auditory and proprioceptive dimensions will not be systematically considered in this paper.
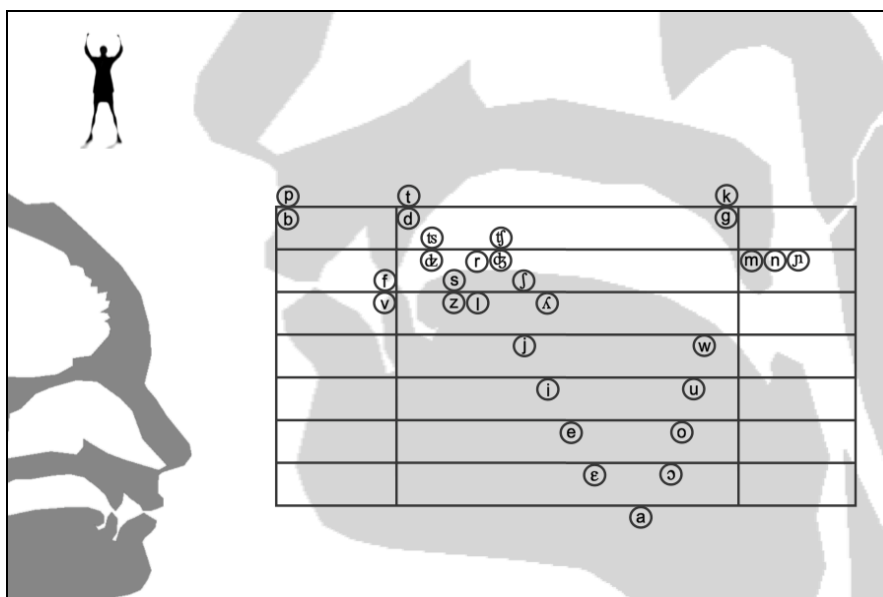
Figure 3. *Phonosemantic diagrammer. The articulatory features of the Italian phonological system are represented within the mouth of a speaker placed in the speech act space.*

The picture represents the phonological system of Italian. The place of articulation of the phonemes is represented on the abscissa: lips are on the left, the tongue is in the middle and the soft palate is on the right. The nasality is represented as a post-velar place of articulation, according to the fact that it is produced by a movement of the velum. The degree of aperture of the vowels and the manner of articulation of the consonants are merged and represented on the ordinate: the plosive consonants are at the top, the approximants are in the middle, the open vowels are at the bottom. The voicing is represented by writing the voiceless phonemes upon the lines and the voiced phonemes < p. 110 > under the lines according to the fact that the former are more closed than the latter. For simplicity, we have omitted some secondary traits, such as the labiality of the back vowels /u, o, ɔ/, of the nasal consonant /m/ and of the prepalatal affricates /tʃ/ and /ʤ/, as well as the dentality of the nasal /n/ (sometimes labiovelarity or velarity) and the laterality of the approximant /l/.

2. Descriptive aspects

2.1 *Vowel monophonemes[i]*

Each of the vowel phonemes of Italian, except for /u/, represents, when taken in isolation, at least one grammatical lexeme. These are: *i* /i/ 'the' {article; defined ; plural}, *e* /e/ 'and' {conjunction ; copulative}, *è* /'ɛ/ 'is' {P3[ii] ; *essere*}, a /a/ 'to, at' {preposition ; locative}, *ha* /'a/ 'has' {P3 ; *avere*}, *ho* /'ɔ/ '(I) have' {P1; *avere*}, *o* /o/ 'or' {conjunction; disjunctive}. The central phoneme /a/ gives rise to two lexemes, *a* /a/

and *ha* /'a/, which can be distinguished only by the stress. The back phoneme /u/ does not mean anything, so it can represent the non-linguistic sound of the human voice in the typical onomatopoeia of the wild man's call: *uh!* {meta-onomatopoeia}. The grammatical word most similar to /u/ is *un* /un/ 'a' {article; indefinite; singular}; as it is the only Italian monosyllable starting with /u-/ it can be employed as an alternative to *uh!* for a morphological comparison among homogeneous features.

These items are a good starting point to analyse the linguistic value as a product of a system of oppositions because they constitute a closed, small, simple and important set. It is closed because it includes all the Italian words formed from one phoneme. It is small because it includes only 8 words, connected by only 10 minimal oppositions, easy to analyse in full. It is simple because all the oppositions can be described by only 2 distinctive features (aperture and place of articulation) which can be easily represented by a single two-dimensional picture. Finally, it is important because it includes the on average most frequent group of words among all the groups formed from words of the same number of phonemes: they alone represent about 7.7% of all tokens in a normal utterance; you can hear one of them every 12.9 words.

If one puts the vowel monophonemes on the phonosemantic diagrammer, one sees that the distribution of the logical-semantic values, represented by distinctive morphological features, tends towards isomorphism with the distribution of the < p. 111 > phono-articulatory values. The analysis can be conducted on two levels (see Figure 4). First one can describe the purely formal isomorphism between the 'opposition axes' of phonemes and lexemes; for example, the fact that the {conjunctions} *e* and *o* face each other on the same degree of aperture (an iconic diagram). Secondly, one can describe a more substantial isomorphism between the 'opposition directions'; for example, the fact that the {positive, copulative} conjunction has a [front, single] place of articulation while the {negative, disjunctive} conjunction has a [back, double] place of articulation, and not the contrary (an imagic diagram).

2.1.1 Opposition axes
The isomorphism between the axes can be summarized as follows:

2.1.1.1 Aperture. The [degree of aperture] of the phonemes tends to distinguish the {grammatical category} of the lexemes:

$$[\text{closed : middle : open}] \quad \approx \quad \{\text{article : conjunction : verb}\}$$

Note that articles are the only representatives of the nominal group in this system: they entirely take up the [closed] side of it, while all verbs take up its [open] side; conjunctions are in the middle.

2.1.1.2 Place. The [place of articulation] of the phonemes tends to distinguish the {morphological variation} of the lexemes inside each category:

$$[\text{front : back}] \quad \approx \quad \begin{array}{l} \{\text{definite : indefinite}\} \\ \{\text{plural : singular}\} \\ \{\text{copulative : disjunctive}\} \\ \{\text{P3 : P1}\} \\ \{\textit{essere} : \textit{avere}\} \end{array}$$

All these semantic pairs are 'polar': they are oppositions between contraries, exactly like the articulatory pair [front : back]. The pair {P3 : P1} can be viewed as polar if it is regarded as an {not-I (P2, P3) : I (P1)} opposition. This is possible because the Italian morphological P3 can also give, semantically, an impersonal (as in English) or a courtesy P2 (as in German) : *è caldo* 'he is hot / it is hot / you are hot'.

2.1.1.3 Accent. The [accent] distinguishes the {verbs}:

$$[\text{stressed : unstressed}] \quad \approx \quad \begin{array}{l} \{\text{P3 } avere : \text{locative preposition}\} \\ \{\text{P3 } essere : \text{copulative conjunction}\} \\ \{\text{P1 } avere : \text{disjunctive conjunction}\} \end{array}$$

Only for the central open homophones (*ha* : *a*) is the stress the only distinctive feature; otherwise (*è* : *e* ; *ho* : *o*) it is in addition to the degree of aperture. < p. 112 >

2.1.1.4 Centrality. The phonological [central] position of /a/ (with respect to [front] and [back] vowels) is reflected by the semantic central positions of *ha* (with respect to *è* and *ho*) and *a* (with respect to *e* and *o*):

$$[\text{front : central : back}] \quad \approx \quad \begin{array}{l} \{\text{P3 } essere : \text{P3 } avere : \text{P1 } avere\} \\ \\ \{\text{copulative : locative : disjunctive}\} \end{array}$$

In fact, the semantic value of *ha* {P3, *avere*} is formed by half of the features of *è* {P3, *essere*} and half of the features of *ho* {P1, *avere*}, while the semantic value of {locative} is logically intermediate between {conjunctive} and {disjunctive}.

This relatively constant use of analogous phonological features to distinguish analogous logical-semantic features falls within the case of diagrammatic iconicity. Below one can see how this diagrammaticity gives rise in turn to secondary imagic structures.
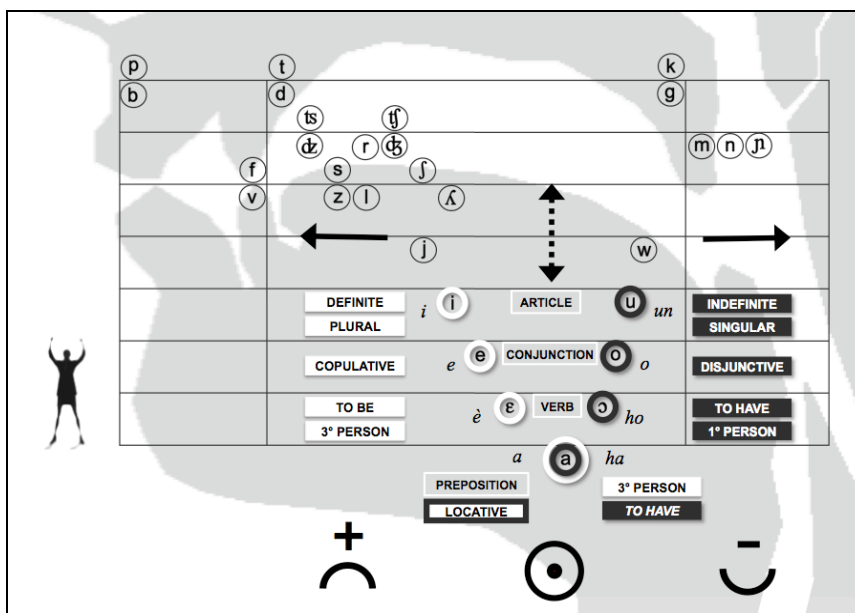
Figure 4. *Iconic and imagic diagram of the vowel monophonemes. The distribution of the morphological features tends towards isomorphism with the distribution of the phonological features. Moreover, the latter is concretely similar to the former: the {positive} values are [front] while the {negative} are [back], and the {relational} values are [open] while the {unrelated} are [closed],.*

2.1.2. Opposition directions
The isomorphism between the directions can be summarized as follows:

2.1.2.1 Aperture. The [degree of aperture] tends to distinguish the {grammatical categories} in accordance to the level of topological-relational complexity. The more [open (F1 acute)] degree characterizes the {more-relational} grammatical categories, < p. 113 > such as verbs and preposition, while the more [closed (F1 grave)] degree connotes the {less-relational} elements, such as articles and onomatopoeia.

$$\frac{[\text{closed : middle : open}] \quad \approx \quad \{\text{article : conjunction : verb}\}}{\text{less-relational : middle : more-relational}}$$

From the point of view of both physiological experience (eating, talking…) and popular metaphors (*opening to China, closed mind*…), the motor pair [open : closed] can be considered a transparent image of the semantic pair {more relational : less-relational}, especially related to spatiality. Furthermore, the homologous timbre opposition [acute : grave] can easily evoke a space opposition {open : close} (and then {more-relational : less-relational}), because, for reasons of physical acoustics, a sound emitted indoors assumes a more grave timbre than when emitted outside (think of a voice from a cave, or of the noise of a train entering a tunnel).

2.1.2.2 Place. The [place of articulation] tends to distinguish the {morphological variation} in accordance with a 'positive' or 'negative' spatial polarity. The place [front

(F2 acute)] connotes the spatially {positive} side of each pair (plurality of *i*, additivity of *e*, convexity and exteriority of *è*), while the place [back (F2 grave)] connotes the spatially {negative} side (singularity of *un,* subtractivity of *o*, concavity and interiority of *ho*). As a factor of redundancy, lip protrusion gives to all back vowels a contradictory gait (tongue back, lips forward), which adds a {separative} connotation to all {negative} elements (singulativity of *un*, separativity of *o*, transitivity of *ho*), as opposed to the {unitive} connotation of the {positive} elements (collectivity of *i,* unitivity of *e,* intransitivity of *è*).

[front : back] [palatal : labio-velar]	{definite : indefinite} {plural : singular} ≈ {copulative : disjunctive} {P3 : P1} {*essere : avere*}

positive-unitive : negative-separative

From the point of view of both physiological experience (advancing, going backwards…) and popular metaphors (*the progress, the recession…*), the motor pair [front : back] can be considered as a transparent image of the semantic pair {positive : negative}, while the motor pair [palatal : labio-velar] (i.e. [single : double] place of articulation) can be considered as a transparent image of the semantic pair {unitive : separative}. Furthermore, the timbre opposition [acute : grave] can easily evoke a semantic opposition {positive : negative} (think of the grave tones that usually accompany the villain's stage entrance), perhaps because, for reasons of physical acoustics, it urges perceptually more [high : low] regions of the body (and this is another image of {positive : negative}; e.g. 'high quality' vs. 'low quality'; see also Lakoff and Johnson 2003: 147).

< p. 114 > One must also remark that at least in the case of the verbs (*è : ho*; but not only) the motor pair [front : back] works also like an index distinguishing the physical positions of the grammatical subjects (P3 : P1) within the speech act space. I will return to this point later on.

2.1.2.3 *Accent.* The [accent] distinguishes two complementary aspects of the aperture as power to contain. The [stressed] accent connotes *ha* /'a/ 'has' as an active {containing}, while the [unstressed] accent connotes *a* /a/ 'at, to' as a passive {contained}(see Figure 5*)*.

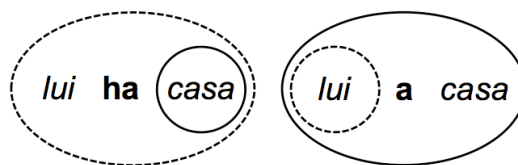Figure 5. *Accent on /a/ differentiates two aspects of the power to contain.*

For example, looking at the picture of a man beside a house, one can distinguish by the accent *Lui ha casa* /'lui'ak'kasa/ 'He has a home' {containing} from *Lui a casa* /'luiak'kasa/ 'Him at home' {contained}. Likewise, watching a bunch of kids dividing themselves into teams, one can distinguish by the accent *Marco ha Fabio*

/'marko'af'fabjo/ 'Marco has Fabio' {containing} vs *Marco a Fabio* /'markoaf'fabjo/ 'Marco to Fabio' {contained}.

$$\frac{[\text{stressed : unstressed}] \qquad \approx \qquad \{\text{P3 } avere : \text{locative preposition}\}}{\text{active-containing : passive-contained}}$$

From the point of view of both physiological experience (breathing reflects activity) and popular metaphors (activity can be *stressful*), the motor pair [stressed : unstressed] can be considered a transparent image of {active : passive}. Furthermore, as it opposes the respiratory cavity to the vocal cavity contained in it, the pair can easily evoke the conceptual opposition {containing : contained}.

2.1.2.4 *Centrality.* The [central open] position of the phoneme /a/ corresponds to the central position of the notion of a {structured spatiality} as the power to contain or be contained (*ha* : *a* 'has : at'), which is the base of any set-element or structure-item system (traditional symbol: ⊙).

$$\frac{[\text{front : central open : back}] \quad \approx \quad \dfrac{\{\text{P3 } essere : \text{P3 } avere : \text{P1 } avere\}}{\{\text{copulative : locative : disjunctive}\}}}{\text{positive direction : structured spatiality : negative direction}}$$

It is not surprising that the [open centre] of the vowel system depicts the idea of {structured spatiality}. Not only because the concept of *centre* (centre of a figure, of a town, of a problem...) implies the idea of a space contained in another space. But also < p. 115 > because the opening of the mouth connects the internal cavities allowing us to contain (lungs, stomach, intestine, bladder...) with the external cavities allowing us to be contained (holes, homes, houses, habitations, hotels, halls, hangars...). The mouth is the anatomical junction between inner space and outer space, the combination of which give rise to our physiological experience of spatiality as structured. The pure exhibition of the oral cavity containing the tongue (/a/) can thus operate as the original figure of that concept (*ha* : *a* 'has : at').

2.2   System of persons[iii]

Among the two hundred grammatical monosyllables of standard Italian, the persons differentiation system constitutes the largest set of forms. It includes 89 words divided into two major subsystems: the verbal one and the pronominal one.

The subsystem of verbal persons also presents in its turn two main subtypes (see Table 2): the subtype of the verb *essere* 'to be' (P1 *son*[iv] /'son/, P2 *sei* /'sɛi/, P3 *è* /'ɛ/) and the subtype of the verbs *avere* 'to have', *fare* 'to do', *andare* 'to go', *sapere* 'to know', *dare* 'to give', and *stare* 'to stay' (P1 *ho, fo, vo*[v], *so, do, sto* /'-ɔ/; P2 *hai, fai, vai, sai, dài, stai* /'-ai/; P3 *ha, fa, va, sa, dà, sta* /'-a/). As they are usually disyllabic, the plural grammatical persons of the verbs are excluded from this analysis.

Table 2. *Differentiation of persons in verbs.*

	P1	P2	P3
essere	/'son/	/'sɛi/	/'ɛ/
avere, fare, andare, sapere, dare, stare	/-'ɔ/	/-'ai/	/-'a/

The subsystem of pronominal persons presents four main subtypes (see Table 3): singular subject (P1 *io* /'io/, P2 *tu* /'tu/, P3 *lui, lei* /'lui, 'lɛi/), plural subject (P4 *noi* /'noi/, P5 *voi* /'voi/, P6 *lor*[vi] /'lor/), singular object (P1 *mi, me* /mi, me, 'me/; P2 *ti, te* /ti, te, 'te/; P3 *lo, la, si, se, sé* /lo, la, si, se, 'se/) and plural object (P4 *ci, ce* /tʃi, tʃe/; P5 *vi, ve* /vi, ve/; P6 *li, le, si, se sé* /'li, le, si, se, 'se/). < p. 116 >

Table 3. *Differentiation of persons in pronouns.*

	P1	P2	P3
Singular Subject	/i-/	/t-/	/l-/
Plural Subject	/n-/	/v-/	/l-/
Singular Object	/m-/	/t-/	/l-/, /s-/
Plural Object	/tʃ-/	/v-/	/l-/, /s-/

2.2.1 Subsystems differentiation

Considering the two subsystems, one can observe that (with the partial exception of *son, sei* and *io*) the verbal persons differentiation depends on the vowel termination, while the pronominal persons differentiation depends upon the initial consonant:

$$[\text{-vowel}] : [\text{consonant-}] \quad \approx \quad \{\text{verbal}\} : \{\text{pronominal}\}$$

The initial consonant of verbs (/f-/, /v-/, /s-/, /d-/, /st-/) does not distinguish persons but, in principle, the semantics of the verb (e.g., /fa/ : /sa/ = 'does' : 'knows'). The vowel termination of pronouns does not distinguish persons but several other things including number, gender, case and logical role. In particular, if we exclude some interferences from the differentiation of genders (/lɛi/ and /la, lo/), the logical role of the subject is usually distinguished by the presence of a back, grave vowel (/io/, /tu/, /lui/, /noi/, /voi/, /lor/), while the logical role of the object is distinguished exclusively by front, acute vowels (/mi/, /me/, /ti/, /te/, /si/, /se/, /tʃi/, /tʃe/, /vi/, /ve/, /li/, /le/).

The distinction of persons is thus based on vowels in verbs and on consonants in pronouns. This can be viewed as an imagic diagram because the phonological relationship between opening and closure ([vowel] : [consonant]) is an appropriate image for the ontological relationship between relations and entities ({verbal} : {pronominal}):

$$\frac{[\text{-vowel}] : [\text{consonant-}] \quad \approx \quad \{\text{verbal}\} : \{\text{pronominal}\}}{\text{open} : \text{closed}}$$

This diagram is particularly clear among monophonemes, where all verbs are vowels (*ho* /ˈɔ/, *ha* /ˈa/, *è* /ˈɛ/) and all pronouns are consonants (*m'* /m/, *t'* /t/, *s'* /s/, *l'* /l/, *c'* /tʃ/, *v'* /v/)[vii]; so, in minimal phrases, the object is distinguished from the subject-in-action as a consonant is distinguished from a vowel (*l'ha* /ˈla/ 'it + he has', *l'è* /ˈlɛ/ 'it + he is', *m'hai* /ˈmai/ 'me + you have'). If one considers distinctive features, this diagram characterises the whole system of grammatical persons in Italian (see Figure 6). < p. 117 >
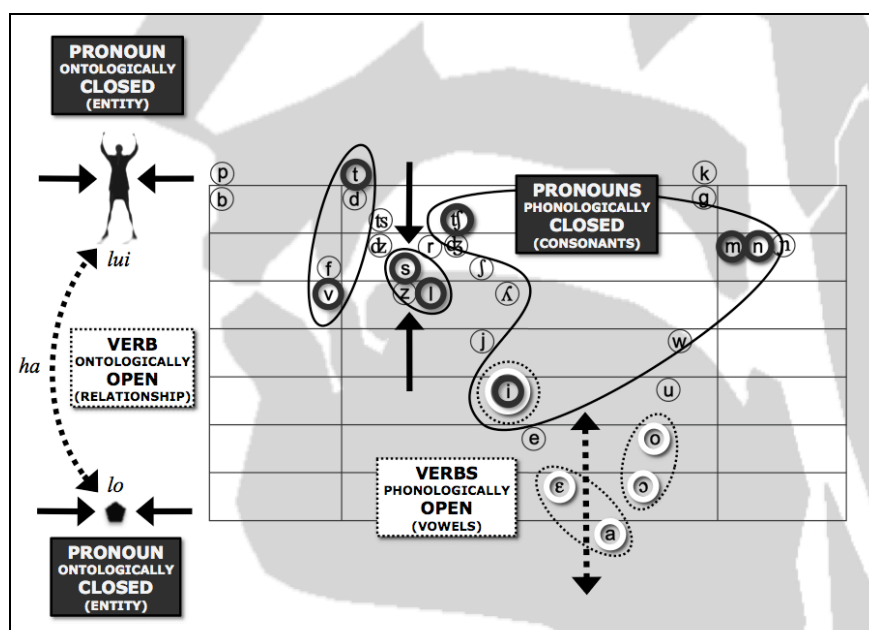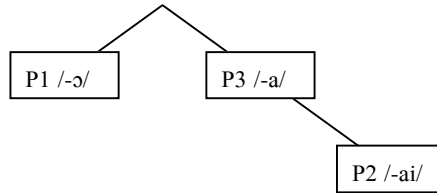

Figure 6. *Imagic diagram of the grammatical persons (I). The entities {pronouns} are closings [consonants] while the relationships {verbs} are openings [vowels].*

Besides, the diagram is an extension of the one we already observed in vowel monophonemes, where the motor pair [open : closed] distinguished the different degree of spatial and relational complexity of {verb : article}. Now the articles are replaced by pronouns and the closed vowels by consonants, but [open: closed] is still an imagic diagram of {more-relational : less-relational}. The exceptions (/io/, /son/ and /sɛi/) reflect the exceptional nature both of the locutor subject among pronouns and of copula among verbs: the person who is doing the action of speaking is distinguished by a (closed) vowel that approximates it to a verb, while the verb that predicates qualities, not actions, is distinguished by a (open) consonant which approximates it to a pronoun.

2.2.2 Subtypes differentiation

Considering the subtypes, one can observe that both in verbs and in pronouns, the phonological distinction of persons is governed by non-symmetrical patterns, and that these asymmetries reflect asymmetries of semantics.

2.2.2.1 Verbal persons asymmetry. In the phonology of verbs like *avere*, the first person {P1} /-ɔ/ is distinguished primarily from the third person {P3} /-a/, which <p. 118> is then distinguished, secondarily, from the second person {P2} /-ai/ by adding a phoneme, in accordance to the schema:

```
                    /\
                   /  \
        ┌─────────┐  ┌─────────┐
        │ P1 /-ɔ/ │  │ P3 /-a/ │
        └─────────┘  └────┬────┘
                          │\
                          │ \
                       ┌──────────┐
                       │ P2 /-ai/ │
                       └──────────┘
```

This asymmetry in the phonological differentiation of verbal persons seems to reflect an asymmetry in their logical-semantic differentiation. This is not only because, universally, the locutor, for himself, remains always {P1}, while others, for him, from time to time may become {P2} or {P3}, but also because in Italian, as remarked before, the morphological {P3} may mean, besides an impersonal (*ha tuonato* 'it thundered') and a semantic {P3} (*ha tuonato* 'he thundered'), even a courtesy semantic {P2} (*ha tuonato* 'you thundered'), so it can be opposed to {P1} as a generic {not-I : I}.

2.2.2.2 Pronominal persons asymmetry. In the phonology of pronouns, only the first person distinguishes, by the initial phoneme, the singular subject (/'io/), the plural subject (/'noi/), the singular object (/mi, me, 'me/) and the plural object (/tʃi, tʃe/). The second person radically distinguishes only the singular (/'tu, ti, te, 'te/) and the plural (/'voi, vi, ve/) while the third person does not distinguish by the first phoneme singular from plural nor subject from object (/'lui, 'lɛi/; /'lor/; /lo, la/; /li, le/)[viii]. So pronominal persons are asymmetrically differentiated in accordance to Table 4.

Table 4. *Asymmetrical differentiation of pronominal persons.*

	Singular Subject	Singular Object	Plural Subject	Plural Object
P1	/'i-/	/m-/	/n-/	/tʃ-/
P2	/t-/		/v-/	
P3		/l-/		

This asymmetry in the phonological differentiation of pronominal persons seems to reflect an asymmetry in their logical-semantic differentiation. Indeed, if P3 is the <p. 119> only one which expresses singular and plural by the same initial phoneme (/l-/), it is also because its plural is the only one which can be obtained by multiplying singular (a genuine plural: {P6} *lor* = {P3} *lui* + {P3} *lui*). Conversely, if the first and second persons distinguish singular and plural by different initial phonemes, it is also because their plurals are obtained by the addition of other persons (hybrid plurals: {P4} *noi* = {P1 *io* + P2 *tu*} or {P1 *io* + P3 *lui*} or {P1 *io* + P2 *tu* + P3 *lui*}; {P5} *voi* = {P2 *tu* + P2 *tu*} or {P2 *tu* + P3 *lui*}). Also, if the first person is the only one distinguishing by

the initial phoneme subject from object, it is also because, from the point of view of the locutor, the grammatical subject of {P1} is the only one referring to an actual, ontological Subject (i.e. the subject of the speech act and of the perception of the world), and, as such, it is radically distinct from the grammatical object. Conversely, if the second and third persons do not distinguish the subject from the object by the first phoneme, it is also because, for the locutor, the grammatical subjects of {P2} and {P3} are just ontological Objects (i.e. objects of his speech act and perception), and as such are not radically distinguished from their grammatical object.

2.2.3 *Persons differentiation*

Considering the single persons, one can observe that, in all subsystems and subtypes, their phonological differentiation is isomorphic to their logical-semantic differentiation (see Figure 7).
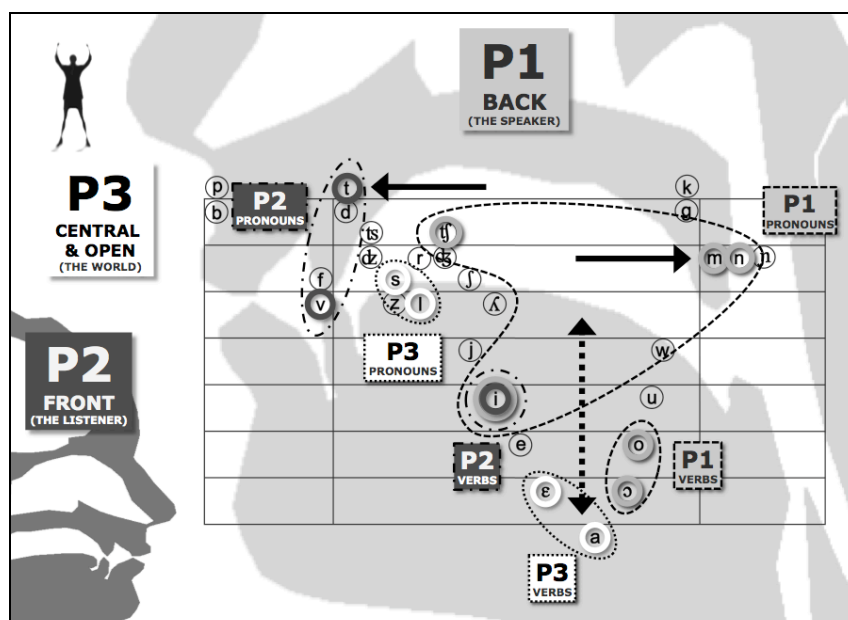

Figure 7. *Imagic diagram of the grammatical persons (II). The speaker {P1} is [back], the listener {P2} is [front], the rest of the world {P3} is [central, open].*

< p. 120 > In fact, in each subsystem, the first person {P1} is distinguished by the most [back] and [grave] (usually also [labial]) articulations (verbs: /-o, -ɔ/; pronouns: /i-, m-, n-, tʃ-/), the second person {P2}, by the most [front] (usually also [closed] and [acute]) articulation (verbs: /-i/; pronouns: /t-, v-/), the third person {P3}, by the most [central] (and usually [open]) articulation (verbs: /-a/; pronouns: /l-, s-/). The phoneme /i/ distinguishes {P2} in the vowel subsystem of the verbs, with respect to which it is [front], while it distinguishes {P1} in the consonant subsystem of the pronouns, with respect to which it is [back].

The distribution of persons within the articulatory space, thus, for both verbs and pronouns, singulars and plurals, subjects and objects, may be regarded as an imagic diagram of their distribution within the speech act space. Indeed, the differential

relationship among the places of articulation [front : central-open : back] is concretely similar to the differential relationship among the places of the speech act {P2 : P3 : P1} since, from the point of view of the locutor, he himself {P1} always occupies the {back} region of his visual field, the allocutor {P2} normally occupies the {front} region, and the rest-of-the-world {P3}, distinctively occupies the elsewhere, that is it can be found not before or behind, but in the {aperture}.

Note that the hybrid plurals {P4} /n-, ʧ-/ and {P5} /v-/ (see above 2.2.2.2), while respecting the general distribution, tend to distinguish themselves from their singulars {P1} /i-, m-/ and {P2} /t-/ by a greater proximity to the hybridizing persons, of which they incorporate some phono-articulatory features: /n-/ includes the alveodental articulation place of {P2} /t-/ and {P3} /l-/; /ʧ-/ almost entirely includes the phonological features of {P2} /t-/ and {P3} /s-/; /v-/ include the sonority and aperture features that characterize {P3} /l-/.

2.3 System of adverbs

The system of adverbs involves 23 forms, traditionally classed in 8 categories, which one can group in 3 types (see Table 5): (I) the spatial adverbs, including adverbs of general place (1 - *lì* /'li/ 'there [punctual]'; *là* /'la/ 'there [areal]'; *qui* /'kwi/ 'here [punctual]'; *qua* /'kwa/ 'here [areal]'; *via* /'via/ 'away'), vertical place (2 - *su* /'su/ 'up'; *giù* /'ʤu/ 'down') and pronominal or vectorial place (3 - *ci, ce* /ʧi, ʧe/ 'to there [standard spoken]'; *vi, ve* /vi, ve/ 'to there [formal written]'; *ne* /ne/ 'from there'); (II) the non-spatial adverbs, including adverbs of time (4 - *poi* /'poi/ 'then'; *già* /'ʤa/ 'already'; *mai* /mai/ 'never'), quantity (5 - *più* /'pju/ 'more'; *men* /men/ 'less'; *[un] po'* /um'pɔ/ 'a bit') and manner (6 - *ben* /'bɛn/ 'well'; *mal* /mal/ 'badly'); (III) the holophrastic adverbs (7 - *sì* /'si/ 'yes'; *no* /nɔ/ 'no') and the negation (8 - *non* /non/ 'not'). Every category except negation distinguishes at least a pair of contrary < p. 121 > semantic values describable as a {positive-convex : negative-concave} opposition; some constitutes a triad with an asymmetrical element.

2.3.1 Types differentiation
The three types of adverbs can be distinguished phonologically by the way they distinguish their own pairs of semantic values.

The adverbs of place tend to distinguish their semantic values by symmetrical pairs sharing final vowels and opposing initial oral consonants (*lì : qui; là : qua; su : giù; ci : vi; ce : ve*); when a third asymmetrical value appears, it gives rise to partial exceptions (*via* shares its /-i-/ with *qui, lì* and its /-a/ with *qua, là*; *ne* shares /-e/ only with *ce, ve*).

The adverbs of time, quantity and manner tend to distinguish their semantic values by asymmetrical pairs sharing the (labial) place of articulation and opposing the (post-velar) nasal switch of the initial consonants (*poi : mai; più : men; ben : mal*); when a third value appears (*già, un po'*), it gives rise to partial exceptions (*già* has a

prepalatal initial consonant /ʤ/ but this is realized with a labial redundant feature; *un po'* /umpɔ/ contains both oral and nasal labial consonants).

The holophrastic adverbs distinguish their semantic values by both initial [oral : nasal] (but not labial) consonants (*s-* : *n-*) and final [front : back] vowels (*-i* : *-o*).
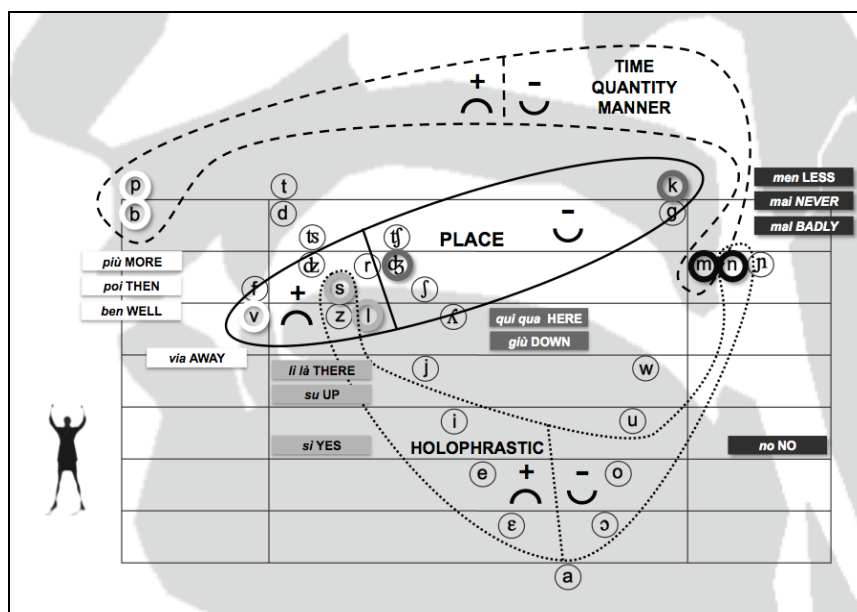

Figure 8. *Imagic diagram of adverbs. Places are tongue positions within the oral space; times, quantities and manners are gestures of the lips and velum on the boundaries of that space; {positive} values are [front], {negative} are [back] (exceptions are omitted).*

< p. 122 > So the initial consonants play a crucial role (see Figure 8): the adverbs of place are mostly distinguished by tongue positions within the oral cavity (/l-/, /s-/, /ʤ-/, /tʃ-/, /k-/; except for /v-/ and /n-/) while the adverbs of time, quantity and manner are mostly distinguished by labial or nasal articulations, beyond or before the oral cavity (/p-, b-, m-/; except for /ʤ-/). This can be viewed as an imagic diagram because the oral cavity is an appropriate image to represent the speech act space (see already above 2.2.3) in opposition with its own borders and nasal cavity which represent other, non-spatial dimensions.

The exceptions are meaningful. Among the adverbs of place, non-lingual articulations characterize the labial *via* 'away' (beyond the oral cavity) and the nasal *ne* 'from there' (before the oral cavity), the meanings of which justify their phonological eccentricity. Besides, the only non-spatial adverb articulated inside the oral cavity is the perfective *già* 'already', the more present and less virtual value among the adverbs of time. These exceptions indirectly confirm thus that the oral cavity tends to be employed as an image of the speech act space.

2.3.2 Categories differentiation
Among the adverbs of place, categories are distinguished by vowels. Adverbs of general place exclusively employ central vowel /a/ (*via, là, qua*) and stressed front

vowel /'i/ (*via, lì, qui*), adverbs of vertical place exclusively employ stressed back vowel /'u/ (*su, giù*) and adverbs of vectorial place exclusively employ unstressed front vowels /e/ (*ve, ce, ne*) and /i/ (*vi, ci*).

Among the adverbs of time, quantity and manner, categories are distinguished more weakly. Adverbs of time have the only pair of descending diphthongs (*poi, mai*) but they can also have a simple vowel (*già*). Adverbs of manner exclusively employ voiced consonants and have closed syllables (*ben, mal*) but they are not the only ones (*men*). Adverbs of quantity create partially palindromic structures with labial (*più*) and nasal features (*men*).

2.3.3 Semantic values differentiation

Every {positive-convex : negative-concave} logical-semantic opposition correspond to a [front acute : back grave] phono-articulatory opposition between initial consonants (see Figure 8 and Table 5). So the whole system of adverbs is structured in accordance with the sensorimotor polarities we already found in grammatical persons (concerning type I) and vowel monophonemes (concerning types II and III). In several cases (categories 1, 3, 4, 5) a third value is opposed consistently to the main pair in different, asymmetric ways. In one case (negation) the value is unique and it is opposed to its own absence. < p. 123 >

Table 5. *Phonosemantic differentiation of the adverbs*

			SEMANTIC VALUE				
			{++}	{+}	{0}	{-}	{--}
I	1	GENERAL PLACE	*via* /'via/ 'away'	*lì, là* /'li 'la/ 'there'		*qui, qua* /'kwi 'kwa/ 'here'	
	2	VERTICAL PLACE		*su* /'su/ 'up'	*giù* /'ʤu/ 'down'		
	3	VECTORIAL PLACE	*vi, ve* /vi, ve/ '(to) thr' (formal)		*ci, ce* /tʃi, tʃe/ '(to) thr' (informal)		*ne* /ne/ 'from there'
II	4	TIME	*poi* /'pɔi/ 'then'		*già* /'ʤa/ 'already'		*mai* /'mai/ 'never'
	5	QUANTITY	*più* /'pju/ 'more'		*(un) po'* /um'pɔ/ 'a bit'		*men* /'men/ 'less'
	6	MANNER	*ben* /'bɛn/ 'well'				*mal* /'mal/ 'badly'
III	7	HOLOPHRASTIC		*sì* /'si/ 'yes'			*no* /'nɔ/ 'no'
	8	NEGATION					*non* /non/ 'not'
			[external]	[front]	[center]	[back]	[internal]

PHONOLOGICAL VALUE
(place of articulation of the initial consonant)

2.3.3.1 General place (qui, qua, lì, là, via) The velar plosive consonant /k-/, having a more [closed] and [back] articulation inside the locutor's mouth, distinguishes the place *qui, qua* {near to the locutor}; the alveolar lateral approximant /l-/, having a more [open] and [front] articulation, distinguishes the place *lì, là* {far from the locutor}; the labiodental fricative /v-/ having an [external] articulation on the locutor's lips, distinguishes the place *via* {away}; this diagram is very similar to the diagram of persons (see above 2.2.3 and Figure 7). Moreover, the [front, closed] vowel /-i/, articulated at a small distance from the palate, distinguishes the precision degree *qui, lì* {punctual} while the < p. 124 > [central, open] vowel /a/, articulated at a great distance from the palate, distinguishes the precision degree *qua, là* {areal}; this diagram is similar to the diagram of the verbs and pronouns (see 2.2.1 and Figure 6).

2.3.3.2 Vertical place (su, giù) The phono-articulatory opposition between /s-/ [open, front, acute] and /ʤ-/ [closed, back, grave] can be regarded as an imagic diagram of the logical-semantic opposition between {up} and {down}, because in the common sense

the most important prototypes of {up} and {down}, are often distinguished in this way. For example, the air and sky {up} are typically more {open} than the ground and earth {down}, the hands and mouth {up} are more {open} and {front} than feet and anus {down}, the calls of animals living {up} are more {acute} than calls of animals living {down} (because their bodies and resonance cases are on average smaller). Moreover, the proprioception of more [acute] sounds (called indeed 'high') mostly involves regions of the body located {up}, like the head, while more grave sounds (indeed known as 'low'), mostly involve regions located {down}, like the belly.

2.3.3.3 Vectorial place (ci, ce, vi, ve, ne) The phono-articulatory opposition between /ʧ/ (or /v-/) [front, acute; single place of articulation] and /n-/ [back, grave; double place of articulation] can be regarded as an imagic diagram of the logical-semantic opposition between {positive, unitive} and {negative, separative}; this is similar to the diagram of monophonemes (see 2.1.2.2).

2.3.3.4 Time (poi, già, mai) The phono-articulatory opposition between /p-/ [front, acute] and /ʤ-/ [back, grave], can be regarded as an imagic diagram of the logical-semantic opposition between {future} and {past}, because in the walking experience future is typically before, while the past is behind (see above 2.3.3.1 and 2.2.3; as well as Lakoff and Johnson 2003: 41-43). Moreover, the phono-articulatory opposition between /p-, ʤ-/ [oral front] and /m-/ [nasal back] can be regarded as an imagic diagram of the logical-semantic opposition between {positive : negative}, in accordance with previous diagrams (see 2.1.2.2 and 2.3.3.3; as well as Lakoff and Johnson 2003: 147).

2.3.3.5 Quantity (più, men[ix], un po') The phono-articulatory opposition between /p-/ [front acute] and /m-/ [back grave], can be interpreted as an imagic diagram of the logical-semantic opposition between {more} and {less}, in accordance with previous diagrams concerning {positive : negative} oppositions (see 2.1.2.2). < p. 125 > Moreover, the intermediate phonological position of the consonant cluster /-mp-/ with respect to initial consonants /p-/ and /m-/ (generated by the fact that the adverb *po'* need an article) can be viewed as an image of the intermediate semantic position of *un po'* {a bit} with respect to *più* {more} and *men* {less} (see above the case of /a/, 2.1.1.4).

2.3.3.6 Manner (ben, mal) The phono-articulatory opposition between /p-/ [front, acute; single place] and /m-/ [back, grave; double place] to signify the logical-semantic opposition between {well} and {badly} is another special case of the general diagram [front acute : back grave] = {positive : negative} (see 2.1.2.2).

2.3.3.7 Holophrastic (sì, no) The phono-articulatory opposition between both /s-, -i/ [front, acute; single place] and /n-, -o/ [back, grave; double place], to signify the logical-semantic opposition between {affirmative} and {negative} is another special case of the general diagram [front acute : back grave] = {positive : negative} (see 2.1.2.2).

2.3.3.8 Negation (non) The phono-articulatory value /non/ can be considered an imagic diagram of the semantic value {negation}, as opposed to its absence, because it involves some of the most [back grave] elements of the Italian phonological system.

3.   Conclusion

The systematic analysis of the vowel monophonemes, of the grammatical persons and of the adverbs of the Italian language highlights a strong tendency to isomorphism between the system of phono-articulatory differences and the system of logical-semantic differences, such that the first appears to be in many cases describable as an imagic diagram of the second. In particular, the [open : closed] phonological pair tends to constitute an imagic diagram of several {complex : simple} semantic pairs, such as {more-relational : less-relational}, {action : object} and {areal : punctual}; while the [front : back] phonological pair tends to constitute an imagic diagram of several {positive : negative} semantic pairs, such as {definite : indefinite}, {plural : singular}, {unitive : separative}, {convex : concave}, {P3 : P1}, {far : near}, {future : past}, {more : less}, {well : badly}.

This result, which has been built in a neo-Saussurean perspective, seems to be consistent with the framework outlined by the mirror system hypothesis, in particular regarding the centrality of the motor patterns and the gestural-mimetic origin of language. On the one hand, indeed, the mirror system hypothesis can explain how the articulatory diagrams can be transmitted to the cognitive system of the listener, since < p. 126 > it provides mirror neurons able to reproduce the motor pattern of other's actions from noise that it produces (Kohler et al. 2002; Fadiga et al. 2002; Rizzolatti and Craighero 2007, citing Liberman and Mattingly 1985). On the other hand, all the evidence brought to light by the mirror system hypothesis about the neurophysiologic and evolutionary contiguity between gestural mimicry and language articulation may receive a more economical explanation. Not only can one say that, in phylogenesis, a mimetic system of gestural communication would have preceded and originated the verbal communication system in use today, but also that, in ontogenesis and psychogenesis, this would continue to operate, at least in part, as a gestural and imitative system for the unconscious differentiation of the percept (see already Fónagy 2001: 347 about this).

The results of the research thus seem to falsify Hurford's prediction (2004), in accordance to which the mirror system hypothesis should not explain the efficiency with which the child acquires the semantic distinctions by means of the phonetic ones. In the light of the foregoing, indeed, the child's cognitive efficiency seems to be explicable as an effect of the isomorphism between the differential systems of signifiers and signifieds. In other terms, the acquisition of semantic distinctions would be made easier by the acquisition of the phonetic distinctions, because the latter provide a diagram of the former. That is all the more so if the logical-semantic distinctions between concepts are embodied in their turn in sensorimotor patterns, as Gallese and Lakoff claim (2005). In this case, indeed, the tendency to isomorphism that we found between phono-articulatory space and logical-semantic space, would result in a tendency to isomorphism between two types of sensorimotor patterns (e.g.,

paraphrasing Gentilucci 2008, between the pattern governing the opening of the oral cavity, connected to /a/, and the pattern governing the opening of the hollow of the hand, connected to *ha* 'has').

It is to be observed, however, that the Gallese's and Lakoff's 'concepts' cannot be identified with the linguistic 'values' so far treated. While the former, indeed, are positive images of the signified things, the latter are negative images of their differences. One emphasizing the identity of things, to which languages refer by different means, and the other the diversity of means, by which languages refer to the same things. From the perspective of a neo-Saussurean linguistics, only the 'values' belong properly to *langue*, and therefore to linguistics: the 'concepts' are extra-linguistic realities, pertaining to psychology. The evidence for this is that while the 'values', as differential systems of signifier and signified, necessarily differ for each language, the 'concepts', as mental images of things or actions, do not necessarily differ. One thus belongs, the other does not belong to *langue*. And *langue* consists only of 'values'. But how, then, are the linguistic 'values' able to refer to psychological 'concepts'?

An example will clarify this. In Hauck's et al. (2004) experiment, the reading of action verbs related to the hands, feet or face, activates in the brain the motor neurons corresponding to the muscles of the hands, feet and face, somotopically, that is in accordance with the map of the body existing at the surface of the brain, called < p. 127 > the *homunculus*. The 'concept' of each of these action verbs is therefore embodied, *inter alia*, in the sensorimotor pattern that allows them to be performed. Moreover, that 'concept' lies in a system of topological relationships with sensorimotor patterns of other actions, a system represented by the cortical image of the *homunculus*. Now, among the examples proposed by Hauck et al., a prominent position is occupied by a *paronomasia*, chosen in order to minimize the interference of the articulatory movement with the activation of the motor neurons due to concepts: *kick, pick, lick*. The reading of these three verbs activates sensorimotor patterns involving respectively the feet, hands and tongue of the *homunculus*. This *paronomasia* can illustrate the way in which one can think that 'values' refer to 'concepts'.

In fact, if one looks at the phonological dimension, *kick* is distinguished by a [voiceless, velar, plosive] initial consonant, *pick* by a [voiceless, labial, plosive], *lick* by a [voiced, lateral, approximant]. So *kick* and *pick* are phonologically a pair of opposites, distinguished only by the place of articulation, while *lick* is an asymmetrical element, distinguished as such by the manner of articulation and voicing. But this can be regarded as a diagram of the fact that feet and hands are symmetric to each other, while the tongue is not. Moreover, if one goes into detail, one also sees that *kick* is opposed to *pick* as a [back] to a [front] articulation place. If it was accompanied by other analogous oppositions in English (e.g. *go : bow*) this opposition could be regarded as an image of the difference between an action performed with the feet, located at the bottom or back of the body, and an action made with the hands, located on the top and front. Between these two polarities, *lick* occupies an intermediate place, since the tongue can be considered neither as front as the hands are nor as back as the feet are. Moreover, it is distinguished by other significant traits of /l-/, which is the only [voiced] consonant in this group (the relationship with voice distinguishes the tongue from hands and feet) and the only phoneme mobilizing the sides of the tongue itself. So, while the 'concepts'

of *kick, pick* and *lick* are embodied in sensorimotor patterns implying feet, hands and tongue, the 'values' of /k-/, /p-/ and /l-/ seem to refer to these concepts in this way: they distinguish their relative positions within the oral cavity, such as the relative positions of sensorimotor patterns identifying concepts are distinguished within the body.

One could object that, while the 'sensorimotor concepts' are probably similar in different languages, the linguistic values that distinguish them are dissimilar enough to falsify the above. For example, some languages may distinguish hands from feet, not by the phonological opposition [front : back] which depicts their locations, but by the phonological opposition [back : front] which does not. Here one may respond that, even if the 'sensorimotor concepts' of the hands and feet do not change, the 'semantic values' that distinguish them from other concepts may change, and this may justify such a change in the phonological value. For example, hands can be distinguished from feet not only as {upper/front : lower/back} limbs, but also as {grasping/pulling : carrying/pushing} limbs. The first pair of semantic values is adequately depicted by the phonological diagram [front : back], the second pair, by < p. 128 > the phonological diagram [back : front]. This answer is correct. But it gives rise to the counter-argument that [front : back] may therefore depict simultaneously a thing and its opposite, which is a contradiction in terms: thus it would not depict anything.

One can answer to this counter-argument that the simultaneity and contradiction exist only in the cognitive domain of the Observer (an epistemological Third Person listening to others' utterances), not in the cognitive domain of the Locutor (an epistemological First Person producing its own utterances), and that the cognitive domain of the Observer is inappropriate to understand the object (i.e. the relationship between phonological and semantic values). On the one hand, indeed, only the Observer has a simultaneous cognition of several languages, from the comparison of which the contradictions emerge: the Locutor has cognition only of the language he is speaking, the use of which shows no contradictions. On the other hand, only the Locutor has a simultaneous cognition of both the phonological and semantic systems of the language he speaks, while the Observer has cognition only of the phonological systems of the languages he observes, since, in most cases, he tends to infer their semantic systems by analogy to the one of his mother tongue (see Proverbio et al. 2008). It follows that the Observer's cognitive domain includes several phonologies inconsistent with its semantics: the Observer does not understand the relationship between sound and sense and feels it is arbitrary. Conversely, the Locutor's cognitive domain usually includes one phonology consistent with its' semantics: the Locutor understands the relationship between sound and sense and feels it is natural. It should be added, however, that the Observer is always also a Locutor, and can therefore understand the cognitive perspective of the latter, while the reverse is not always true.

If one intends to study language as an activity of the human body, not only as the product of that activity, it is necessary to distinguish the cognitive domains of the Locutor and Observer, and assume the perspective of the former. Although in the Observer's cognitive domain languages seem to make an arbitrary use of the phonological values, in the Locutor's cognitive domain phonological values exhibit a tendency to specialize themselves in a few semantically coherent distinctions, so that, as a whole, the differential system of sounds of a language can be described as an image of the differential system of its meanings.

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NOTES

[i] This chapter summarizes Nobile 2003; see also Nobile 2008.

[ii] P1, P2, P3, P4, P5, P6 mean first, second, third, fourth, fifth, sixth person.

[iii] This chapter summarizes Nobile 2011.

[iv] *Son* is a literary and somewhere popular form with apocope of the more standard (but disyllabic) *sono*.

[v] *Fo* and *vo* are literary and somehow popular short forms of the more standard (but disyllabic) *faccio* and *vado*.

[vi] *Lor* is a literary form with apocope for the more standard (but disyllabic) *loro*.

[vii] These are forms with elision of the pronouns *mi, ti, si, lo, la, ci, vi* before words starting with a vowel.

[viii] Although, among the objects, P3 distinguishes the reflective (/si, se/) and the masculine dative (/ʎi/). For reasons of simplicity here we overlook these two cases.

[ix] *Men, ben, mal* are forms with apocope of the more standard (but disyllabic) *meno, bene, male*.