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Language, Sign, and Representation. An Answer to Stewart, Laurent, Reboul, and Palma

> *'[…] Most of those wishing for a false document intend that their own photograph shall be on the document, but with the personal details falsified. But to devise a new photograph which does not even look like you as you now appear, this complicates things.'*
> *He drank off half of his beer, still eyeing the Englishman opposite him. 'To achieve this it will be necessary to seek out a man of the approximate age of the bearer of the cards, and who also bears a reasonable similarity to yourself, at least as far as the head and face is concerned, and cut his hair to the length you require. Then a photograph of this man would be put on to the cards. From that point on it would be up to you to model your subsequent disguise on this man's true appearance, rather than the reverse. You follow me?'*
>
> Frederick Forsyth, The Day of the Jackal

First of all, I desire to thank the authors of the commentaries on my paper[1]. I think that these commentaries have been very useful in order to clarify and better stress some important points of this difficult subject.

Before I enter directly into the main questions raised by my critics, I wish to synthesize in few words my main theses. This may be useful for all the various aspects of the discussion. I may resume my positions in the following 7 points:

(1) Intentionality as such is void of representational contents. Intentionality is an act through which we establish some connection with a referent to which a representational content may then be eventually attached. Intentional acts in their most evident character are, for instance, to search for an object that could explain the

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[1] G. Auletta (2002). Is representation characterized by intrinsity and causality? *Intellectica*, 35, 83-113.

behaviour of physical systems without knowing exactly what it is; or to speak about and seek to find an unknown person (only her or his name is known or, for instance in criminal affairs, only the fact that she or he killed someone is known), etc.

(2) A representation is a structure that as such is independent from the represented thing. There is no analogy or resemblance or causal relationship that connects "representation" and "represented thing or event" in any way.

(3) The connection between represented thing and representation is a problem of interpretation (we interpret the x that is the referent of the intentional act as the represented thing, i.e. the subject S that has properties P and P'). Then this connection is eventually fixed and selected in the course of evolution or of personal experience.

(4) There is no distinction between internal and external representations. Language is both internal and external and one should not separate these two dimensions.

(5) Representing is a reversible operation due to its intrinsic dynamicity, that is, even if in a certain context x is a representation of y, in another context it may happen that y is a representation of x.

(6) Anything can serve as representation: There are in principle no limitations on the nature and character of the representational medium. It is only a matter of use, context, and conventions.

(7) Language is a particular case of general semiotics. Also dreams are subjected to syntactic manipulations. On the other hand, language throws light on what a representation really is (especially on the fact that it is not a reproduction of the represented thing).

I think that **John Stewart**'s contribution raises two important questions: The relationship between semantics and syntax and the problem of the internal representations.

Let us first consider the problem of the relationship between semantics and syntax. Traditionally, it was always supposed that syntax was a blind manipulation of symbols, whereas semantics has to do with the objects, which a syntactic string may be referred to, and therefore to the 'contents'. I think that it is time to try and think about this relationship in different terms. It is well known that there cannot be a single semantic interpretation of a syntactic structure. This is a consequence of the Löwenheim-Skolem theorem that was pointed out by Putnam (1980; see also Lakoff, 1987: 229-59), and raises a lot of difficulties if one assumes that the connection with meaning must come from a semantic relationship with possible referents. In my opinion, the connection with possible referents of a given syntactic structure has nothing to do with meaning or contents. As regards mental operations, the referential or the intentional act points, in its pure function, to a something, to an undetermined x, and, for this reason, is best expressed by ostensive and indexical

forms of relationships with a referent. I have stressed (Auletta, 2003) that, in order to catch this referential act in its purity, one should consider, in particular, the perception and execution of motion – Llinàs (2001) stresses this connection throughout his book. In this case, we do not often have the time to represent the referent explicitly - for example it may be perceived as a spot that runs from the left of our visual field to the right (see also Merleau-Ponty, 1945: 318). Another example stems from scientific activity. It is very often the case that a scholar knows very well that there is a "something" that may explain an anomalous behaviour of a given system but she or he is not able to specify its nature until she or he has found it (it is also very common that the properties that are then ascertained are very surprising and unforeseen). Another example comes from robotics: Brooks (1986; 1990) has clearly shown that one may build robots that are responsive to environmental tasks without a direct representation of the objects.

Then, one could say that representations, at least internal representations, are not necessary. However, representations are needed for predicting situations: It is impossible to anticipate a situation without an internal representation of what is to come (Llinàs, 2001: 23-24). Moreover, reaching movements cannot be carried out as a series of sequential steps: They present a hierarchical structure that involves representation (Jeannerod, 1991). For instance, in order for a hand to be transported to a visual target located outside the body, its position with respect to the other body parts must be represented. This is the function of the proprioceptive map, which must be kept distinct from the visuomotor map (that encodes target position in body-centred coordinates). The visual and proprioceptive maps jointly project to another part of the hierarchical structure, where the goal of the action of reaching is defined. In my opinion, this could not be achieved without a form of representation. It has also been shown (Perner, 1991) that a mature (5-year-old) child is characterized by the use of a representational theory of mind, where desires and beliefs are dependent on a target only indirectly, i.e. through a representation of it, and this in contrast with younger children, who have a causalistic, direct understanding of beliefs and desires (the mere presence of the target directly determines the related states of mind).

In conclusion, representations are important but they are not necessarily needed by intentionality or referential acts, which as such are devoid of representational content – it may be interesting to observe that Merleau-Ponty (1945: 36-40) speaks of a "void intention" referring to attention, and I have (Auletta, 2003) stressed the close relationship between intentionality and attention. These contents, i.e. the possible specifications that I attach to a given referent, come from the autonomous activity of the cognitive subject, that, independently from possible referents, produce such

representations. This could be called the representational (i.e. syntactic, if one wants) side of the relationship to a given referent. In this context, I also wish to recall that Paillard (1991b) distinguishes between a sensorimotor mode and a representational mode, which could correspond to my distinction between referential (or intentional) activity and representing. Finally, the meaning can only be found in the relationship between the referential and representational sides of the semiotic relation to a given object, i.e. in the interpretation according to which I attribute these and those properties to a given referent. For this reason, I stressed that it is only the intentional act that distinguishes a dream from a "suitable" representation (see also Llinàs, 2001: 6-8, 42-44).

In other words, any semantics is always contextual to a given pragmatics and this is the reason why there cannot be a single interpretation of any sequence of characters or of any syntactic structure. Summing up, a dividing line may be traced between contents without reference and reference without contents. For the mind and the brain, representational contents are "internally" produced, whereas their being referred to a thing and therefore also their connection with sensory stimulations, is a problem of intentional, goal-directed exploration of the environment (see also Llinàs, 2001: 12).

Concerning the second problem, i.e. the question of the internal representations, John Stewart rightly says that, in the computational perspective, the task of a subject is to find an appropriate representation of a given object. I think that computationalists implicitly assume that a given representation should somehow reproduce the object. However, since the cognitive subject has only access to his own representations, it seems that we are moving round in a never ending circle. As I have said, a representation (internal or external does not matter) has nothing to do with a given referent apart from the referential act that connects it to the latter: Representations are produced spontaneously by the subject and only thereafter used and tuned according to the practical feedback (see also Freeman, 2002). On the other hand, since referential acts are not dependent on representations (at least in principle: in most actual situations they do depend on representations because any organism takes advantage of its memory of past situations and so automatically associates a given representation or a given scheme to a given referent), the cognitive subject does not need another subject in order to establish this relationship. It is simply a relationship between two different systems of the mind and of the brain.

About the problem of internal/external representations, an interesting way to see the problem is by considering fast mapping (Bloom, 2000: 33-34): Children show a surprising ability to retain the meaning of words after just a single exposure, and this retention

can persist even in the long term. Now it has been experimentally shown that children do not use the mechanism of fast mapping when properties of objects are easily and visibly accessed, i.e. when they are understood in terms of information stored in the world. This shows that children (humans) use the world as a cognitive map and this supports the idea that there is no distinction in principle between external and internal representation - see also the evidence worked out by Hutchins (1995) and described in my paper. On the other hand, it is clear that mental representations must derive from neural and biological structures that may be taken as signs of something else. Also a spot or a specific plumage may be taken as signs of a great reproductive talent and therefore may allow for mating. Another, more striking, example is given by all sorts of biological clocks and biophysical oscillations as representations of time (Gallistel, 1990: 221-41): this is a universal feature that can be found in virtually all living forms (including bacteria). Two things, in my opinion, are here relevant: That in each living being there are several oscillations with widely different periods, which range from fraction of seconds to years (otherwise time could not be represented), and that these forms of time representation are in general not driven by external rhythmic stimuli, though they respond to certain periodically recurring extrinsic events in such a way as to maintain a fixed phase relationship between internal and external cycle. Thus, any internal cycle is phase dependent on an external cycle (without necessarily having the same period); if this were not the case, internal oscillations could not be representations at all. The reason for the endogenous character of oscillation is that the oscillations set in motion by the occurrence of one thing would have to be kept distinct from the oscillations set in motion by the occurrence of any other thing, with the consequence that there would be an extraordinary number of event-labeled oscillations. This example is therefore interesting under two respects: first, because it shows that biological features can be representations; second, because it shows again that any representation is arbitrary relative to the represented thing (here the period, but also the phase referent is selected arbitrarily).

It is clear that the biological and (at least a part of) neural representations are not chosen. In fact, they are, at least partly, archaic forms of representation. But the important point here is that they represent something (for the female, for instance).

Moreover, I would like to stress that there are many cases in which we take external objects as representations of our internal representations. Apart from the psychological and psychoanalytical aspects of the phenomenon of projection, we project each time we are involved in motion. For this reason it is inescapable that we take the external objects to be charged with symbolic significance (Cassirer, 1923-29).

Stewart says that human language cannot be considered as a special case of semiosis due to the fact that it implies internal representations whereas non-linguistic signs are "always external". I do not think so. Any animal that has a complex representation of events must have internal representations. For instance, pigeons can categorize – and also produce concepts (see Herrnstein 1990). It is also well known that primates may use human languages like the American Sign Language (Gardner *et al.*, 1989; Fouts and Mills, 1997) or make use of artificial "lexigrams" (Rumbaugh, 1977; Savage-Rumbaugh, 1986: Savage-Rumbaugh *et al.*, 1998). This would be impossible if these animals did not already have a form of internal representation in the stage preceding the acquisition of linguistic forms of communication.

For all these reasons, I do not think that computationalism can represent a good solution to our problem. All the new tendencies in neurosciences and psychology go in the opposite direction by showing that the brain and the mind are active and intentional mechanisms and that therefore the main problem is not to elaborate some passively absorbed information from somewhere.

As regards **Éric Laurent**'s commentary, I have found a lot of suggestions. I only limit myself to some short remarks because I generally agree with what has been written by Laurent.

I am sure that affordances have to do with automatic processes that rule our activity in general. It is very important to stress that affordances are the measure of the feasibility of carrying out actions. Moreover, I think that intentionality becomes especially important when there is a conflict between this automatic mode of perception and the feedback we receive from the object and the environment. In this case, we are obliged to focus our attention on the referent of the action in order to receive some additional information that can enable us to substitute the false representation (schema) with a suitable one.

I also completely agree with Laurent that there can be interesting connections between the explanation of representation and intentionality that I have tried to offer and Berthoz's approach. I especially think about the fact that intentionality is projective like, according to Berthoz, the perception of motion is. Moreover, both Merleau-Ponty (1942; 1945: 110) and Berthoz (2000: 115-36) stress that movements are in general performed by starting from the end and not from the beginning of the action. This is the reason why, according to Berthoz, memory is useful especially for predicting.

Also Berthoz's (2000: 9-24) central idea, that perception is simulation of action and interrupted action, seems to me to be very consonant with my main thesis. Moreover, Berthoz (2000: 117-19) points out that topographic memory is a form of procedural memory because it involves a succession of places and relative movements:

This is consistent with my examination of the problem of maps (in section 4 of my paper).

Let us now consider **Anne Reboul**'s commentary. I have found a little bit surprising to see Reboul stressing that Dretske's notion of representation is based on the notion of function and this with the aim, at least so seems to me, to criticize my presentation of Dretske's positions. However, at the beginning of section 2 (titled *Dretske's analysis*), when I have presented Dretske's positions, I have stressed the centrality of the notion of function. At the beginning of section 4 I have also written: "Let us now examine Dretske's, Perner's, and Lloyd's positions. First, Dretske's definition of representation in terms of the function it plays, the fact that this function is strictly dependent on either a derived or an intrinsic intentionality, and that, like signs, representations also show a duality between reference and sense (way of representing), in my opinion, all these features are fundamental elements of any theory of representation". It suffices to do a rapid search to see that the word 'function' appears hundreds of times in my paper. So I cannot understand in what I may have mispresented Dretske's position about this point.

Moreover, in section 2 I have written: "It is clear here that a thing carrying meaning can act, in general, as a material thing and another material thing can react to the thing carrying meaning. However, what does the nexus between the material nature of a thing (and of causation) and its meaning consist of? It must be, as we have seen, a functional nexus. But how does this function come about?" This is my only question and I think that neither Dretske, nor Reboul give an answer to this problem. As Reboul admits, any functional relationship cannot establish [?!?], as such, an ontological nexus with the referent. In fact, I believe that any functional relationship presupposes an intentional or referential act that establishes this to be a representation of another thing. There cannot be, say, physical or chemical connections that can do this (and also having recourse to natural selection is of no help for this purpose: it can obviously explain *a posteriori* the genesis of a certain behaviour but not the reasons why and how a certain behaviour is the necessary condition for obtaining a certain result). However, since Dretske cannot completely agree with this explanation, and, it seems to me, that Reboul does not at all, they are both forced to have recourse to the causal relationship in order to connect referent and representation. This move is very interesting because both Dretske and Reboul agree that a causal relationship has nothing to do with representing as such. In fact Dretske says that it is not meaning itself which is a cause, but a thing's having meaning, or that the fact that a thing has meaning is a causally relevant fact about the thing. In order to know how a system is representing an object, one needs to know what its reaction to that object means, i.e. what value of the property *P* the

reaction is a reaction to when the system is functioning the way it was designed to function. And Reboul writes: "Indeed, according to Dretske, a representation represents an object (its reference) through a contextual relation, C. This contextual relation is external to the representation and is, indeed, the causal part of Dretske's account under the conditions indicated above (see the end of § 2)." When Reboul proposes again the relationship between a represented thing and a representation in causal terms, it seems to me that she has not sufficiently considered my (and Pylyshyn's) argument (presented in section 4), which I quote here: "[…] different representations or different mental states can be referred to the same state of affairs, and it is then difficult to explain how this state of affairs can cause, say, a mental state and eventually what mental state has been caused. For example, take some cars that stop at a red traffic light. The mental states of the drivers cannot be exactly the same … and also their specific perception of the traffic light cannot be exactly the same. This is true not only in interpretational terms but also with regard to the mere physical aspects of vision: They cannot see the traffic light in the same perspective nor receive exactly the same number of photons, and so on. […] A way out would be to say that … the differences are determined by the specific and antecedent mental state of any of the drivers, so that the same external state of affairs together with different internal conditions can produce different mental states. But this move is of no help. The point is that the same person could have been in a different position (occupied now by another driver) and nothing would have changed relative to the function of mentally representing the colour of the traffic light. In conclusion, there cannot be a causal chain of events (starting from the "external" event, i.e. the red light until the mind) that is capable of explaining such a situation". I think that supporters of a causal explanation of representation must be able to provide a convincing answer to this problem.

I have also been surprised that, once Reboul establishes that representing is a function (a point, as I have said, on which I agree), she springs to the following statements: "So, what is it that makes the notion of representation irreversible or causal for Dretske, given that covariation, though necessary for the system to perform its function, is in itself neither causal nor irreversible? It is quite simply the fact that the system has the function of representing certain properties of a domain of objects, while the objects in that domain do not have the function of representing the properties of states of the system. This, in effect, is what makes representation irreversible. It also is what makes it causal". I think that Reboul is moving round in a circle. In fact, I had precisely posed the problem of the reversibility of the representational relationship as a reason for rejecting the causal account of representing and the attribution to the latter of an ontological status. Reboul cannot now use the statement

of irreversibility as an argument for causality. I mean that she should have given specific reasons for this irreversibility. My only point is that Dretske's definition of representation is taken from Peirce's definition of sign (a connection between sense and referent). And it could not be otherwise, because any representation can be used as a sign of the represented thing and in general this is its function. Obviously, representation is a special type of sign, as I explained in my paper. However, signs are reversible. So the question is: What is special about representation that hinders this possibility? I think that one cannot find an answer to this question in Reboul's paper, though I had expected from a supporter of Dretske's thesis precisely this explanation.

However, one could again have recourse to a computational perspective and say that what is "special" about (mental) representations is that they are symbolic strings that are amenable to syntactical manipulation while their referents are not (a position that is probably shared by almost all my critics). I would retort that any thing may be syntactically manipulated. Interesting studies have pointed out that syntactical manipulation is not an isolated phenomenon, but one that runs in parallel with the combination of objects during the course of child development (Greenfield, 1991). For example, the sentence "want more apples" is an analogy of the so-called subassembly method. The problem is: Is there a homology (a common origin) beyond analogy? Experiments conducted by Grossman (quoted in Greenfield) showed that non-fluent aphasics were the least successful in recreating the hierarchical structure of a model under a memory condition. On the contrary, fluent or Wernicke's aphasics, who are affected by semantic emptiness but not by grammar deficits, can reproduce tree structures although not always correctly. Similar results have been found by using positron emission tomography (PET). It could be also possible that in the region of Broca's area there are two near but separate circuits, the one for language and the other for manual object combination. However, it is this area that creates specific circuits for the complex structures in language and manual action. On the other hand, the earliest meaningful words begin toward the end of the first year when children begin to combine two objects intentionally (pairing strategy). And similarly for the successive development. Other studies (Holloway, 1981; Corballis, 1991; Gibson, 1993) stress the interrelation between syntax, manual skills, and social division of labour. Typical of humans is the capacity to break words, perceptions, motor actions and concepts into small (meaningless) components and then combine and recombine these parts in higher order constructs in a recursive manner. In other words, humans are inherently constructional in nature. For this reason, social and technological intelligence are strictly interrelated because technology demands social division of labour and is fostered by it. Finally, social division of labour places

major demands on language and quantitative thoughts. Therefore, also language and technology are interdependent.

Let us now discuss more extensively the problem of reversibility. I wish first to introduce another example. Take an identikit of a criminal. In this case the police search for a person who is unknown and do this using a drawing. According to Reboul's theory this drawing should be a representation of the person. How is it possible if the drawer does not know this person? In reality it seems evident to me that it is the wanted person that is here taken as a representation of the identikit, and in fact the police use the identikit as a guideline for searching for someone who is unknown. Otherwise the theory of representation would be a complete nonsense theory. In fact, let us here apply Reboul's theory of causality. I cannot understand how an unknown person could be the cause of an identikit. Reboul could say that it is the real person (the criminal) who has caused a mental image in the witness that has then been transferred to an identikit by a third person, the drawer. However, as is well known, any witness does not have a mental "photo" of a person or of an event, but rather his or her mental representation of a person or of an event is mostly the result of an inference, i.e. it is a mental reconstruction. Now, in what sense could it be said that an identikit built according to this mental representation of the witness is a representation of another person? A perfect correspondence between the mental representation of the witness and the identikit may also be questioned. Then, it seems to me that we should apply here a tortuous theory of causality in order to take these problems into account, and also in this case I am not sure of the result.

Now, I wish to stress that the main difference between a drawing of a person used as a representation of this person and an identikit to look for a person is: In the first case we compare the drawing with the person with the aim of seeing if the representation is adequate or good. Suppose that we took several photos of a person (we are for example reporters). It is normal that we select among them the one or the ones that we think best represent this person (in a given situation). On the contrary, in the case of an identikit, we search for a correspondence to the identikit, i.e. we use the identikit as a tool for identifying someone by comparing several persons with the drawing.

Suppose also that I and another person have a rendezvous in an airport and we have never met before. The other person says to me: I am a tall Eurasian man with brown hair, and will have a copy of the *Financial Times* in my left hand. In this case how could my representation be a representation of someone I have never met? It is more like a guideline for searching for a person, i.e. a kind of original model relative to the person.

So far as I understand Reboul, I think that the main point of her (and Palma's) criticism is that, while a (mental) representation varies when the represented thing also varies, things do not vary when their

representations vary. This is to a certain extent a truism because it is absolutely true that a representation must somehow be referred to its represented thing. My only point is that this relationship may be reversed, and in this case the "thing" will be itself the representation and not the represented thing. However, there is an important aspect in this view of how representations work. In fact, I think that Reboul's (and Palma's) main idea is that representations are somehow mirrors, *phantasmata*, of things and in this sense their existence and nature is not autonomous whereas that of represented things is autonomous (and in this sense the difference between representations and represented things should be ontological and not functional, contrary to Reboul's own assertion). A picture, for instance, will always be dependent on the subject it portrays in the same way as a mental representation is dependent on the thing that caused it (in Reboul's sense). However, representations are not so passive and harmless. In fact, people use representations mainly with strategic, political intentions. It suffices to look at the use that is made of representations by politicians or showmen. They use the representations they create as means to alter the vision that opponents or the public may have of them, and, by doing so, they also alter the way they are (there is not a clear cut distinction between the way persons are and the way persons present and represent themselves). This is only a particular refinement in the use of representation, and this refinement has been brought to the extreme consequences in our time, dominated by mass media. However, this sort of use is very well known and applied by any child from the first months of life. In sum, we adapt ourselves to the representation of ourselves that we (and other persons) produce. Moreover, this is not a specifically human phenomenon. It is ubiquitous in nature, and can be found every time an animal tries to repel a rival or an enemy by "blowing up" (a, mostly hyper-charged, representation of its power) – nice examples for ants are provided by Hölldobler and Wilson (1994: 69-70) - or to attract a female by showing its skill.

I think then that the main problem in Reboul's position is to consider representations as static and complete structures that somehow "mirror" external reality - Merleau-Ponty spoke (1945: 11-17) in this case of a "hypothèse de constance". I think that any representation (and especially a mental representation) is essentially dynamical and incomplete. Any representation is not a statement about a known fact, it is rather a hint, a guideline for searching and acting. In the moment when I produce a representation of something, I use this representation in a practical way and search for possible feed- back. Once I receive further information, I modify and integrate my representation and begin a new action or a new search. As is evident from this circular activity, what we normally consider representations act in both ways: As models of something and as (in *stricto sensu*) representing something. We reach a representation of

something in the ordinary (Reboul's) sense, i.e. we fix a representation as a (official) representation, only after we have "gone" back and forth several times between the referent and our schema. It is this intrinsic dynamicity of representations, together with the arbitrary relationship they have with the represented thing, to be the ground for their reversibility.

Summing up, we cannot understand the role and the meaning of internal and external representations without starting from the intentional use of them by living beings: Life is as such goal-oriented (Llinàs 2001: 1-3).

Finally, I wish to say a few words on **Palma**'s commentary. Palma thinks that semiotics is dead. It suffices to know a little bit about current literature - for instance Deacon's book (1997), but see also Hailman (1977) and Hauser (1996) – to ascertain that semiotics is very much alive and, in particular, Peirce's work is. As the examples about language show – they are taken mostly by Chomsky (for instance Chomsky, 2000: 3-4) – Palma is persuaded that language is a completely different thing relative to representation and semiosis. It seems to me that Chomsky is always in the background of Palma's reflections. Obviously, it is not my intention to deny language's specificities (negation, and so on) and it is also not my paper's aim to show them. I wish only to deny that language can be so isolated from other cognitive (and therefore from general representational and intentional) functions of the mind. The insularity of language was in fact Chomsky's position, but before 1995. Chomsky changed two times his program, as he explicitly acknowledges (Chomsky, 2000: 3-19): In the middle of 1980s when he adopted the `Principles and Parameters' approach, and in the middle of 1990s when he adopted the theory of 'legibility conditions". The latter theory may be resumed by saying that language interacts with other mental systems, which impose cognitive conditions that language must satisfy if it is to be usable at all. For this reason, Chomsky (1995) now openly rejects the modular interpretation of language, as supported, for instance, by Fodor (1983). This change in Chomsky's position was prepared by a lot of studies, but I wish here in particular to quote the work of Pinker (1989), which offered a general solution of Baker's paradox (not all verbs showing a prepositional dative argument structure, as in "John gave a dish to Sam", may also have a double-object structure, as in "John gave Sam a dish", and it seems that the child has no way of knowing this, given the nonavailability of negative feedback): The paradox could be solved by allowing semantic constraints on lexical (transformation) rules. I also wish to quote Deane's work (1993), which showed that cognitive variables are in general relevant for syntactic phenomena. In particular, Deane pointed out that syntactic structures are metaphoric extensions of basic spatial schemata in the sense of Lakoff's (1987) spatialization-of-form hypothesis. Then, constituency

relationships are understood in terms of part-whole relationships while grammatical relations in terms of linkage relationships. However, one cannot interpret this hypothesis in the sense that grammatical processing involves an explicit spatial metaphor, but rather in the sense the same neural processing mechanism that is used for spatial representation is also used for grammatical processing. In this case, grammatical knowledge has no direct connection to spatial knowledge but there is notwithstanding a direct isomorphism between the two forms of knowledge. In this case both forms of knowledge may be innate but are not domain-specific in the sense of Fodor (1983). It is important to stress that Lakoff does not claim that metaphor requires objective similarities, but rather that it consists in the *construal* of the target domain in terms that assimilate it to the source. It is not the recognition of objective similarities but the construal of subjective similarities – which is in accord with the idea of similarity that I discussed in my paper on representation. This means that the neural structures, which are basic for both spatial experience and language, in themselves do not represent anything in particular. It is only their purposive use that confers to them the role of representing in a specific domain.

Given these results, it seems inescapable to understand semiotic processes as the context in which language is embedded: In fact, there is no cognitive process that does not show a symbolic and sign structure. It is interesting to observe in this context that Bloom (2000: 60-87) strictly connects word learning and a broadly understood theory of mind. Now, in my opinion, the fact that a child, when hearing a word, understands that this word refers to a thing by figuring out the intentional act of the speaker, is a clear evidence of the fact that language is embedded in semiotic processes because children understand (and could be not otherwise) these intentions of others through the signs that manifest them.

Moreover, while Chomsky (legitimately) reads the relationship between language and cognitive (and therefore representational) skills in structural terms, i.e. in terms of legibility conditions, it is also (legitimately) possible to understand their relationships in genetic, i.e. evolutionary, terms, as an emergence of language from semiotic and representational structures, which are widely used by all or almost all living beings – one of the most known examples is represented, for instance, by social insects. It is very interesting that, in the case of ants, an elementary syntax combining different chemical "words" (pheromones) for transmitting different "phrases", has been envisioned (see Hölldobler and Wilson, 1994: 46-47)

It is not fortuitous that recent research (Armstrong *et al.*, 1995; see also Corballis, 1991) has pointed out that language may be evolved from a gestural language, used by our ancestors before a full evolution of the vocal tract could be accomplished. Such a gestural

language, relative to our vocal language, is a different semiotic system that shares important features with our actual language and may to a certain extent parallelize it, for instance in the case of modern American Sign Language (ASL). It is also not fortuitous that ASL has been used as one of the most important vehicles for communicating with chimpanzees and for teaching to them a human form of communication (see Fouts, 1973; Fouts and Mills, 1997).

Obviously, language is not a "picture" of the world, as Palma stresses; but I think that representations are not either. I think that both words and representations (and signs in general) are characterized by an arbitrary relationship with the things they refer to, and to show this was the main aim of my paper.

As regards the problem of reversibility, it is clear that nobody uses language in the "reverse" mode. However, this has nothing to do with an impossibility in principle or with some basic feature that would distinguish language from other semiotic or representational systems. This has only to do with the fact that language is born as a communication tool for expressing intents, for representing things, events, and so on. In other words, it is only a matter of convention and nobody would consider something a language if it would not be the expression and representation medium for excellence.

I also add that reversibility is integral part of *the method* used in the research in animal language. In other words, in order to test if an animal is able to understand a symbol, one sees if it is able to see that the symbol stands for a referent and the referent for the symbol, i.e. that they are interchangeable – this is called the *equivalence paradigm* (Sidman and Tailby, 1982; Schusterman *et al.*, 1993). As is well known, equivalence is characterized by reflexivity, symmetry, and transitivity. My requirement of reversibility corresponds then to the symmetry condition. It is not fortuitous that the equivalence criterion is also used in order to test, in general, representational capacities of animals (see Jitsumori and Delius, 2001).

Obviously, Palma rejects intentionality. He argues that it is medieval non-sense. I think one should have understood or at least read medieval thinkers in order to speak about them (it is not fortuitous that no serious present-day scholar in logic, linguistics, semiotics, and so on, would follow Palma's judgement). Moreover, Palma criticizes me for trying to find the essence of intentionality. In his words: "Auletta sets out to supply the essence of intentionality in general, zeroing in on the idea that representations are 'signs'". But with this criterion, and without any further qualification, any scientific subject (Earth, Moon, Ant, Mammal, Language, Mind, Brain, and so on) becomes automatically a search for essence. So, I cannot see where this argument will bring us.

However, my main point is not this. Apparently, also Chomsky rejects intentionality. Or, better: Chomsky is persuaded that it is impossible to speak of language without speaking of intentions (Chomsky, 2000). One of the preferred examples of Chomsky is that we may understand the term book either as a material (and numerical) entity, as the copy, for instance of Chomsky's book that I have on my table, or as a more abstract entity, as the book that Chomsky wrote. However, when Chomsky develops his current program about language he stresses many times that it is a naturalistic program and sometimes it seems that naturalism is exactly what leaves intentionality out of the door. In fact, some of Chomsky's followers (Jackendoff, 1992) completely reject any discourse about reference and intentionality and see meaning in the internal correspondence between terms and concepts. Here I cannot go deeper into this problem. I only remark that a living being so equipped would not survive half an hour – this does not wipe out the importance of Jackendoff's research especially on the problem of the main ontological categories. However, returning to Chomsky, in the evolution of his reflections it is clear that his naturalistic program reduces to a smart form (Chomsky, 1995). In his words, "A naturalistic approach simply follows the post-Newtonian course, recognizing that we can do no more than seek the best theoretical account of the phenomena of experience and experiment, wherever the quest leads." I cannot but agree with these words, and say that if intentionality explains something, then is good a good tool, and if it doesn't, then it is worthless.

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