

# **The Meaning of the Basic Elements of Language**

## **in Terms of Cognitive Operations:**

## **Operational Semantics**

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### **Abstract**

In this article, the author provides a brief introduction to a completely new theory in Semantics, *Operational Semantics* (OS), which concerns the meanings of the *basic linguistic elements* that are indispensable for any linguistic expression, that is, mainly the “grammatical” words and morphemes. OS differs significantly from the other theories. In fact, in linguistics several of these basic elements are often considered to have a *complex* meaning and, in some cases, to be *polysemous* (such as some prepositions/cases and some verbs). Nevertheless, *the words that designate them are among the first that children learn*, and *unique*. OS is a systematic theory about the meaning of these linguistic elements, which it considers, *in agreement with such facts*, as having a *simple* and (substantially) *unique* meaning. The fundamental presupposition of OS is that the meanings of such linguistic elements are essentially *sequences of elemental mental operations, amongst which the ones of attention play a key role*. The author proposes a list of these elemental mental operations and shows how it is possible, by basing ourselves on these, to account for the meanings of the aforesaid linguistic elements. *A new theory*, which lies between linguistics and cognitive psychology, derives from this. This theory also allows us to define fundamental concepts of linguistics (such as “noun”, “subject”, “object” etc) in a simple and clear way and propose new solutions for some other problems in linguistics and psycholinguistics.

In the last part of the article, the author also mentions a possible short-term practical application of OS, i.e. a device to improve the quality of machine translation, and highlights the limits of OS.

**Keywords:** mind, mental operations, consciousness, attention, thought, language, Italian Operational School, operational semantics, linguistics, psycholinguistics, neurolinguistics, semantics, grammar, philosophy, cognitive psychology, neurobiology

## § 1. — Introduction

Language has been studied from various points of view and its study has produced a great deal of results. Nevertheless, its most important (from a certain point of view) aspect, that is, semantics (since language is the expression of *meanings*), has proved to be the most problematic [28, 14, 63]. In this paper, I shall consider language right from the point of view of semantics, introducing a radically new theory in this field. I call this theory *Operational Semantics* (OS). Here, I shall provide a brief exposition of it.

This article has been conceived to be read by as wide a public as possible. Therefore, a specialised foundation has been avoided.

## § 2. — The origins of Operational Semantics

OS partly coincides with Silvio Ceccato's (1914-1997) thought, partly is an innovative development of this, partly is very different. Ceccato's thought started developing in the 1950s and reached its full maturity in the 60s and 70s [17, 18, 19, 20, 21, 22, 23; 26]. Ceccato used various names for the theories that made up his thought. The name *Operational Methodology* (OM) is the one that has prevailed in his School, the *Scuola Operativa Italiana* (*SOI*) [Italian Operational School].

Even though Ceccato was well-known in Italian philosophical circles since the 40s and even though he directed important projects involving the application of his theories (one of the very few European projects of machine translation and the only one in Italy in the first phase of research in this field [funded by USA Air Force, 1959-66; described in 20 Ceccato 1969]; the project of the so-called “mechanical reporter”, a machine that had to be able to observe and to describe a scene made up of seven objects arranged in various ways on a stage [Italy National Research Council, 1958-66; described by Ceccato 1969 [20]]), his thought has had very little diffusion (this can be due to various reasons, which it is impossible to examine here). Nevertheless, I believe that the work of Ceccato and his School [40, 41; 75; 85, 86, 87; 1], even if it needs an in-depth critical revision, includes many original and very valuable ideas and intuitions, which deserve to be taken into consideration again and developed. This is precisely where I have focused my work ever since the second half of the 90s [5, 6, 7, 8]. In the early 90s, another researcher from the *SOI*, Giorgio Marchetti, began a very remarkable critical revision and development of Ceccato's thought [64, 65, 66, 67, 68, 70, 71]. Since 2003, there has been a tight collaboration between Marchetti and myself.

In the following treatment, there is the problem of distinguishing Ceccato's original theories from those of the author. A complete and precise distinction here is not possible due to lack of space: for such a distinction, I can do nothing else but refer the reader to the bibliography [17, 18, 19, 20, 21, 22, 23, 24; 26; 25]. Nevertheless, in the main text or in the notes, I shall indicate which are Ceccato's main original theses and which are the author's. When this is not provided, the thought exposed generally derives from Ceccato's, but with possible differences.

The foundation of the exposition is the author's own and differs entirely from Ceccato's.

### § 3. — The fundamental theses of Operational Semantics

The best way to introduce OS is starting from a concrete example. That is, to take a sample of language at random and think over the meaning of the words that form it. It is important to note that, from the point of view that I am about to express, we may choose *any* sample of language, in *any* language, and the result will be always the same. As a sample of language, let's take the beginning of one of the most famous books in the world: Pinocchio.

*Once upon a time there was...*

*— A king! — my small readers will say at once.*

*No, children, you are wrong. Once upon a time there was a piece of wood.*

*It was not a luxury wood, but a simple stack piece, one of those pieces we use to put in stoves and fireplaces in winter to light fire and to heat rooms.*

[translation from Italian is the author's own]

Every discrete element of language, that is, every word, designates at least one meaning (in many languages however, many single words designate more than one meaning together, like, for instance: the basic meaning of a noun plus the plural; a verb and its tense, mood and person; etc). Therefore, each word designates one or more "atoms" of thought. Let's ask ourselves what these "atoms" are, what their nature is. As far as their nature is concerned, it seems that the meanings of words can be divided into at least two main classes.

1) In the passage we have chosen, the words "children", "wood", "stack", "stoves", "fireplaces", "winter", "[to] light", "fire", "[to] heat", "rooms" seem to designate something *physical* (apart from the endings that indicate the plural). It is easy to realise that there are so many of these words that they probably make up most of the lexicon of any language. Therefore, there is a big class of words that make an *evident and specific reference to something physical*.

2) In the passage chosen, there are then the following words: the verbs "to be" and "to have", the article "a", the prepositions "upon", "at", "of", "in", "to", the demonstrative adjective "those", the negations "no" and "not", the conjunctions "and" and "but", the numerals "once" and "one", the adverb "there" and the morpheme "-s" (or "-ren", in "children"), which indicates the plural. These words (or morphemes: morphemes instead of words are used in other languages) seem to be *clearly different* from those in class 1. In fact, unlike the words in class 1, these words *do not* seem to refer (or refer only) to something physical. Although they are certainly often used to describe the physical word, they do not seem by any means to *necessarily* and *specifically* refer to something physical. If, for example, instead of saying "*this* stone", "*two* trees", "*all* the grass" (phrases where the words in italics refer to physical things), we say "*this* problem", "*two* considerations", "*all* his thought" (phrases where there is no reference to something physical), the meaning of the words "this", "two" and "all"

does not seem different at all.

In a language, items of this kind are all the “grammatical” words or morphemes, that is: 1) *prepositions*<sup>1</sup> (with, of, to, at, from, by, in, for, on, between, among etc); 2) *conjunctions* (and, or, if, because, but etc); 3) *interrogative-indefinite-relative pronouns* and *adjectives* (who, what, which, whoever, whatever, whichever etc); 4) *demonstrative adjectives* and *pronouns* (this, that, other, the same etc); 5) *main adverbs* of place, time, manner etc (here, there, where, when, how, why etc); 6) *pronouns* and *adjectives of quantity* (all, whole, many, some, few etc); 7) *negation* (not, no, in- or un- as a prefix); 8) *numerals* (one/first/once; two/second/twice; three/third etc); 9) “grammatical” verbs like “to be”, “to have”, “can”, “must” etc; 10) most *morphemes* in the large number of languages that have a more or less rich morphology (the ones which indicate *cases*, in languages that have cases; the *number* of nouns and, in many languages, of adjectives; *tenses, moods, forms, aspects* of the verb etc).

Besides the “grammatical” words, the vocabulary of a language contains other words that, like the former, do not seem to refer (or refer only) to something physical. The passage contains two of these words: “small” and “piece”. Other examples of words of this kind can be: “big”, “part”, “beginning”, “end”, “to get”, “to make”, “to look for”, “to find” etc.

It is easy to realise that the number of items in class 2 is quite limited (definitely much less than in class 1), but, as a class, they are used *in an extremely frequent way* (in the passage, the ratio between the words of class 1 and the words/morphemes of class 2 is about 1:4). If we choose samples of language at random, we can see that the words/morphemes of class 2 are, in a large majority of the cases, the main component of sentences and that they are *absolutely indispensable in order to speak*, that is, to construct *any* speech. Therefore, it is logical to consider them *fundamental*. All the words of a language are certainly useful (otherwise, they would not exist) and many words in class 1 can also be considered fundamental from a certain point of view. A word such as “water” is surely, from a certain point of view, fundamental. However it is possible to write *a whole book* without using the word “water”. Instead, one can easily realise that it is impossible to form *even the simplest sentence* without using some of the words/morphemes in class 2. Therefore, we can say that the words/morphemes in class 2 are the fundamental *structural component* of language, and then of linguistic thought. I maintain that *until we understand the nature of the meaning of these words/morphemes, we shall not be able to understand the deep nature and structure of language and linguistic thought*.

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<sup>1</sup> The correct term is “*appositions*”, because various languages, unlike English, have *postpositions* rather than *prepositions*. In this article, where great efforts have been made to avoid using a technical language, we shall use the term “*prepositions*” even when the term “*appositions*” should be used.

Well, what do these words or morphemes indicate? Let us consider a list of basic words (Table 1).

Table 1

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woman, man, animal, bird, dog, eye, nose, drink, eat, fly (verb), walk, sun, moon, water, stone, sky, fire, red, green, night, day, warm, cold, I, you, in, with, of, have, get, make, this, that, here, there, who, what, where, when, how, not, all, many, some, few, other, big, small, long, short, wide, narrow, thick, thin, near, far, right, left

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Some people who are not familiar with linguistics could initially think that the meaning of words, that is, semantics in general, is not a problem. In fact, one can initially think that words are nothing else but signs that have been created to indicate *objects*. The very many words of a language that belong to class 1 (in Table 1, the first 23 words) can make us think so. This theory is undoubtedly correct to some extent. However, if we stop and think, we realise that things are not so simple. Words in the list such as “bird” and “animal” clearly show that in some cases we designate *categories*, not objects. Yet, if we think carefully, even more specific words such as “dog” designate categories. In fact, the word “dog” is unique, but there are many kinds of dogs. Even if we consider more uniform biological species than dogs, often not all the specimens of a species look exactly the same. Nevertheless we designate them with the same word. We can say that this applies to the majority of natural objects, and artificial ones as well. Cases where a word designates a single object or a class of identical objects are the exception, not the rule. Therefore, perception (and the designation that follows) is almost always a *categorisation*, not a sort of “photography” and memorisation of it. We can then say that what we designate is often not a single object, but a “category” or “concept” or “prototype”. However the problem does not end here. If we consider the words in Table 1 that seem to belong to class 2 (from “in” to the end), things get complicated. The meaning of some of these words, namely “big”, “small”, “long”, “short”, “wide”, “narrow”, “thick”, “thin”, “near”, “far” (in their literal meaning), “right” and “left”, may seem less problematic, because of their reference to space and/or time (even if this reference is not always present). But the meaning of the other words in the list, such as “to have”, “to get”, “to make”, “with”, “genitive”, “not”, is clearly problematic. First of all, not only do these words not indicate physical objects, but neither do they indicate *relationships* amongst physical objects. In fact, we can say both “bottle of wine” and “stream of consciousness”, both “he has a moustache” and “to have an idea”, without changing the meaning of the preposition “of” in the first couple of examples, and of the verb “to have” in the second. In order to understand the difficulties that linguistics has encountered in defining such words, we can simply examine their definitions in dictionaries. Some of these definitions are clearly tautologies. For example, “not” is defined as “negation”, “all” is defined as “totality”. The definitions that send us from one word to another and then back again (for example, the verb “to look for” is defined by means of the verb “to find” and vice versa) are also tautological. Some of these words are said to have different

meanings according to the context, and a synonym is provided for each meaning (for example, the synonyms that are provided for “to have” are “to possess, to own”, “to keep”, “to get, to obtain”, etc; the synonyms for “to get” are “to obtain”, “to purchase”, “to catch”, “to receive”, “to understand”, “to become”, “to arrive” etc; the synonyms for “to make” are “to create”, “to construct”, “to produce”, “to constitute” etc), but it is definitely much more convincing to think that the meanings of these more “specialised” verbs are *included* in the *much more general* meanings of the verbs “to have”, “to get” and “to make”. Dictionaries have long lists of relationships for words such as “with” and “of”, which are said to represent the many meanings of these prepositions (for the preposition “with”: company or union, means or instrument, manner, cause etc; for the preposition “of”: possession, association, belonging to a group, composition, containing, participation in an action as an agent or as a patient, origin, cause, purpose, quantity, quality, denomination, plenty or lack, topic, in respect to, fault, accusation and similar things, age etc). One could easily object by saying that it seems highly unlikely for words, which occur so frequently and are so indispensable, to have so many meanings. These prepositions are more likely to have *only one, more general meaning* (which is why it is so difficult to determine), and the many relationships grammar speaks about are *included* in this more general meaning.

Another big problem in linguistics is defining fundamental grammar concepts such as “subject” and “object”. In linguistics, there are no satisfactory definitions of these concepts (i.e. definitions that always work) [47]. Yet even primary school children learn what subject and object are without any difficulty through examples. Therefore, it is logical to think that *something fundamental is escaping us* here.

In linguistic research, a serious, wide and in-depth approach to semantics such as the one by Wierzbicka [89, 90, 91, 92; 43, 44; 45, 46] clearly shows how big a problem the semantics of the fundamental linguistic elements is and why. The approach (called Natural Semantic Metalanguage, NSM) is based on a reductive paraphrase (that is, breaking concepts/words down into combinations of simpler concepts/words). This approach shows that most words in a language can be defined, yet there is a *core of fundamental, “atomic” meanings* (which Wierzbicka calls “semantic primitives”), which allow us to define any other meaning, but are *absolutely irreducible*, that is, *undefinable* by means of other words, as Wierzbicka explicitly states. The “semantic primitives” are believed to be present in all human languages. This assumption was tested extensively against a wide and extremely diversified range of languages. Table 2 shows the present list of the 60 or so “semantic primitives”. The words that seem to belong to class 2 are underlined. As we can see, they are the majority of the list.

**Table 2:** List of the semantic primitives (2002; <http://www.une.edu.au/lcl/nsm/nsm.php> - model)

substantives: <i>I, you, someone, people, something/thing, body</i>	existence and possession: <i>there is/exist, have</i>
determiners: <i>this, the same, other</i>	life and death: <i>live, die</i>
quantifiers: <i>one, two, some, all, many/much</i>	time: <i>when/time, now, before, after, a long time, a short time, for some time, moment</i>
evaluators: <i>good, bad</i>	space: <i>where/place, here, above, below; far, near; side, inside; touching</i>
descriptors: <i>big, small</i>	“logical” concepts: <i>not, maybe, can, because, if</i>
intensifier: <i>very</i>	augmentor: <i>very, more</i>
mental predicates: <i>think, know, want, feel, see, hear</i>	taxonomy, partonomy: <i>kind of, part of</i>
speech: <i>say, word, true</i>	similarity: <i>like</i>
actions, events, movement, contact: <i>do, happen, move, touch</i>	

Therefore, Wierzbicka's approach shows that in any language, and therefore *in language*, the core of the *most fundamental* meanings cannot be defined by using the words of the language itself (Arnauld, Descartes, Pascal and Leibniz had already maintained this theoretically [42]). As a result, the solution to the problem of the meaning of the words/morphemes that make up this fundamental component of language has to be searched for *outside* language itself, that is, in something other than language. These words/morphemes should be defined in terms of something more elementary.

Operational Semantics is a *completely new solution* to the problem of the meaning of the basic words/morphemes belonging to class 2. The fundamental thesis of OS is that *these words/morphemes designate sequences of mental operations* (the name “Operational Semantics” derives from this), *amongst which the ones of attention play a key role*. Therefore, we may say that *these words and morphemes are “tools to pilot attention”* [67, 70] and other cognitive functions of the listener. The reason why the meanings of such linguistic elements cannot be defined by means of other words is precisely because *they can only be defined in terms of such operations*.

Ceccato called these sequences of mental operations “mental categories” (because they have some analogies with the categories of Kant's philosophy). OS has adopted this name as well. We must point out that the meaning OS gives to the term “category” is *completely different* from the meaning that cognitive psychology and linguistics give to the same term. Typically, cognitive psychology and linguistics use the term “category” to highlight the fact that, since many objects of

the physical world share common features, but are not identical, we create *classes* (that is, *categories*) by means of a mental process of abstraction [4; 62; 82, 83]. On the contrary, OS calls “mental categories” the meanings of the words of class 2.

Ceccato called the mental operations that make up the mental categories *elemental mental operations*. Once again, we must point out that the use OS makes of the expression “elemental mental operations” differs completely from the use that cognitive sciences make of the same expression: while for OS the expression denotes only the elemental operations that make up mental categories, for cognitive sciences it has a wider meaning, denoting various kinds of operations that may be considered “elemental”, such as, for example, basic operations of perception. In this paper we shall therefore use, as much as possible, the more specific expression “elemental operations that make up mental categories”, or its acronym EOMC.

Therefore, defining the meaning of a word that designates a mental category means, according to OS, identifying the structure of that mental category, that is, the sequence of elemental mental operations that make it up. We call this task “analysis of a mental category”.

#### § 4. — The elemental or basic mental operations

Ceccato hypothesized that attention can only be in two states (attention waiting for something to focus on and attention focusing on something) and that the structure of mental categories is made up of the various possible combinations of a progressively increasing number (2, 3, 4 etc) of these two states. Since this hypothesis gave poor and controversial results in the analysis of mental categories, I believe it is completely wrong [6]. Nevertheless, Ceccato also gave some other sketched descriptions of the structure of several mental categories. I used these descriptions as a starting point to identify the elemental mental operations that make up the mental categories. I proposed [8, 11] a more complex set of EOMC, and consequently present new analyses of the fundamental mental categories. Most of the operations that are considered EOMC have been repeatedly described in cognitive psychology (as regards attention, see for example James 1890; Jonides 1983; La Berge 1983, 1995; Pashler 1998; Posner 1980, 1994; Posner, Cohen 1984; as to representation, see Braga-Illa 1997, 2006; Denis 1989; as to memory, see Baddeley 2000; Baddeley and Hitch 1974; Cowan 2001, 2005; Miller 1956; Oberauer 2002; Oberauer et al. 2000; in general, see Benjafield 1997, Reed 1992). *The new idea we are proposing is that by means of these operations we can account for the meaning of the words in class 2, hence for the nature and structure of linguistic thought* (this idea is Ceccato’s own).

The list of the EOMC I propose at present is the following.

- 1) ***Operation of attentional focalization (AF)*** – This operation has the fundamental property of producing the “selection”, or “highlighting”, of its object with respect to all the rest [55]. Inside AF we can distinguish at least three sub-operations.

AF can widely vary in extension (**AFext**): it may concern an object, or a part of it, or several objects.

- a) The focus of attention can move (**AFmov**) from one object to another, or from a part of the field to which it is applied to another.
- b) Moreover, AF can last for variable, though limited, amounts of time (**AFdur** [dur = duration]).
- c) The extension, movement and duration of attentional focalization can be estimated in quantitative terms (**AFext-estim**, **AFmov-estim** and **AFdur-estim**, respectively).
- d) AF can vary in intensity (**AFint-var**), that is, we can pay more attention to one object instead of another.

2) **Presence keeping (PK)** – Let's imagine a scene with a bottle and a glass. Let's look at the bottle and say "bottle"; then, let's look at the glass and say "glass". Let's try to say, "there are a bottle and a glass". Obviously, the physical situation has not changed, but it is our mind that has done something different. In the first case, when we passed to the glass, the bottle was mentally left. In the second case, instead, we keep the bottle present while our attention passes to the glass. I call this fundamental operation "presence keeping".

The operation of presence keeping is surely strictly related to the well-known concept, developed by cognitive psychology, of "working (or active) memory", whether in the classic Baddeley-Hitch's model or in more recent models, such as Cowan's or Oberauer's models [2; 3; 30, 31; 74; 73]. The operation of presence keeping requires the interaction of a short-term memory having a limited capacity and attention (the interaction of a short-term memory and attention is especially highlighted in Cowan's and Oberauer's models).

3) **Operation of attentional discarding (AD)** – Considering a bottle and a glass once again, let's try to say "glass or bottle". In this case, we can easily sense that both objects are focused on by attention and kept present, but when our attention focuses on the bottle, we must exclude, discard the glass (this operation is different from simply stopping to focus our attention on an object in order to pass on to focus it on another one, because in our case we bear in mind the fact that we considered the object we are now discarding). I call this operation the operation of "attentional discarding".

4) **Operation of representation (R)** – The operation of representation is the act of thinking about something that is not present at the moment. This is what we do when, for example, hearing a word, we pass to its meaning, which was previously memorised. Sometimes the formation of a mental image of the object follows the understanding of the meaning. In some cases, this operation is not simply a retrieval of something memorised, but has a clearly creative character, such as when we imagine or think up something that does not exist.

5) **Operation of comparison (C)** – Our mind performs comparisons very frequently. Every time we use typically relative words, which concern properties of an object (like "high/low", "strong/weak", "heavy/light" etc) or express a judgement (like "good/bad", "normal/abnormal" etc), we make comparisons. Obviously, when we perform this operation, we focus our attention on the objects compared and we bear them in mind. Even though comparison implies operations

of attentional focalization and presence keeping, I believe that it has to be considered a separate function. This is why I call it “extra-attentional” operation.

6) ***Operations of memory (MO)*** – Memory surely plays a key role in our mental life: by means of it, we fix and recall both brief and long-term memories continuously. Apart from all of this, I think that memory operations are part of the structure of some mental categories [8, 11]. Therefore, I list memory operations amongst the EOMC. Also these memory operations are distinct from the ones of attention.

### § 5. — Examples of analysis of fundamental mental categories

Naturally, the mental categories that we must concentrate on are the “primitive” ones, that is, those that cannot be defined by means of other words. Wierzbicka’s method seems to identify them precisely. Her work also shows that the “semantic primitives”, which have been identified using this method, are probably universal. Therefore, we shall use this list as a primary source. Even if Wierzbicka’s work seems to be extremely serious and rigorous, I suggest using another list to provide confirmation to the reader. I have intentionally chosen a list that was created in a completely independent way, in a field other than semantics and for a completely different purpose: the Swadesh list. The Swadesh list contains about 200 words that are considered fundamental, and is used in so-called “glottochronology” to determine the degree of “kindred” of languages and the approximate date of their separation. From our point of view, the criticisms that have been made about glottochronology do not matter: what matters is that the Swadesh list is a set of words that are fundamental and present in all (or almost all) languages. This is probably true. Table 3 shows the words of the Swadesh list that at first sight seem to be mental categories.

Table 3

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*this, that, here, there, who, what, where, when, how, not, all, many, some, few, other, count, one, two, three, four, five, big, small, long, short, wide, narrow, thick, thin, give, hold, correct, near, far, right, left, straight, round, new, old, at, in, with, and, if, because*

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As we can see, most of these are the same as the ones included in the “semantic primitives” of NSM (or are very similar: for example, “in” is very similar to “inside”, “how” is similar to “like” (some languages use the same word), “who/what” is not so different from “someone/something/thing”). Therefore, a list that has been created independently and for a completely different purpose substantially confirms Wierzbicka’s list. The fact that very few words are not common to the two lists does not matter to us here. In fact, we are not interested in identifying *only* the meanings of the “primitives”. We are interested in having a list of these meanings that is presumably complete, in order to see if our method of analysis works for them. But we can also consider some more meanings, if they seem very important (which is what we shall actually do: for example, the verb “to have to”,

which is easily paraphrasable with “cannot not”, is not included in Wierzbicka’s list, but, since it seems as important as “can”, we shall consider it).

This section deals only with a part of the mental categories that are considered fundamental, in order to use them as examples of analyses. The others will be considered further on.

Only the results of the analyses are introduced here. The methodologies that have been used and the way in which they have been developed cannot be discussed in this short introductory article.

Noteworthy here is the fact that OS considers the problem of the meaning of the linguistic elements belonging to class 2 *from as general and “deep” a point of view as possible*. Wierzbicka’s approach clearly shows that there are some meanings that cannot be defined by means of other words and are probably present in all languages, i.e. they are universal. Such “semantic primitives” are obviously expressed by linguistic elements (words or morphemes). In each single language, these linguistic elements can present some particularities, above all of use (for example, in the same situation a certain language can use one word/morpheme, while another languages may use another), but also of meaning (for example, in one language a linguistic element can have an additional meaning that it does not have in another language, there can be various words that express the same fundamental meaning with different shades of meaning, etc). *OS does not deal with these linguistic particularities, but only the aforesaid presumably universal semantic primitives*. OS tries to account for the latter, without using, as a program, the concept of polysemy (which, as we stated, clashes with the uniqueness of the corresponding linguistic elements) and using the hypothesis that the “semantic primitives” must be something simple (since the corresponding words are amongst the first that little children understand and use).

After these preliminary remarks, we can provide some examples of the analyses.

The preposition **with** means that we focus our attention (AF) on something, *A*, then, keeping it present (PK), our attention also extends (AFext) to something else, *B*, because *B* is in such a relationship with *A* that our attention tends to include *A* and *B* in a single focalization<sup>2</sup>. For example, we say “bottle with cork” if the cork is in the neck of the bottle, while we do not use this expression if the cork is far from the bottle.

Generally, the two things that the preposition links cannot be inverted because one of them is (or is considered) the main one (“bottle with cork”, not “cork with bottle”). Nevertheless, when the two things are equally important, they can be inverted (“I saw John with Bob/Bob with John”), and which will be the first depends on which we are more interested in.

A noteworthy fact is that this analysis clearly explains that in many languages this preposition is used to express both the relationship of company or union between two things and the relationship of means or instrument between an activity and an object. Whether we say, for example, “cup with handle” or “to write with a pen”, what appears to our attention are two things that are in such a relationship that our attention, when focused on *A*, tends to include *B* in the same focalization as well.

<sup>2</sup> This analysis is my (substantial, from a certain point of view) modification of the original Cecato’s analysis (which is: “two things are focused together by attention and then they are divided by it”).

In fact, the handle is joined to the cup and therefore as long as we look at the cup we also see the handle; and as long as we watch the action of writing we see the pen.

The analysis also clearly explains that the preposition “with” can be used when relationships such as object-its part (“book with a red cover”), opposition (“to fight with”), manner (“with ease”), simultaneousness (“swallows migrate with the cold season”), cause (“to shiver with fear”), concern (“no concern with”) are involved, and in comparisons (“to compare with”). In all these cases the attention, while focusing on something, is also extended to something else (from the act of fighting to the enemy, from an activity to the way it is performed, from an event to another one that happens at the same time, etc).

Therefore, the preposition *does not designate the aforesaid relationships*, that is, they are not *its meanings* (which would be too many). The preposition designates a *much more general relationship*, i.e. *A* is in such a relationship with *B* that attention, when focused on *A*, is also led to “embrace” *B*. This very general relationship can include various more specific relationships (manner, simultaneousness, cause, etc), which depend on the two related things, but the meaning of the preposition is only the first relationship, *not the second ones*. Therefore, *there is only one meaning for the preposition*, in agreement with the fact that there is only one corresponding word.

As we shall see, this is also true, at least in principle, for the other prepositions or cases that linguistics generally considers as polysemous. This clearly shows how much OS differs from previous theories in semantics.

I have introduced the analysis of the preposition “with” first, because it illustrates a fundamental general concept of OS very well (this is indeed valid for several other words/morphemes, as we shall see). This concept is that *the meaning of these words/morphemes can be found only at the top level of abstractness*, that is, at the level of the operations of attention and other basic cognitive functions, *not at more particular levels* such as the spatial, temporal, causal, instrumental etc relationships.

The category of **negation** (“not”, “no”, “in-” or “un-” as a prefix) indicates the discarding (AD) of the representation (R) of a meaning (the analysis is my own). If, for example, we say, “John’s car is not red”, we mean that the representation of the meaning “red”, concerning John’s car (a representation that was prompted by something previous, such as for example the question: “Does John have a red car?”) is discarded.

The categories **who**, **what** and **which** indicate the fundamental operation of attention of selecting an unspecified item  $A_x$  from a group of two or more items ( $A_1, A_2, A_3, \dots$ ), which are considered equal (C), and kept present (PK). The only difference between “who” and “what” is the kind of item: human beings in the case of the pronoun “who”, anything that is not a human being in the case of the pronoun “what” (“which” is the derived adjective). If, for example, there are some books, and we ask someone “Which book do you want?”, we will realize that we are keeping in mind the group of books, while our attention is waiting to focus on one of them.

Focusing our attention on an element of a group, while discarding the others, is obviously an operation of fundamental importance. In fact, linguistic research has

shown that the two pronouns “who” and “what” are among the first in the list of the most stable words in the linguistic evolution of the languages of the world (Dolgopolsky, in [63], p 217 It. ed.).

The category “how many” is produced by means of the operation of **counting**, that is, by means of a series of operations of focalization of attention (AF), one after the other, on each item of a group of items considered equal (C), bearing in mind (PK) the preceding items each time we add a new one. Each subsequent repetition is called by a different name (these are the **single numbers**: “one”, “two”, “three” etc). The word **number** indicates indistinctly one of these repetitions without specifying which one, while the word **how many** indicates that attention must be focused on the final result of counting. The category of **plural** indicates that we have simply carried out subsequent attentional focalizations on things considered equal, but without associating a conventional name of a progressive series (that is, a number) to each of them<sup>3</sup>. For example, if, when looking at a scene with an apple, a pear, a plum and a peach, we say “there are four fruits”, this happens because, first, we have considered the apple, the pear, the plum and the peach as items that are equal (that is, “fruits”); second, we have focused our attention on one of them associating a conventional name (“one”) to it; third, while bearing this in mind, we have focused our attention on a new item associating another conventional name (“two”) to it; and so on. If instead we say “there are some fruits”, we have carried out the same operations, but without the association of a progressive series of conventional names.

Now, let's consider the meanings “other/else” and “the same”. There are a lot of objects of which many specimens exist, which are thus designated with the same word. For example, the word “dog” indicates each specimen of the class of “dogs”. If, in a speech, after having found one of these words we find it once again, we remember that the word has been already used, so we have to know whether the latter word refers to the aforementioned specimen (let's call it  $A_1$  of class  $A$ ) or not. The mental category **the same** indicates that we have to focus our attention again on  $A_1$  retrieved from memory, while the category **other/else** indicates that we have to discard  $A_1$  retrieved from memory and represent a new specimen of class  $A$ , let's call it  $A_2$  (therefore, these categories are examples of categories with memory operations in their structure). These analyses agree perfectly with linguistic data. The word that expresses the meaning “other/else” is rather stable during the linguistic evolution, while there is not such a stable word that expresses the meaning “the same” (this is the reason why the Swadesh list, which is a list of universally widespread fundamental *words*, includes the word “other/else” only, while Wierzbicka's list, which is a list of fundamental *meanings*, includes both meanings). In the Indo-European linguistic family, for example, the root ALI, “other/else”, can be clearly reconstructed starting from its derivatives that are largely widespread across the languages of the family, while a root that means “the same” cannot. The stability of the word that means “other” and the absence of a stable word for the meaning “the same” are due to the fact that the former is necessary, while the latter is useful, but not strictly necessary. In fact, if we have to discard  $A_1$  retrieved from memory and represent  $A_2$ , we need a

<sup>3</sup> The analysis of the category of “plural” is my own. The other analyses of this group are developments or modifications or explanations of analyses sketched by Ceccato.

specific word, but if we just have to focus our attention again on *A*, retrieved from memory, we can simply repeat the word leaving the thing understood, or use a demonstrative adjective/pronoun or the definite article (if the language has the latter).

The meanings of the two verbs “to have” and “to get” are so general that dictionaries usually try to capture them by defining each entry with a long list of verbs, as we have seen. However, these lists are nothing else but collections of more “specialised” verbs, whose meanings are included in the more general meanings of “to have” and “to get”. The meanings of “to have” and “to get” are so general because both these verbs designate the same relationship as the one designated by the preposition “with”<sup>4</sup> (two distinct things, *A* and *B*, are in such a relationship that our attention, when focusing on *A*, tends to include *B* in the same focalization as well). The difference with the preposition “with” is that, in the case of these two verbs, as in all verbs, we see the situation from the temporal point of view, which entails that we focus our attention in a continue way or repeatedly on the *same* situation (see further on). In the case of the verb **to have**, the result is something static. For example, “that man has a moustache” means that when we focus our attention on his face we also see a moustache and this remains constant throughout time. On the contrary, in the case of the verb **to get**, the result is something dynamic. For example, “to get the pen” means that our hand comes in such a relationship with the pen that, if we look at the hand, we also see the pen (the pen is *in* the hand), while before there was not such a relationship<sup>5</sup>.

In order to show the analyses of the conjunctions “and” and “or” (these analyses are substantially Ceccato’s own), let’s imagine a scene with an apple and a pear. In the case of the conjunction **and** (“an apple *and* a pear”), we focus our attention (AF) on something (say *A*; the apple, in our example) and we keep it present (PK) while focusing our attention (AF) on something else, *B* (the pear). In this way *B* is “tied” to *A*, but remains separated from it because attentional focalization stops during the passage from *A* to *B*, that is, we perform two distinct operations of attentional focalization. In the case of the conjunction **or** (“an apple *or* a pear”), firstly we focus our attention (AF) on an object *A* (the apple, in our example) and then we discard (AD) it in order to focus our attention (AF) on another one, *B* (the pear). Therefore, *A* is excluded when *B* is taken into consideration: an alternative between the two objects is thus created.

A very important group of mental categories is the one designated by the words and morphemes frequently (some of them exclusively) related with space or time (for example: “place”, “where”, “here”, “there”, “high”, “short”, “wide”, “narrow”, “left”, “right”, “now”, “before”, “after”, “during”, “when” etc). In order to analyse the meaning of these linguistic elements we have to introduce some concepts.

In my opinion, the attentional operations and the other EOMC can be applied not only to objects, but also to what I call “maps”. I call “**map**” an ordered mental rep

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<sup>4</sup> This basic idea, and the difference between “to have” and “to get” described below, are Ceccato’s own; as regards the analysis of the proposition “with”, see note 2.

<sup>5</sup> The restricted space of an article do not allow us to show other examples in order to verify these two analyses and the other analyses that I have proposed. Nevertheless, the reader can easily verify them himself or herself by finding other examples.

resentation of an ordered set of elements or of an ordered *continuum* (since here I use the word “map” in a new meaning, I shall always put it between quotation marks). Examples of “maps” are the representation of the series of numbers, of the words of a speech, of the items of a list, etc. Nevertheless, the main “maps” are the spatial “map” and the temporal “map”, that is, our mental representations of space and time.

Let's consider the **temporal “map”** first. As everyone can easily sense, when we have focused our attention on an object, we can continue keeping it on that object. If the situation is static, we can keep our attention on the same object for rather brief periods, a few seconds. Think, for example, about when we look at a red traffic light waiting for the green one: after a very few seconds of gazing at the red disk, our sight is inevitably pushed, even against our will, to look away from it at least for a moment. In the case of dynamic situations (for example, when our eyes track a moving object), we can keep our attention focused on the same object for longer periods. Nevertheless, we have to note that even in situations of this kind rarely do we keep our attention exactly on the same object. That is, attention is extremely “mobile”, that is, it tends to move continuously in the attentional field (the reason for this is easily understandable: only with a continuous exploration of the attentional field it is possible to perceive all the stimuli that could be important for the subject). Anyway, even if we can keep our attention focused on the same object for limited periods only, it is possible, once we have left the object, to focus it on again. This is what we do for example in the aforesaid case of waiting for the traffic light to become green, when the waiting is rather long: we keep our attention on the red disk for some seconds, then we divert it for a moment, then we gaze again at the red disk, etc, till it goes out and the green disk appears. This kind of operating can cover even long or very long periods. In fact, we can focus our attention again on the same object even after many years (for example, when we knew a man when he was a boy and we meet him again when he is an adult). Whatever the distance of time between the two (or more) attentional focalizations, all that is necessary is that their results are remembered and that there is some way of ascertaining without any doubt that the object of the attentional focalizations that follow the first one is always the same as that of the first focalization, even if the object has not been continuously followed. Furthermore, we usually integrate what we perceived during the phases of the attentional focalization, representing, that is, imagining, what happened during the phases when our attention was elsewhere directed, so as to build a *continuum* where the object has a stable existence (for example, when we are waiting in front of a traffic light, we assume that the red disk still exists also when we divert our attention away from it; as in the case of the man met after many years, we assume that he gradually changed from a boy into an adult; etc). As we can see, this way of operating is a rather complex one, where there can be several operations of attentional focalization, operations of memory and of representation. Because of this, I call it temporal “operational scheme” (**TOS**).

When we perform this fundamental operational modality, we use a **verb**. This fact may be not immediately evident. This depends on the fact that we *already know* the meanings of the various verbs and this may make us think that these meanings can be understood in an instantaneous way, without necessarily following the

situation during time. But imagine you want to teach the meaning of a verb, for example “to burn”, to a very little child who does not know it: to do this, there is no other way but to make the child keep his or her attention on something that is burning, for example some wood, and see it changing into something else (the ashes) during time, while producing heat and fire. The fact that the use of a verb implies a non-instantaneous application of attention is clearly demonstrated when, in order to choose the verb that describes a given situation correctly, a prolonged observation is necessary. For example, when watching a ship on the horizon, it would be impossible to say “that ship on the horizon is still” or “that ship on the horizon is moving” if the observation were instantaneous.

The result of TOS is a temporal representation or “map” relevant to a process (or state). By capturing the relationships among the various phases of many processes (or states) and by using some cyclic processes (the alternation of day and night, the lunar phases, the seasons etc) as a privileged reference, we build a temporal “super-map” where all other temporal “maps” are integrated, that is, the general representation of time (the complexity of such a process is evident and accounts for the fact that children come to possess a representation of this kind late).

A *spatial “map”* is what allows us to consider an object or an environment from the spatial point of view, that is, in its extension. We can become aware of the activation of a representation of this kind if we make the two following simple experiments:

- 1) considering any physical object (for example, this page) in two different ways:
  - a) first, we simply recognise it (in this case, only its distinctive features, that is, its whiteness, its rectangular shape, etc will be evident);
  - b) then, we consider some positions on it (for example, the centre, the upper half, etc);
- 2) considering a part of the environment (for example, the room where we are) in two different ways:
  - a) first, once again we simply recognise it (also in this case, only its distinctive features will be evident);
  - b) then, we consider it as a “place” (in the latter case, the room will become a part of a wider spatial representation that includes it, for example the one of the house).

Just like the temporal “maps”, the very many spatial “maps” that we build and memorise during our life are integrated in a “super-map”, which is our general representation of space.

When a “map” is activated, attention can focus on it, selecting a more or less large part of it, moving around it, etc. In other words, we can perform the attentional operations (and the other operations) that are the elemental mental operations (EOMC) on the “map”. If the same operations that are at the basis of the mental categories “who/what/which” are performed on a spatial “map”, that is, if we first focus our attention on a “map”, and we keep the “map” in mind while we focus the attention on a part (say *A*) of it, we obtain the mental category **place**, or **where** as an interrogative or relative adverb (for an analysis of the categories “interrogative” and “relative”, see further on). If we perform the same operations on a tem-

poral “map”, we obtain the mental category **moment/time** (“time” in the sense of “portion of time”), or **when** as an interrogative or relative adverb).

Once the concept of “map” and performance of EOMC on it has been introduced, identifying the structures of the other mental categories related with space and time is very simple. We shall mention them for the sake of completeness only.

Spatial “maps” are uniform, that is, there is no privileged position or direction. Therefore, setting reference points and directions on them is very useful. The vertical direction (the direction of the force of gravity and the upright position) and the horizontal direction are often chosen as a reference of course. Using attention to select one of the two parts of a spatial “map” that has been divided either vertically or horizontally obviously makes up the two pairs of categories **right/left** and **high/low (up/down)** as adverbs).

The quantitative estimate of attentional movement (AFmov-estim) is obviously the basis of the categories **near** and **far**. The choice of the speaker’s position on the “map” (and, in some languages, of the listener too) as a reference for this estimate is naturally the basis of the demonstrative adjectives/pronouns (**this**, **that**, and others in other languages) and various adverbs of place (**here**, **there** etc).

Typically relative terms such as **high/low** (as adjectives), **large/narrow**, **long/short** and **thick/thin** are obviously based on an operation of comparison (C), which concerns the extension of the one-dimensional attentional movement from one extremity of an object to the other extremity, along a reference direction that is chosen according to the object’s position in space or to the relationships among its three dimensions. If the two-dimensional (or three-dimensional) relative extension of attentional focalization (AFext-estim) is considered, we have the categories **big/small** (in the literal and fundamental sense of this pair of words of course, and not in the figurative sense, which also exists for some of the other pairs). Linear attentional movement can be of two fundamental kinds, with or without variation in direction (categories **round** and **straight**, respectively).

Unlike spatial “maps”, the temporal “map” has only one direction. On this “map” there is a privileged position, the one in which the linguistic communication takes place (the **present/now**, as a substantive and adverb, respectively), which divides the “map” into two parts that are clearly identified by its unique direction, the **past** and the **future** (obviously, these three possibilities are also expressed by the **tenses of the verb**). The three possible positions of a given attentional focalization on the temporal “map” (that is, a moment) with respect to another are the three categories **before**, **after** and **during**. Naturally, the same operations that were said to make up the meanings of the “near/far” and “long/short” pairs are possible. Therefore, many languages designate them by means of the same words, both when they are applied to space and time.

Several of the words that we have just considered are also used not in relationship to space and time (“a *long* list”, “the subject must be put *before* the verb”, “*this* is the problem” etc). Of course, this is because, as stated, *any* ordered set of elements or ordered *continuum* (the series of numbers, the words of a speech, the items of a list etc) can be mirrored in a “map”, whereon the operations that are the meanings of these words can be performed.

## § 6. — The correlational theory of thought

Now that we have introduced some analyses of mental categories, we can explain how, according to OS, mental categories allow us to produce linguistic thought. Let's consider the following words: "apple", "pear", "red", "and", "or", "with". Let's try to represent each of the meanings of these words in an isolated way. This is easy for the first three words, while for the other three we have a clear sense of "incompleteness". We sense very well that the last three words require something that precedes them and something else that follows them. In other words, their function is to "tie" two other elements to each other. According to OS, linguistic thought is made up of two fundamental kinds of elements:

- 1) correlators
- 2) correlata

*Correlators* are the elements that have the specific function of tying the other elements of thought. They are the mental categories designated by prepositions, conjunctions and some of the so-called cases (genitive, dative, etc), in languages that have cases (in languages that have no cases their meaning is expressed by means of prepositions). *Correlata* are the elements that are "tied" by a correlator. According to OS, even though the meanings of isolated words (such as "apple") are a kind of thought, there is actual linguistic thought only when we "tie" or "correlate" more than one meaning to each other, that is, when we say, for example, "apple and pear", "red apple", etc.

The two correlata that are tied by a correlator are called "first correlatum" and "second correlatum", respectively, according to the temporal order in which attention focuses on them. We call the whole structure thus formed *correlation* or *correlational triad* and we represent it graphically in the following way:

correlator	
first correlatum	second correlatum

In the case of the example "pear and apple", we shall have this correlation:

and	
pear	apple

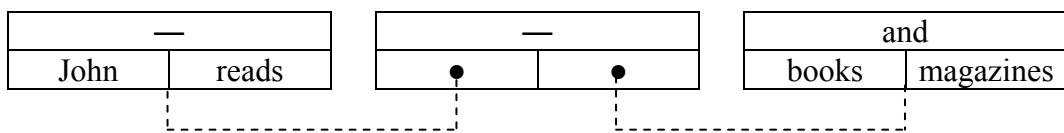
Besides prepositions, conjunctions and some cases (in languages that have cases), there is another correlator, which is extremely important. Its structure is the same as for the conjunction "and" (attention focuses on *A* and *A* is borne in mind while attention focuses on *B*), but in this case *A* and *B* do not remain separate, but they "combine" together because the attentional focalization does not stop in the passage from *A* to *B* because *A* and *B* are in some way complementary. For example, *A* is an object that can exist on its own and *B* a possible feature of it (correlation substantive-adjective); or *B* is what may happen to *A* in time (correlation subject-verb); or *A* is an activity and *B* something the activity can be performed on (corre-

lation verb-object); etc. We call this correlator *presence keeping* and we represent it graphically by means of a horizontal bar:

—	—	—			
green	leaf	John	runs	reading	books

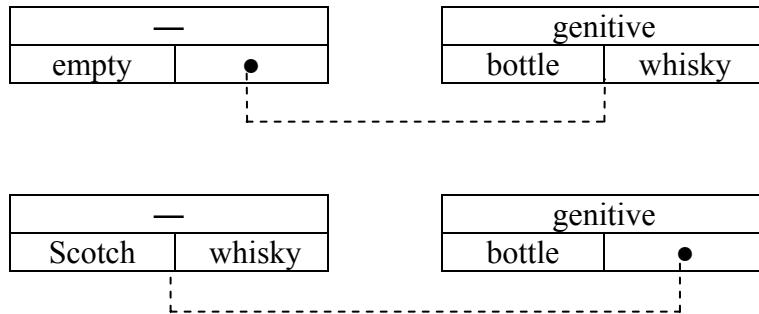
Since this correlator is, as we can easily understand, the most used of correlators, it is convenient not to express it with a word and to indicate its presence either by simply putting the two words that it correlates one after the other (when this is possible) or using marks of the words (English has very few marks of this kind, but many languages have several of them: for instance, in the Italian sentence “bottiglia di vino nuova”, which means “new bottle of wine”, the two “a” that are underlined are marks of the feminine genus, which indicate that the adjective *nuova*, “new”, has to be related to *bottiglia*, “bottle”, not to *vino*, “wine”). Because of this, this correlator has also been called *implicit correlator*. Nevertheless, it is really implicit only when no linguistic element (whether word order or word marks) expresses it, that is, only when we can understand which words it links only by the general sense of the sentence. For example, in the two expressions “empty whisky bottle” and “Scotch whisky bottle” only the sense of the expression tells us which noun the two adjectives “empty” and “Scotch” refer to.

According to OS, correlation is the basic unit of thought. Thought is, in fact, a “network” formed by correlations (*correlational network*) in which a correlation acts as a correlatum of another correlation. Therefore, the sentence “John reads books and magazines”, for instance, has the following structure of thought:



(the dotted line that starts from the line that separates the two lower boxes of a correlation and that ends with the symbol “•” placed in one of the two lower boxes of another correlation indicates that the first correlation is one of the correlata of the second correlation).

In order to use less space, I resort to a graphic representation with the correlational triads on the same line. The triads are not on the same line in Ceccato's original graphic representation, and therefore it is more similar to a network. However, irrespective of the graphic representation, *it must be very clear that the structure of thought is not a simple linear structure where the elements are added one after the other*. The elements (that is, the meanings) that make up thought are surely loaded one after the other in working memory, and the previous elements are kept present while the next ones are added. However, what is formed is a precise *non-linear* structure, which can be different even when the words are spoken in the same order. For example, the two aforesaid sentences (“empty whisky bottle” and “Scotch whisky bottle”) are, from a certain point of view, identical (that is, they are made up of a first word, which, albeit different, is in both cases an adjective, plus two identical words in the same order), but the two corresponding correlational networks are different:

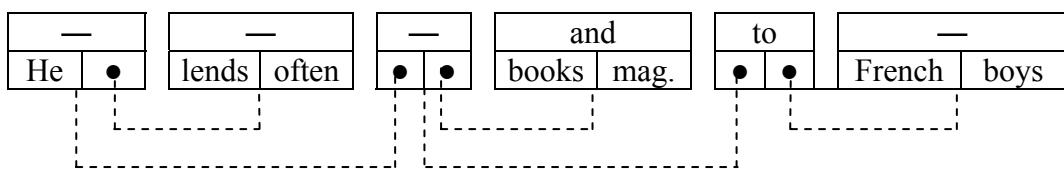


(in the two triads where the correlator is the genitive the order of the two correlata is inverted in comparison with speech order because English can use the inversion of the two correlata to express the meaning of the genitive; this would not have happened if the genitive had been expressed with the preposition “of”: see the analysis of the genitive further on).

The theory of the structure of thought that has just been introduced is called *correlational theory of thought*. Below is the correlational network of thought that corresponds to a more complex sentence than those above:

*He often lends books and magazines to French boys*

which, from a certain point of view, can be considered a typical sentence (there is a subject, a verb, an adverb, a direct object, an indirect object, a conjunction and a preposition).



This example shows even more clearly that the structure of thought is more complex than the simple sequence of the words that express it.

Obviously, the correlational theory of thought is also a linguistic theory, but *deeply different from all other linguistic theories* because: a) it is above all a theory about the nature and structure of thought; b) it makes a clear-cut distinction between correlators and correlata; c) it considers linguistic thought a non-linear “network”, based on units necessarily composed of three elements, that is, one element that ties and two elements that are tied (even if sometimes the former is not expressed).

In my description of mental categories and thought, their procedural and architectural character is implicit. When mental categories are formed, a working memory is necessary to keep the result of the previous mental operation present while the following operation is carried out. Furthermore, a procedural memory is also necessary to carry out these sequences of operations starting from the linguistic input. When the correlational network of thought is formed, i.e. when mental categories of relationship (correlators) link correlata to each other, a working memory and, when we understand language, a procedural memory, are still necessary. Theoreti-

cally, the process of production of the correlational network can go on without limits. Practically, its limit is exactly the capacity of working memory. This corresponds to the well-known fact that sentences have a limited length (even if they can be very long) and are separated by full stops in writing and by pauses in speech. A **full stop** and the corresponding pause exactly indicate that working memory has stopped being loaded. What has been present in it up to that moment has to be in some way stored in a short-term memory. An item or a part of a correlational network or even a whole correlational network is often taken from short-term memory and loaded again in working memory in order to begin a new correlational network. This function, which we may call *recall function*, is very important, because it allows us to build even very complex thoughts. It is mainly carried out by pronouns. In the following two examples, the pronoun and the preceding part of the correlational network that it recalls are underlined:

- a) "This morning I saw Bob. But he didn't see me."
- b) "This morning I saw the German boy I knew at the seaside last summer.  
He told me..."

Given the level of complexity that the correlations of thought can reach, the aforesaid process requires a huge capacity of working memory. The task of procedural memory may also be very difficult. All of this could be one of the main reasons for the huge differences between human thought/language and animal thought/communication. In order to deal with this subject, I use a very simple example. Let's imagine that we have an apple and a leaf. It is very likely that a lot of animals can perceive an apple or a leaf. Amongst the motor activities that the animal can perform, there is the activity of producing sounds when a certain object appears in its visual field (or other perceptual field). These sounds can be recognised by some other animals of the same species making them direct their attention so that they too can perceive the object. All of this is surely a form of communication. Yet research in linguistics and psycholinguistics has repeatedly stressed that this form of communication is different from human language in some fundamental features, one of which is that in animal communication the number of objects that can be indicated is very limited and fixed and the relationship between a certain sound and a certain object is fixed too [93].

According to OS, a *fundamental difference between human mind and animal mind* could be the fact that the former has:

- 1) an *attentional activity* that is *much more sophisticated* than the latter;
- 2) an activity that is probably absent or almost absent (at least spontaneously)  
in animals: the *production of mental categories and correlational network*.

The very sophisticated human attentional activity allows humans to *fragment* their experience in a far richer way than animals. In the aforesaid example, humans can isolate the perceptions "apple" and "leaf" (that is, two specific shapes, which are different from the shapes of any other object) from two other perceptions, the colour "red" and the colour "green". Humans can do the same in innumerable other situations: they can isolate the action of "flying" from the object "bird", the meaning of the adjective "hard" from the object "stone", etc. As a result of this process of fragmentation, many single different meanings are created.

Then, at the level of thought, correlators allow humans to perform a *recombination* of these many single different meanings, thus generating sequences (that is, sentences) that can be made up of many of them. In this way humans, by means of a number of words that is *limited* (even if rather big: the words that designate the aforesaid many meanings that have been created, i.e. the lexicon of a language), can produce an *unlimited* number of utterances, that is, they can describe *any* experience. For instance, with the words of our very simple example, they can describe, besides a red apple and a green leaf, a green apple and a red leaf too. *The aforesaid two processes, the one of fragmentation and the one of recombination, are, according to OS, the essence of human language.*

All of this implies a huge advantage from an evolutionistic point of view. In this way, human beings have acquired the ability to tell each other any experience they have. Therefore, a huge accumulation of notions becomes possible for every human being, with the only limit of the long-term memory capacity.

## § 7. — The grammatical terms according to Operational Semantics

The correlational theory of thought allows us to give an easy definition of some grammatical terms that have always been considered fundamental, but have always been very difficult to define.

One such concept is “subject”. While everyone is able to identify the subject of a sentence, all the definitions that have been suggested up to now in some cases fail to identify it. For example, the semantic definition (“subject is who/what performs the action or is in the state expressed by the predicate”) fails in identifying the subject in the passive sentences (for example, “Tom was arrested by the police”); the morphosyntactic definition (“subject is what triggers agreement morphology on the verb”) does not work in languages where this morphological agreement is (partially or totally) missing (however, as regards this definition we might also object that this agreement, when it exists, presupposes that the speaker *knows* which is the subject); the definition of subject as “what is being talked about” (or “topic”) fails in sentences such as “The little girl, someone hit her”, where the topic is not so much “someone” (that is, the subject) as “the little girl”.

On the contrary, thanks to the correlational theory of thought, OS offers a definition of “subject” and “object” that always works. According to OS, **subject** is what is focused on by attention, and kept present, *before* the verb; **object** is what is focused on by attention *after* the verb, which is kept present. We can easily see this different temporal setting in a couple of expressions such as, for example, “the wheel rotates” and “rotating the wheel”: in the former expression, what we see before is the wheel, while in the latter it is the act of rotating. In other words, “subject” is the first correlatum of a correlation whose correlator is presence keeping and whose second correlatum is a verb; “object” is the second correlatum of a correlation whose correlator is presence keeping once again, and the first correlatum is a verb. These definitions work perfectly in the aforesaid examples where traditional definitions fail. Moreover, they agree perfectly with two facts: a) languages where the order of subject, verb and object is either SVO or SOV or VSO

(that is, where the subject *precedes* the object, like in the correlational network of thought) are almost the totality of languages of the world, while the ones that have one of the other three possible orders (where the subject *follows* the object, contrary to what happens, in our opinion, at the level of thought) are extremely few; b) the languages that put the subject in the first position (SVO e SOV) are the very great majority [33; 47, p 68].

Another grammar concept that has been always considered necessary and fundamental is the “noun”. Yet, the definition of this concept has always been a big problem as well. School grammar books generally provide a semantic definition by stating that nouns are the words that indicate “persons, animals, vegetables, unanimated objects”. Some books also add “qualities, quantities, ideas”, or “places, events” and so on. The “verb” category (which is the main category in contrast with the “noun”; nevertheless, the infinite forms of the verb, i.e. the infinitive, the participle and the gerund, are commonly called “nominal forms”) is also generally defined in a semantic way: verbs are said to designate “processes or states”. Contemporary linguistics is perfectly aware that these semantic definitions are unsatisfactory: for example, a word such as “birth” designates a process, but it is a noun, not a verb; words such as “to be born” and “outside” are a verb and an adverb respectively, but they designate an “event” and a “place” respectively, which are among the things that nouns are supposed to designate. In general, we can say that many languages have a great many pairs of words which, like “to be born” and “birth”, have the same meaning, where one is a verb and the other a noun (unlike English, where there are fewer such morphologically different pairs and often the same word has both functions).

Contemporary linguistics has therefore tried to go beyond these semantic definitions. In general, it has tried to give functional definitions and/or definitions based on the relationships among the parts of speech. In order to give an idea of these kinds of definitions, the noun, for example, is said to be what occurs with articles and attributive adjectives (that is, the adjectives that are part of a noun phrase headed by the noun they modify, such as “happy” in “happy years”) and is the head of a nominal phrase. Nevertheless, these definitions are partially not applicable in some languages (for example, Russian and Latin do not have articles), are partially tautological (“*nominal phrase*”) and easily end up being circular (the noun is defined in terms of its relationships with the article and/or adjective, and the latter two can be defined, either directly or indirectly, in terms of their relationship with the noun). Apart from this, even if a definition of this kind works (i.e. it identifies words that are sensed as nouns), the two following objections are still valid: a) we can say that the definition works exactly because *we already sense* very well which words in a sentence are nouns, even if we do not know how we do this (the theory that we record these reciprocal relationships and/or functions unconsciously is not very convincing, because it involves an unconscious elaboration that is rather complex and incompatible with a circular identification of the various parts of speech); b) the fact that nouns occur with certain other parts of speech however does not explain *what nouns are*, i.e. what their *nature* is.

The real problem is not giving a definition of “noun” that works, i.e. that always identifies which words in a sentence are nouns. *The real problem is understanding why we sense very well that in speech there are words that all belong to the same*

*class*, which is called the class of “nouns”. If we understand this, the definition of “noun” comes automatically.

OS provides a simple and natural solution to this problem. We have to note that:

- 1) conjunctions, prepositions and the verb in the personal form are never nouns;
- 2) the verb in the infinitive forms is a noun instead (for example, “reading books”);
- 3) the adjective has always been considered a noun (the present-day substantive/adjective distinction was absent in the Greek and Latin grammar but was introduced during the Middle Ages and the expressions “substantive nouns” and “adjective nouns” have been used for a long time since then [81, p 106-7 It ed]; in linguistics, adjectives are commonly considered “nominal forms” as are substantives).

According to OS, the grammar category of **noun** is based on the fundamental distinction between *correlators* and *correlata* (section 6), i.e. between elements of linguistic thought that have the function of linking and elements that are linked by the former. Nouns are the *mere correlata*, i.e. the words that designate something which *has no relating function*, unlike the words or morphemes that designate a correlator or *also* (see below) a correlator. Nouns are therefore the meanings which, in the graphic representation of the correlation triad that we use, are *exclusively* placed in one of the two lower boxes, unlike the meanings that are placed or are also placed in the upper box. Therefore, according to OS the grammatical category of “noun” *can be defined only by using the position the word has in the correlational network as a criterion of classification, not by basing ourselves on a semantic criterion*. For example, the words “John”, “piece”, “glass”, “doors” and “windows”, which are mere correlata in the following correlations:

—	of		and		
John	reads	piece	glass	doors	windows

are nouns. The adjective also indicates a mere correlatum, as we can see in this example:

—	
red	book

Instead, the **verb in the personal form** is never a “noun”, because it does not simply indicate a correlatum (thus it is not a “*mere correlatum*”), but it designates a good four things:

- a correlatum;
- a particular correlator, the presence keeping (therefore, it indicates both a correlatum *and a correlator*);
- the position of the correlatum, which is the one of a second correlatum;
- that the first correlatum is what grammar calls a “person” (that is, the agent or the “addressee” of the linguistic interaction, or another person/thing [47, p 193]), and the kind of this person (first, second, third, singular, plural, etc).

That is, for example, the personal form of the verb “to laugh” *laugh-s* indicates that the verb has to be related to a third person singular. Therefore, “laughs” is not a *mere correlatum*, but designates a *whole correlation*, i.e. the following:

—	
a third person singular	laugh

Instead, the verb in the infinitive mood is a mere correlatum, as in the following examples:

—	
to be	strong

—	
reading	books

Therefore, in this case the verb is a noun. Thus, the noun/verb distinction does not have a semantic basis, but depends on the function of the meaning in the correlational network: the same meaning and, depending on the language, the same word, can be either a verb or a noun, as in the following examples:

—	
I	run

—	
long	run

Do not be misled by the fact that the *position* of the word “run” is the same in both correlations: its *function* in the two correlations is different (this is *not* shown by the graphics we are using—this would have been too complicated). In the first correlation, the word “run” is a first person personal verb. English does not indicate this in any way, and we can only deduce this from the fact that the correlation of the personal pronoun “I” with the word “run” as a noun would have no sense. Since “run” here is a personal verb, it indicates a correlatum, its position of a second correlatum, the correlator “presence keeping” and that the first correlatum is a grammatical person, as we have said. In the second correlation, the word “run” cannot be, based on the general sense of the expression, a personal verb, therefore it indicates a correlatum only, not all of the above. That is to say, it is a noun. Other languages do not rely on the general sense of the expression, but indicate if a certain meaning is either a noun or a verb in the personal form in a morphological way. For example, French would say *je cours* (“I run”) and *longue course* (“long run”). The “-s” ending of *cours* indicates a good five things: 1) that the meaning of the theme *cour-* (which is the theme of *course* too) is not isolated, but is linked to something by means of the presence keeping; 2) its position is that of a second correlatum; 3) the first correlatum is a first person; 4) thus, since *cour-* is a personal verb, its mood is the indicative and 5) its tense is the present.

Other fundamental grammatical terms are “substantive” and “adjective”. According to OS, the **adjective** designates something that does not exist independently, but is necessarily tied to something else, from which it can be isolated by means of the selective ability of attention (this generally also applies to the verb, which nearly always refers necessarily to an agent (for a definition of the meaning “agent”, see further on), but, as we have seen, the verb requires a prolonged attentional focalization, which makes it a category apart). On the contrary, the **sub-**

**stantive** designates something that exists (or is considered) independently. For example, the meanings of words such as “tall”, “green”, “hard” do not exist as independent things (unlike the meanings of words such as “man”, “leaf”, “stone”), but are necessarily tied to something, which owns them as features, and are only obtained by means of a mental operation of separation.

## § 8. — Analyses of the other fundamental mental categories

### *Correlators*

The first meaning of a correlator that will be examined here in linguistics is commonly called “genitive”, from the name of the case that expresses it in the classic Indo-European languages. This meaning is expressed in English by means of the preposition “of”, the possessive case, and word order. Although this meaning is not included in the two lists that were chosen to identify the fundamental mental categories, in linguistics it is generally considered fundamental (in English, the preposition that designates this meaning, “of”, is the most frequently used preposition and the second most-used word).

Just like every correlator, the genitive ties two correlata, the one that is present first at the level of thought (first correlatum) and the one that is present after (second correlatum). The principle that the order at the level of thought is mirrored in the word order of speech is valid for the correlators that we have considered until now and, in many languages, generally for all correlators. That is, the word that expresses the first correlatum precedes the one that expresses the second correlatum. This is not always the case however. There are many languages where, since they often express the correlators by means of a case mark, an inversion of the aforesaid order is allowed. For example, the English expression “the walls of the town” can be translated into Latin both by using the order of thought (*moenia urbis*) or by inverting it (*urbis moenia*). Furthermore, some languages can express the meaning of the genitive exactly by inverting the order (for example, in English, “safety belt”), or in some cases apply the inversion anyway (for example, still in English, the so-called “possessive case” involves the inversion [“John’s car”]). Therefore, in the case of genitive, which is the first and which is the second correlatum could be unclear. This calls for an explanation. The first correlatum (which we shall call *A*, as before) of the genitive is the one that in English precedes the preposition “of”, the second correlatum (*B*) is the one that follows it.

Having explained this, the meaning of the correlator can now be analyzed. The **genitive** indicates the attentional focalization of something, *A*, while keeping in mind that *A* was previously focused on together with something else, *B* (this analysis is my own).

If we wish to make a comparison with the correlator “with”, we can say that, while “with” designates a sort of “addition”, in the sense that the attention, after focusing on *A*, includes *B* too, the genitive designates a sort of “subtraction”, in the sense that, of the whole *A+B* that is kept present, we take *A* into consideration. For example, if, looking at a man with a black hat on his head, we say “there is a man with a hat” and then add “the man’s hat is black”, in both cases the attention

has focused on the man and the hat together, but when using the genitive the attention focuses then only on the hat (in order to talk about it and say that it is black).

The genitive can indicate many relationships between things. The classifications used in linguistics are more or less similar to the following: 1) various kinds of possession (for example: "John's eyes", "John's car", "the diameter of the sphere") and association ("the sound of the trumpet", "the paintings of Raphael", "1929 recession"), relationship indicated by the noun being modified ("John's wife"); 2) belonging to a group ("three of us"); 3) composition ("marble statue", "group of men"), containing ("a glass of water"); 4) participation in an action, as an agent ("John's arrival") or as a patient ("the discovery of America"); 5) origin ("men of Rome"); 6) cause ("to die of tuberculosis"); 7) purpose ("safety belt"); 8) quantity ("a height of 100 m"); 9) quality ("man of honour"); 10) denomination ("the city of Rome"); 11) plenty or lack ("full/devoid of malice"); 12) topic ("grammar book"), in respect to ("slow of speech"); 13) fault, accusation and similar things ("guilty of murder"); 14) age ("a child of four years").

All these cases confirm our analysis that the first correlatum is focused on while keeping present that it was focused on together with the second correlatum. The fact that the genitive simply indicates, in an *extremely general* way, that its correlata were focused on together by the attention, clearly explains the fact that the relationships that there can be between the two correlata of the genitive are many, and that it can be used in very many cases.

Therefore, the relationships between *A* and *B* are the ones where *there is no interruption in the attentional focalization*, such as those designated by the preposition "with" ("cup with handle" → "the handle of the cup") and the verb "have" ("that man has a moustache" → "the man's moustache"). The implicit correlator also designates a relationship of this kind. Therefore, the genitive can be used when one of the following relationships occurs: substantive-adjective ("white wall" → "the whiteness of the wall"), subject-verb ("John runs" → "John's running" [so-called "subjective genitive"]) and verb-object ("choosing the cards" → "the choice of the cards" [so-called "objective genitive"]<sup>6</sup>), verb-adverb ("moving slowly" → "the slowness of the moving")<sup>7</sup>. If there is an interruption in the attentional focalization (that is, in practice, there are two attentional focalizations), as in the case of the conjunctions "and" and "or", and the link is only given by the presence keeping (PK), then the genitive cannot be used, because there is no relationship between the two things, and it is we who link them (for example, after having said "on the table there is a bottle and a cork" we cannot say "the cork of

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<sup>6</sup> Note that in the objective genitive it is the *first* correlatum of the starting relationship, that is, the verb ("choosing", in our example), that becomes first correlatum in the correlation that has the genitive case as correlator, not the *second* correlatum, as happens in the other cases. This is due to the fact that, if the patient becomes the first correlatum (that is, subject) of the verb of which it was before the object, we have the passive form of the verb (see further on): in our example, starting from the expression "choosing the cards" we have not "the cards of the choice", but "the chosen cards".

<sup>7</sup> Note that in this passages the first correlatum of the genitive case becomes always a substantive, even if before was not ("white wall" → "the whiteness of the wall"). Naturally, this is due to the fact that it is considered in isolation (see the definition of "substantive", p 27).

the bottle”, while we can do this if the first sentence was “on the table there is a bottle *with* a cork”).

It is important to note that, in practice, the use of this mental category often has the result (and the purpose) of identifying something, belonging to a certain class, by means of something else that has been focused on by attention together with the former. For example, expressions such as “the panes of the window”, “John’s car” etc identify a certain item belonging to a certain class. An example where this is clearer can be “the fireplace of the hall” vs “the hall of the fireplace”: the former expression implies that there are at least two fireplaces and the hall is used to identify one of them, the latter that there are at least two halls and the fireplace is used to identify one of them. This explains why the two correlata of this correlator can be inverted in rare cases only, i.e. when *B* can be used to identify *A* and vice versa (“glass bottle” and “glass of a bottle”, “the bottle of the wine” and “the wine of the bottle” etc), but not when this does not happen (“the buttons of the jacket”, but not “the jacket of the buttons” etc). In the cases of the second kind, if we want to speak of the first term, we just put it as the first correlatum and designate its relationship with the second (“the jacket with the buttons”).

Correlations can also be made on the “maps”, which means designating the position of something with respect to something else. The operations that these correlators designate are obvious: we shall mention them for the sake of completeness only. At least two things (objects or activities) are involved, *A* and *B*. The structure is the general one of correlators, that is, *A* is focused on by attention (AF) and kept present (PK) while the attention focuses on *B*.

When there are two correlata, *A* and *B*, the part of the “map” that corresponds to *A* can be a part of the part of “map” that corresponds to *B* (preposition **in**) or not (preposition **out of**).

If we relate a thing (*A*) not with another thing, but with two or more other things (*B*, *C*, etc), there is also the possibility designated by the preposition **between/among** (the attentional focalization of *A* takes place in the area(s) encountered when passing directly from *B* to *C* etc (the distinction between two things/more than two things, which English makes, is not present in other languages).

When correlating something (*A*) to something else (*B*) on a “map”, if we take, as a reference, the vertical or the horizontal direction (both passing through *B*), we obviously have the categories that correspond to “right/left” and “up/down”, but that designate correlators (**on the right/left of** and **on (or over)<sup>8</sup>/under**, respectively).

The operations corresponding to the categories “in”, “out of”, and “between/among” can also be performed on the temporal “map” or other “maps” (for example: “*in* the past”, “a pause *in* the speech”, “*in* this series of numbers”, etc; “*between* 9 and 10 o’clock”, “*between* the subject and the verb”, “*between* 2 and 4”, etc). The structure of the category “out of” also allows it to be used on the temporal “map”, but, since this “map” is asymmetric, what happens “out of” a given time is made up of two phases that are clearly distinct, the one that precedes and the one that follows that time. Therefore, the word “out”, when referred to

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<sup>8</sup> This distinction, which concerns the contact, can be found in English, but not in other languages.

time, can only be used in rare cases where the time before and the time after are equivalent, such as in the expression “out of time”.

In a “map”, following some activity by attention (first correlatum, *A*) can also involve the shifting of the attentional focus with respect to something else (second correlatum, *B*). The two possible directions of this movement, which we may call “moving away” and “approaching” and/or symbolise by the symbols  $A \rightarrow$  and  $A \leftarrow$ , are naturally indicated by the prepositions **at/to**<sup>9</sup> and **from**.

The analyses of the correlators that we have just considered are, as we said, obvious. The meaning of another preposition (found in various languages), which is in some ways similar to the preposition “at/to”, i.e. the preposition “for”, is less obvious. Some observations should also be made about the three prepositions “at/to”, “for”, and “from” together. The preposition **for**, like “at/to”, designates attentional movement towards and/or entering into attentional contact with something, but differs from “at/to” because with “for” the contact is extended, prolonged or repeated, while with “at/to” the contact is restricted or single.

The aforesaid movements ( $A \rightarrow$  and  $A \leftarrow$ ) can take place on a spatial “map” (“going *to* Rome”, “coming *from* Rome”, “passing through [“*for*”, literally, in other languages] Rome”) or a temporal “map” (“*from* 9 *to* 10 o’clock”, “he lived there *for* three years”) or a “map” of another kind (“he got down *from* the first *to* the last position of the hit parade, passing through [other languages use *for* instead of “through” in such cases] the intermediate ones”).

Maybe the aforesaid shifting of the attention is not so strictly related to a “map”. Cases of this kind are the following.

a) Preposition “at/to” — In many languages, this preposition is used after verbs such as “to give”, “to say”, “to bring” etc for the so-called “indirect object”. Adjectives such as “harmful”, “useful”, “near”, “similar” etc are also followed by “at/to” in many languages. This is due to the fact that in all these cases there is a shifting of the attention, as happens on the “map”. Other languages, such as Latin, use a case mark in both these cases, the **dative case**. In the passage from a language that has the dative case to a derived language that does not (from Latin to French or Italian, for example) this case is almost always replaced by the preposition “at”. This demonstrates that the preposition “at/to” and the dative case are substantially the same.

b) Preposition “from” — Verbs such as “to originate”, “to separate” etc also imply a shifting of the attention, as happens on the “map”.

The structures that we have suggested for the prepositions “at/to”, “from” and “for” explain their use very well. Let’s consider them one by one.

- 1) In addition to the above, the structure of “at/to” lends itself to indicate the following relationships:
  - purpose (for example: “she has gone out to smoke”): while we keep the action of “going out” present, the attention enters into contact with the action of “smoking”, which is, in this case, the purpose;
  - manner (“to be at one’s best”) and (in some languages, unlike English) means (for example, the French expression “jouer à la balle”, which is

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<sup>9</sup> This distinction can be found in English, but not in other languages and will therefore not be considered.

translated by the English expression “to play with a ball”, literally means “to play at ball”): while we keep the actions of “being” or “playing” present, the attention enters into contact with “one’s best” or the “ball”, which, in these cases, are the manner and the means, respectively;

- sometimes, the relationship of cause (“he was shocked at the news”): see further on;
  - other relationships that are quoted by grammar books and dictionaries, such as advantage/disadvantage (“cheque to bearer”), measure/price (“running at 100 km/h”), comparison (“similar to”) etc, for which the same consideration applies.
- 2) We have hypothesised that the operations designated by “for” are similar to those designated by “at/to”, but differ because there is an extended, prolonged or repeated attentional contact with the second correlatum. This clearly explains four facts.
- The first is that both prepositions are used in some cases (“harmful to/for health”, “he was sorry at/for her departure”; in several languages this phenomenon is more widespread than in English).
  - The second is that in some cases where a certain language uses “at/to”, another language uses “for” and vice versa (for example, the Latin expression *ad laudem insignis* is translated by the English expression “famous for his merits”). Similarly, in some cases where a language uses the dative case, a derived language that does not have this case uses “for” instead of, as happens more commonly, “at/to”. For example, Latin has the so-called “dative of advantage or disadvantage” (for example: *non solum nobis divites esse volumus*, “we do not want to be rich for ourselves only”) and the so-called “dative of reference” (*venientibus ab Italia*, “for those who come from Italy”). In a language that derives from Latin such as French the preposition *pour* (“for”) translates these two kinds of dative case.
  - The third is that we use “for” and cannot use “at/to” when the relationships are a prolonged contact in time (“he lived there *for* three years”) or in space (“passing through [“*for*”, literally, in other languages] Rome”).
  - The fourth is that both prepositions can indicate relationships of cause and purpose, but one of them does this better. In fact, we can find both prepositions to indicate cause (“he was sorry at/for her departure” and many other possible examples in other languages; “he was shocked at the news”, “I cannot see the road for the fog”), but the extended, prolonged or repeated contact that the preposition “for” is thought to express, can better express the “strength” of the causal relationship, which furthermore is often prolonged in time (“he got pale for fear”). In agreement with this, “for” seems to be used much more frequently than “at” when a relationship of cause is involved. Nevertheless, in cases where there is a causal relationship, but what happens exactly is a “single” contact (“he was shocked at the news”), we find “at”. We can also find both prepositions in the case of the relationship of pur-

pose (“used to make/for making”; in several languages this phenomenon is more widespread than in English), but “for” expresses better than “at” the lasting attention on something when we pursue it as a purpose. In agreement with this, in this case “for” seems to be more used than “at/to”.

- 3) The structure of the preposition “from” lends itself to indicate detachment from something in space or time or another kind of “map” and origin as well as the following relationships:
  - means, when the second correlatum is the origin of the first (for example, “he recognised her from the footsteps”);
  - agent: the analysis of this meaning (see further on) perfectly explains the fact that, whereas some languages have a specific preposition or case mark, others, such as Italian, use the preposition “from” to indicate the agent in the passive construction of the sentence (for example, “amato da tutti”, “loved by everybody”, literally “loved *from* everybody”).

After analyzing the main prepositions (or corresponding cases; since a preposition and a case are only two different ways of expressing the same correlator, in this paragraph we shall only use the term “preposition”, for the sake of simplicity), we can more clearly understand the concept that we mentioned at the beginning of § 5, when the preposition “with” was considered. The meaning of prepositions that are strictly related to the “map” concept (both spatial and temporal, or “maps” of a different kind), such as “on (or over)/under”, “in/out of” etc, seems, as we stated, obvious (and substantially unique). For the others (such as “with”, “of”, “for”) it is a completely different matter. The problem of their meaning has always proved to be particularly difficult. Linguistics has generally supported the thesis of a complex polysemy. There are basically two theses: 1) these prepositions have many meanings; 2) these prepositions have no meaning of their own, and take a meaning from the context.

Both theses (explicitly the first, but also the second) maintain that these prepositions are polysemous. Actually, the relationships between the things that each preposition correlates are very different. In attempting to identify their meaning, dictionaries and grammar books have long lists of relationships for each preposition (for example, for the preposition “of”, they list the relationships: “possession”, “composition”, “containing”, “agent or patient of an action”, “origin”, “cause”, “purpose”, “quality”, “quantity”, “denomination” and so on, as we have seen). Whether it is explicitly stated or not, these would substantially be the meanings of the preposition. In my opinion, it is highly unlikely that a preposition has so many meanings. In fact, this thesis disagrees significantly with the fact that words normally have only one meaning plus, possibly, a very few other meanings, namely the figurative, extended etc ones, which derive from the first meaning for easily understandable reasons (for instance, the term “nose” means a part of the face, but also snout, muzzle, shrewdness, the opening of a tube etc, a spy). Furthermore, the thesis that these are the meanings of the preposition disagrees with the fact that in several cases *the same* relationship can be expressed by *different*

prepositions (for example, in both the expressions “to be in bed *with* a fever” and “to be shocked *at* the news” the relationship is cause).

As mentioned, OS instead suggests the thesis that these prepositions *do not designate such relationships*, i.e. these relationships are not *the meanings* of the prepositions. These prepositions designate *much more general* relationships, which allow/induce sequences of mental operations, amongst which the ones of attention play a key role. We have proposed the analyses of such sequences. These very general relationships *include* the aforesaid more specific relationships (which depend on the two related things), but the meaning of these prepositions is only given by the first relationships, not the second. Therefore, *the meaning of these prepositions is only one*, in principle.

The aforesaid more specific relationships are designated *by the whole* that is made up of the preposition and the things that it correlates. This designation is often *partially implicit*, in the sense that, starting from the precise (and unique, in principle) meaning of the preposition and those of the two things that the preposition correlates, our general knowledge tells us what relationship is involved (cause, time, manner etc). This thesis is proven the fact that, if we consider *isolated* correlations, so as to limit the importance of the “general knowledge” factor as much as possible, we can find cases of ambiguity, such as “Smith’s book” (possession or relationship work/author?), “love of God” (an objective or subjective genitive, that is, does God love or is God loved?), “invisible for the crowd” (cause or limitation?), etc.

As we can see, OS therefore differs greatly from previous theories in linguistics about the meaning of these prepositions.

The correlator **because** in the two lists of fundamental words chosen above, expresses an extremely important notion, the so-called **efficient cause (cause)**, as a substantive; as a correlator, many languages also use, as we have seen, the more general meaning expressed by the preposition “for”). Naturally, we are not interested in the philosophical or scientific problems that are related to this notion (the dualism case/necessity, the existence of a “first cause” etc), but simply in the mental operations that are designated. In my opinion, these are:

- 1) in the temporal operational scheme (TOS), attention focuses (AF) on two things (that is, two events), *A* and, subsequently (or, at the best, simultaneously), *B*;
- 2) this experience is kept present (PK) while we perform
- 3) an operation of representation (R) of the absence of *B* in the hypothesis of an absence of *A*, a representation that is induced by the memory (MO) of experiences that are equal (or similar) to the present one, i.e. experiences where the absence of events that are equal (or similar) to *A* is followed by the absence of events that are equal (or similar) to *B* (such experiences are eventually summarised in a general law).

The operation in point 3 is *necessarily a representation*, that is, something *intrinsically uncertain*. In fact, there can be two or more events that are equal (or similar) to each other, but, since a given event is by definition associated with a specific moment, *it cannot repeat itself any more*, precisely because of the passing of time. In other words, we can observe one or more events that are *equal* (or simi-

lar) to a given event, but we can *never* observe *the same* event more than once. Because of this, it is impossible to perceive/establish the existence of causal relationships with certainty (as stated by Hume). In order to determine a causal relationship *with certainty*, we should be able to go back in time and remove the supposed cause of a certain effect. This is impossible of course. We can only infer the existence of a causal relationship on the basis of equal or similar experiences. This lies behind the well-known unavoidable uncertainty of causal relationships in history (where no events are the same because each event is strongly associated with different people) and the certainty beyond any reasonable doubt of causal relationships amongst repeatable phenomena that are ascertained with the experimental method. Therefore, causal relationships are not *inexistent*, that is, illusory (Hume), but, *strictly speaking, not ascertainable* (even if for those where the phenomenon is repeatable the doubt is not reasonable).

In the case of the so-called **final cause (purpose)** as a substantive, **so (that), so as, in order that, in order to**, as a correlator; English and many other languages also use the more general meaning expressed by the prepositions “for” and “to”, as a correlator, as we have seen), the meaning, i.e. the operational scheme, is the same as the efficient cause (in fact, the term “cause” is used in both cases). However, in the final cause the cause is given by will, whose object is “purpose” (for the meaning of “will”, see further on). In fact, we can always change a final clause (for example, “I study to learn”) into a causal clause introducing will as a cause (“I study because I want to learn”).

Let's consider the conjunction “if”. Grammar books distinguish the so-called *conditional* “if” (e.g. in sentences such as “if you study, you will learn”) from the so-called *dubitative-interrogative* “if”, which is used in dubitative and indirect interrogative sentences (e.g. “I do not know if I shall go”, “tell me if you will go”). Nevertheless, linguistic data, as a whole, show that there must be a strong affinity between the two kinds of “if”. In fact, in the various languages the conditional “if” and the dubitative-interrogative “if” can be expressed: 1) always by the same word (as in French: *si*); 2) by different words, but also by the same word (as in English, which uses *if* and *whether/if*, respectively); 3) by different words, but with the possible presence of indications that suggest an affinity (for example, Latin does not use the word that expresses the conditional “if” [*si*] to express the dubitative-interrogative meaning, which is expressed by the enclitic particles *-ne* or *num* in the simple indirect interrogative sentence, and *utrum...an* [“whether...or”] in the double indirect interrogative sentence; nevertheless, in the latter we can also find *sive...sive*).

Let's take two very simple examples of the two kinds of “if”, where the governed clause is the same.

- *You will see, if you will go* (conditional “if”)
- *Tell me if you will go* (dubitative “if”)

In *both* cases the **conjunction “if”** designates an alternative in the operation of representation, i.e. on the one hand, we represent the meaning of a clause (*A*) and, on the other, keeping this meaning present, we discard it (the latter operation is, as we have seen, the negation).

In the case of the conditional “if” *only the meaning A* (that is, the eventuality “you will go”, in our example) is correlated (as a second correlatum) to another clause (“you will see”). In the case of the dubitative-interrogative “if” *the whole alternative A/not-A* is correlated (still as a second correlatum) to another clause (“tell me”). The languages that use the same word in both cases rely on the fact that the meaning of the main clause is sufficient to settle the ambiguity: if an alternative is implied, then the dubitative-interrogative “if” is involved.

### **Interrogative, indefinite and relative pronouns and adjectives**

We have stated that the categories “who”, “what” and “which” (and “where”, “when” and, as we shall see, “how” as well) designate that attention selects an *unspecified item* ( $A_x$ ) belonging to a group of items that are considered equal to each other ( $A_1, A_2, A_3, \dots$ ). Therefore, they substantially designate *an unsolved alternative*. The result is that, even if put into a correlation, they give a “sense of suspension”, which is not present in other correlations. Compare the two expressions “yellow flower” and “which flower”. These two correlations are equal.

—	
yellow	flower

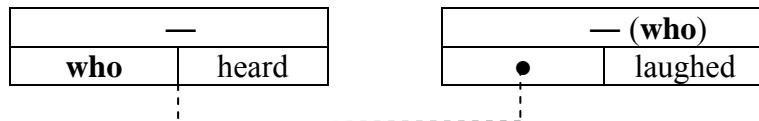
—	
which	flower

The expression “yellow flower” means that a *definite* thing (a “flower”) has a feature (what the adjective “yellow” means), which is also *definite*. Therefore, in this sense, the expression is *accomplished*. The expression “which flower” instead indicates that, given the class of flowers, we have to select *one*. Therefore, *it is not definite*, and, above all, actually remains an *isolated* substantive, that is, a substantive that is not correlated with an adjective or a verb (i.e., from this point of view, saying “which flower” is no different from simply saying “flower”). Hence this sort of “sense of suspension”. Note that this sense of suspension remains even if the adjective “which” is correlated with something unique (therefore, well identified) such as a proper noun (for example, “John who...”). In this case, the adjective has the effect of “making plural” even the proper noun, because the expression “John who...” means “John, in a *particular* moment or attitude etc of the *various* possible moments or attitudes etc (for example, “John who laughs”).

This particular meaning clearly explains how we can use these categories.

- 1) Since these categories substantially designate an alternative, it is possible to correlate *two* (or more) things to it, by repeating the word that designates the category: this is the use of **who/what/which as indefinite pronouns/adjectives** (for example, the Italian sentence “chi parlava, chi tacceva” [“some spoke, some were silent”], which literally means “who spoke, who was silent”). This use is not present in all languages, because it is the same as using the more specific (and more appropriate) term “some” (for this term, see further on): some languages, such as English, use the latter term only, other languages, such as Italian, have the alternative.
- 2) It is also possible to correlate something to the category and try to eliminate the alternative, that is, try to identify  $A_x$ : this is the use of **who/what/which as interrogative pronouns/adjectives** (for example, “who knocks?”; for the meaning of the interrogative form, see further on).

3) Finally, it is possible to insert the category, after having correlated it with something, in another correlation: this is the use of **who/what/which as relative pronouns/adjectives** (for example: “those who heard laughed”). In this case, the person who the pronoun “who” refers to remains unspecified, but, whoever he or she is, he or she becomes the correlatum of something else definite, so that the aforesaid “sense of suspension” stops. It is important to note that when “who/what/which” are used as relative pronouns/adjectives, they designate *not one but two* elements of the correlational network, that is, both a correlatum (as in cases 1 and 2) and a correlator, the presence keeping (we have seen that the verb in the personal form also acts in this way). For example, the correlational network that corresponds to the sentence “who heard laughed” is the following (the double role of the relative pronoun has been highlighted by means of a bold font):



These statements about the uses of “who/what/which” also apply to “where” and “when” (and “how”, which, as we shall see, is based on the same operations). The distinction that grammar makes amongst indefinite, interrogative and relative pronouns/adjectives (cases 1, 2, and 3, respectively) is therefore more a *use* than a *meaning* distinction. The meaning of the pronoun/adjective *is still the same*. This agrees perfectly with the fact that in many languages it is designated by the same word or theme or root.

### How and adverbs of manner

The meaning that is expressed, as a substantive (that is, when we designate it in an isolated manner), by the term **manner** (or **way**) and, in the adverbs, in several languages, by a suffix (**-ly**, in English), is very similar to the meaning of the grammatical category of “adjective” (which has already been examined), and has the same relationship with the verb that the adjective has with the substantive. We have said that the adjective indicates something that does not exist independently, but is necessarily tied to something else, from which it can be isolated only mentally, using the selective ability of attention (while the substantive designates something that exists, or is considered, independently, i.e. in an isolated manner). In the same way, “manner” is something that attention finds tied to a meaning of a verb and which is separated by it mentally, using the selective ability of attention. For example, the meanings of words such as “slowly”, “strongly” etc are not already isolated, but are necessarily tied to something (which is often a verb) that owns them as features, and are obtained by means of a mental operation of separation. The close analogy between what grammar calls the “adverb of manner” and the adjective is confirmed by the fact that in many languages, such as English, the large majority of words that designate adverbs of manner are made up of the same word that designates the corresponding adjective plus a suffix (“sweet-ly”, “easily” etc), and the fact that in some languages (for example, Turkish) the same word can usually be both an adjective and an adverb.

As stated, the word **how** designates the same basic operations that are designated by “who/what/which”, “where” and “when” (the attention selects an *unspecified* item ( $A_x$ ) belonging to a group of items that are considered equal to each other [ $A_1, A_2, A_3, \dots$ ]). In the case of “how” these items are “manners”. Therefore, this term has the same fundamental uses that we have seen in the paragraph above for “who/what/which” (“where” and “when” have the same uses too), that is, the interrogative use (for example, “How did you do?”) and the relative use (for example, “I don’t know how he did”).

### **Quantity-related words**

The two lists of fundamental words include some words that seem clearly related to “quantity”. We have seen that “quantity” originates from a particular operational modality, which we could call “summative”. This consists of keeping in mind each item of a group of items that are considered equal for as long as the attention focuses on a new item (naturally, we can only keep a limited number of items in mind, but it is possible to count up to an indefinite number simply by remembering the name of the number of the last item that we have named: the following name originates from the former on the basis of a rule, which is partially recursive). Besides the word “number”, some words that designate single numbers and the verb “to count”, which have been already examined, the words that seem related to quantity in the “semantic primitives” of NSM and the Swadesh list are: “much/many”, “few”, “some”, “part” and “all”. **Many** and **few** indicate a big and a small quantity, respectively, both in a relative and an absolute sense. The word **some** seems to mean both an “unspecified quantity” and an “unspecified, but small quantity”. The categories “all” and “part” indicate that a group of items is kept present and attention is focused on it again, while performing an operation of attentional selection or not. In the first case we have the category **part**, in the second case the category **all**.

Naturally, the terms **more** and **less** indicate the two possible results that differ from equality, of the operation of comparison (C) that concerns quantitative estimates.

### **Verb-related objects**

We have stated that things that require a *prolonged* attentional focalization to be known are the meanings of the verbs (or words whose theme or root is of a verbal kind, such as “recognition”, “invasion”, “birth” etc). When we recognise what a verb designates, our attention can almost always also isolate some objects, which we recognise *instantaneously* instead, from the process or state (for the sake of simplicity, from now on we shall only use the word “process”) that is the meaning of the verb. The few cases where this does not happen are essentially the verbs that designate meteorological phenomena, such as “it rains”, “it snows” etc. In this case there is practically no instantaneously recognisable object that is separated from the process: all we see is the process only (for example, with the verb “to rain” there is practically no separate object (“water”), because when it rains water appears in a particular form, which is typical of “raining”, and this form cannot be separated from the process of “raining” itself). In all other cases instead, one or some instantaneously recognisable objects can be separated from the process designated by the verb (for example, in the case of the meaning of the verb “to

fly”, there is always an object that can be separated from it and that can be recognised instantaneously, such as a bird). These objects have, with respect to the process and each other, *very precise relationships that are their role*. In other words, there is a temporal-causal *intrinsic order* in the process and the objects involved in it. Since in most cases all objects precede, as to *existence*, the process, and the situation is captured very quickly, the presence of such a temporal-causal order can escape at first sight. If we think carefully, we shall realize that, when *the dynamics* of the process are considered, such a temporal-causal order is always present and the attention *must* follow it. Let's consider it in detail.

1) There is always an object that originates and carries out the process, that is, that *precedes and determines the progress of each phase* of the process. In other words, such an object that, if removed (mentally, that is, by means of an operation of representation [R], or physically too), the process would not exist (that is, the operational scheme is the same as that of causality, which we have already examined). Since such an object precedes each phase of the process, it is *necessarily* focused on *first* by the attention that follows the process, and kept present. The object with such features is the **agent**. Some languages have a particular mark to indicate the agent (for example, Japanese has the affix |ga|). Many other languages do not have a particular mark, but indicate this meaning by means of **the construction of the sentence** and the **active or passive form of the verb**. When the verb is in the active form, the agent is used as subject, therefore something that, as we have seen, is focused on by attention *before* the verb, thus *in the same position that the agent has in the process* (note that the active form of the verb is, in many languages, simply the verb without any mark or with more simple endings than the passive form, showing that this *is the natural order* of things). When the verb is in the passive form, the agent is indicated by a case mark or a preposition (“by” in English, but some other languages, as we have seen, use the preposition that corresponds to “from”, which indicates one of the two possible attentional movements with respect to something, moving away: this preposition is therefore very suitable to indicate *the origin* of an action). In this construction, the patient, i.e. what *comes after* in the natural temporal-causal order of the process (see point 4 below) is used as subject, that is, focused on *before* by attention (because we are paying more attention to it, see point 4 below). The fact that the passive form of the verb is, in many languages, the marked one or the one that has more complex endings than the active form is a demonstration that this *is not the natural order* of the process. When the meaning “agent” is used as a substantive, many languages use suffixes, such as in English “-er”. Note that my analyses of “agent” and “subject” are *clearly different* from each other, in agreement with the clear-cut difference that has always been sensed between these two categories. In fact, we have proposed that the “subject” is what *is focused on by attention and kept present before a verb*, while the “agent” is what *precedes the verb from the temporal-causal point of view in the natural order of the process*.

2) There may also be a second object, which is almost always unanimated, *between* the agent and the process. This means that, in the dynamics, it follows the operating of the agent and, as the latter, precedes the process from the temporal-causal point of view. This second object is designated by the term **means**, when

we indicate it in an isolated way, i.e. as a substantive. At the level of the correlational network it is indicated by the **instrumental case** or **equivalent prepositions** (in English, **by**) or prepositional phrases such as the English **by means of**. In many languages, instead of this correlator we can also find, as we have seen, prepositions that have a *more general operational scheme than the instrumental one, but which can include the latter* (in English, “with” [“to write with a pen”] or, less commonly, “through” [“he was hired through an agency”]). Naturally, it is this intermediate position of the object between agent and process that explains the English term “means” and the other analogous terms of many other languages.

3) The third element of the dynamics is the process itself. At this point, maybe there are no other objects in the dynamics of the process, and so the attention does not pass to something else. It is probably this *not passing* or *passing of the attention* to something else that unconsciously determined the grammatical terminology **transitive/intransitive verb**, not the fact that there is “an action that passes from subject to object”, as is usually said. This definition works in the many cases where the object exists before and is modified by the process designated by the verb (“to dig the ground”), but does not work in examples such as “to dig a hole” or “feeling pain”.

4) On the contrary, in following the dynamics of the process, the attention may *pass* to a third object, which *follows* the process *from the temporal (in the dynamics, not as to existence, as we said)* and *effectual point of view* (that is, this object receives an effect from, or is in effect of, the process). The effects can be many: existence (“building a house”), end of existence (“destroying a house”), modification (“folding a sheet”), movement (“moving the furniture”), etc. This object is what linguistics generally calls the **patient**. Like the agent, some languages have a particular mark to indicate the patient (for example, Japanese has the affix **|o|**), but many others do not have it. As mentioned in point 1, the latter indicate this meaning by means of a **construction of the sentence where the patient is the object** (indicated by the related mark or position) **and the verb has the active form**. There are some cases where the attention focuses on the patient more intensely (variation in intensity of the attentional focalization, AFint-var, which was mentioned when the EOMC were examined) than the agent, sometimes to the point that the latter can even not be expressed (“John has been wounded”). In many languages, this is expressed, as mentioned, by means of a **construction of the sentence where the patient is the subject, the verb has the passive form and the agent (if expressed) is indicated by a preposition or a case mark**. In some languages, such as Italian, the preposition used is the equivalent of the English preposition “from”. As mentioned, this preposition indicates one of the two possible directions of the attentional shift with respect to something, the moving away ( $A \rightarrow$ ). Therefore, this preposition is very suitable to designate the agent of a verb in the passive form, because, as we have seen, in the temporal-causal dynamics of the process the direction is agent → process.

5) Following the dynamics of the process may also imply *shifting* the focus of attention to a fourth object. This is the **indirect object**, which is expressed, depending on the language, by the dative case or the preposition “at/to”, which indicate, as we have seen, this shifting.

As mentioned, it may be difficult realizing the temporal-causal dynamics that has just been described, because we perform these operations almost instantaneously, unconsciously, without any effort and many times a day. In order to realize them better, let's take a situation where all the aforesaid objects are present, such as the one described by the sentence

*Mary gave the book to Paula with her own hands*

and try to slow down the action to capture what the intrinsic temporal-causal order of the process is. Although this may all seem simultaneous at first sight, and all the objects exist before the verb, a more careful reflection will show that, whatever the order of the sentence that a given language uses, "Mary" is always *before* the process *in its progression* and the attention focuses on her as such, *then* comes "her own hands" (which also *precedes* the process *in its progression*), *then* comes the process of "giving", which *precedes* the "book" in the dynamics (this is very evident when the verb creates the patient, such as in the expression "to dig a hole") and *finally* implies a shifting of the attention to "Paula". This agrees perfectly with the fact that a construction with the agent as the subject, that is, in the first place in the descriptive thought (i.e. the active construction) is the standard construction.

### **Some fundamental verbs**

We have stated that the object in point 4 of the preceding paragraph can be *the effect of*, or *receive an effect from*, the process. In both cases there is a *causal* relationship, that is, the representation of the absence of something, *A* (the cause), is followed by the representation of the absence of something else, *B* (the effect), as we saw. Yet, while in the second case the process has an effect on something *that already exists* (the existence of the object *precedes* the process), in the first case the process *determines the existence* of the object (that is, the existence of the object *follows* the process). The latter relationship can be in a *pure* form, i.e. without any other specification about the process or the object. This is the meaning of the verb **to make** (Wierzbicka's list includes the English verb "to do", which differs from "to make" more as to use than as meaning; in fact, other languages have only one verb). This analysis can be verified by examining the examples provided by dictionaries, which show that the existence of the object of the verb "to make" is always determined by the process that is designated by the verb itself (for example, "to make: a son, a noise, a law, a cake, a face, money, troubles, friends, someone laugh, something better, sure, clear etc). Furthermore, if we try to think of the meaning of the verb "to make" in an isolated manner, we should sense that the meaning of this verb lies exclusively in this coming into being of the object as a consequence of the process.

The verb "to hold" is included in the Swadesh list, where "to have" is missing. Actually, the meanings of the two verbs are similar. The verb **to hold** and, even more so, the verb **to keep** (this distinction is present in English, but other languages have a single verb) indicate the same relationship as "to have", but also the agent-process relationship that we saw in the previous paragraph, in point 1. That is, the persistence of such a relationship between two objects that our attention tends to focus on both objects together (i.e. the meaning of "to have") is caused by an agent. One should sense this difference between "to have" and "to

hold/keep" very well by comparing the two pairs of expressions "she has/holds a baby in her arms" and "he has/keeps the engine on": both in the first and the second pairs of expressions the (static) relationship is the same (there is a closeness between a baby and a woman's arms, and a running engine and someone, respectively), but when "to have" is used, the fact that the baby remains in the woman's arms and the engine remains on, does not depend on the activity of the subject, whereas in the other two cases it does.

Let's examine the verb "to be". In English, this verb is generally said to have two (only two) meanings.

- 1) An example of the first meaning is "the book is on the table". In this meaning, in English (as in many other languages) the verb is often used together with a particle having a locative meaning ("on the table *there* is a book"). Since this meaning seems similar to that of the verb "to exist", it is often referred to as the "existential meaning".
- 2) The second meaning is commonly called "copula", which is used very frequently and for which there are infinite examples ("the book is nice", "the sky is blue" etc).

Besides being used alone, the verb "to be" is also used in many languages as an auxiliary verb (for the passive conjugation and some tenses of the active conjugation), which makes it the most used verb.

Let's attempt to identify the aforesaid meanings in terms of EOMC. We have stated that all verbs indicate a temporal operational scheme (TOS), that is, the attention follows the evolution of something over time. The verb **to be, in the existential meaning**, designates the simplest thing a verb can designate (in fact, grammarians have always sensed that "to be" is the most elemental of the verbs), i.e. something is, or can be, focused on by attention and this persists over time. That is, if we simply realise that, for a certain time (which will be indicated by the tense of the verb "to be"), something is, or can be, focused on by our attention, we say exactly that such a thing "is", or "there is", or "exists". For example, "the book is on the table" means that, at the present time, "the book" is (or we know it can be) focused on by attention "on the table".

Instead of focusing our attention on *only one thing*, *A*, and seeing that *A* persists over time, we can also focus the attention on *something*, *A*, and a feature of it, *B*, and have the same result. This is the **copulative meaning of the verb to be** (for example, "the book is red"). The fact that *B* is a feature of *A* implies that *B* is an adjectival meaning (as in the example that has just been made), or a substantival meaning that is yet used as an adjective, such as in the expression "John is an engineer": what matters is that *A* and *B* are not separate, but fused in *the same* attention focalization. Therefore, since there is little difference between the existential meaning and the copulative meaning of the verb "to be", it is natural that many languages use the same verb in both cases. It is also natural that, as mentioned, many languages use "to be" as an auxiliary verb, in order to express the passive form of all other verbs. The verb "to be", in this copulative function together with a verbal form that has an adjectival and passive meaning, such as a past participle (for example, "the thief is arrested by the police") lends itself perfectly to this purpose.

### Modal verbs

The main so-called “modal verbs” are “to want”, “can/may” and “have to”. The verb “to want” indicates a fundamental psychical function, will, therefore this verb cannot be analysed in terms of EOMC. As regards “can/may” and “have to”, first of all we have to note that, unlike “to want”, which can also govern a substantive, these verbs always govern another verb. Therefore, it can be said that these two verbs add some meaning to the meaning of the verb they govern. The first observation to make in order to identify their meaning is that, when one of these two modal verbs is used, the process or state (the word “process” will be used from now on) that is designated by the governed verb cannot have taken place at the time indicated by the tense of the modal verb. Saying “I can/have to work” makes no sense if we have already worked (at the most, we may say this if the action is still taking place, i.e. is not finished). In fact, the time when the process that is designated by the governed verb happens is generally in the future with respect to the tense of the modal verb. Sometimes, the tense can be the same or in the past tense (for example, in the sentence “dinosaurs may/must have become extinct because of the impact of a meteorite”), but in these cases the process, even if it refers to the past, it is not considered to have happened, because we do not know if it happened. If we knew it happened, these verbs could not be used. All this is because “can/may” and “have to” concern the *carrying out/reality* of what the governed verbs designate (I use the expression “carrying out/reality” because in some cases the former is involved, in others the latter: for example, “today I must/can work” and “there must/may be a solution”, respectively). More specifically, they designate an operation of representation, *which is based on something real*, regarding the carrying out/reality of what the governed verb designates. That is, first we *represent* (R) the meaning of the verb that is governed, which is not, at the moment, *real/a known reality*, then we represent *its carrying out/reality*, basing ourselves on another element—there is no need to say how important this is in practice. In this carrying out/reality, the following two cases are possible.

1) *There is no alternative*, i.e. the aforesaid operation of representation produces a *single result*: verb **have to** (for example, “I have to go out” means that something induces the representation of carrying out the action of “going out” only). The element which the representation is based on can be a material circumstance, a moral rule etc and the intensity of its power to condition can vary. Therefore, several languages use different verbs for the various cases (for example, the English verbs “must”, “have to”, “shall”, “should”, “ought to”).

2) *There is an alternative*, i.e. the aforesaid operation of representation produces a *double result*: verb **can/may** (for example, “I can/may go out” means that something induces the representation of performing or not performing the action of “going out”). The element which the representation is based on can be a material circumstance, can depend on the subject or somebody/something other than the subject, or can be an unknown factor (eventuality). Therefore, several languages use different verbs in these different cases (for example, English uses “can” in the first two cases and prefers “may” in the latter two), while other languages, such as Latin, generally use only one verb and rely on the context to understand what determines the fact that we “can/may”. The case of eventuality is

also expressed by means of the adverb **maybe** (see Wierzbicka's list) or phrases such as "it is possible that".

Instead of saying that the two verbs "can/may" and "have to" designate the presence or the absence of an alternative, respectively, it is perhaps more exact to say that "have to" indicates that there is no alternative *to the* carrying out/reality (that is, the carrying out/reality is sensed as the first pole of an alternative that lacks the second pole), while "can/may" indicates that there is *the* alternative *of the* carrying out/reality (that is, we have the alternative of performing/not performing the action).

My analysis clearly explains why the negation of the verb "can" that refers to the negation of the governed verb (that is, "cannot not") is equivalent to "must": if the alternative of the negation is excluded, we obtain the absence of an alternative.

### ***The interrogative sentence***

Let's examine the meaning expressed by the term **question** (as a substantive) and the **interrogative form of the sentence** (a particular construction or tone or verbal mood or particle or more than one of the former, depending on the language). There are three kinds of questions.

- 1) Those introduced by the pronouns/adjectives "who", "what", "which", "where", "when", "how". As we have seen, all these terms designate an unsolved *alternative*.
- 2) Those not introduced by the aforesaid pronouns or adjectives, but where *an alternative* is indicated explicitly (for example, "Are you leaving or staying?").
- 3) Those where *an alternative* is not indicated explicitly, but is clearly present (for example, "Are you leaving?").

Therefore, we can say that an alternative is always present in a question. It is an alternative in the representation. That is, the operation of representation produces an alternative as its result. The alternative can be given by:

- a) two terms that are both indicated explicitly (case 2), or
- b) two terms of which only one is explicitly indicated, while the other, which is implicit, is the negation of the first (case 3), or
- c) a term whose meaning is exactly an unsolved alternative, that is, selecting one item of a group of items that are equal to each other (this is the basic meaning of the terms in point 1, as we have seen).

The question is the mental operation of the search for the solution of the aforesaid alternative, that is, searching which term of the alternative to accept while discarding the other/s. We keep the alternative in the representation (R) present (PK) while, by means of attention, we look for something in reality that allows us to choose one of the terms of the alternative. This is generally done by resorting to the knowledge of other people, because, if the solution is present inside our knowledge, it is often immediately available and therefore the search for it is so quick that even we are not aware of it. Nevertheless, we sense very well that sometimes we ask questions to ourselves too, when the aforesaid solution is not immediately available (for example, "I ask myself how he did").

### § 9. — Relationships between OS and other approaches to the study of cognitive activity

As we can understand very well from what has been said up to now, OS lies somewhere between cognitive psychology and linguistics. Actual or possible relationships between OS and psycholinguistics (and the related neurolinguistics) can surely be found (even if OS has an independent origin, as we said). We cannot deal in depth with this subject in this article, which aims to provide a brief introduction. Here, we can only mention very briefly the main actual or possible relationships.

1) A central question in psycholinguistics is how human beings manage to create syntactic sentences, that is, whether syntax is an evolutionary product of increased human intelligence over time and social factors that encouraged the development of spoken language, or language exists because humans possess an innate ability, an access to what has been called a “universal grammar” (the first view is well represented by the mentalistic theories of J. Piaget, the empiricism of R. Carnap etc; the second point of view can be said to have begun with N. Chomsky [27]). With regard to this, OS’s position is an intermediate one. In fact, in my opinion, it is *only the ability of carrying out the EOMC that is innate*. On the contrary, *the ability of making up mental categories by means of these operations*, and of building the structure of thought by means of the mental categories, *is acquired* and culturally transferred, from generation to generation. The fact that in the various languages most of the mental categories are common (so that translation is always substantially possible) derives from the fact that humans live in physical environments that have a lot of similarities and have more or less the same necessities in communication. Sometimes these necessities can nevertheless be satisfied in different ways, with the result that in the various languages there can be some differences both amongst the various mental categories and the structures of thought that are used. For example, in English there is no word with the same meaning as the Italian demonstrative adjective/pronoun “*codesto*”, which designates a distance from the one who speaks and a closeness to the one who listens (in English, we can only indicate either a distance from, or a closeness to, the one who speaks). All of this is in agreement with both the fact that the so-called “linguistic universals” [63; 29] are really very few and with the well-known fact that the so-called “feral children” lack language. We can clarify the position of OS about the innate component of thought/language and the cultural one by means of a simple comparison between language and the way of eating. There are some peoples who use knife, fork and spoon in order to eat, some who use sticks, and others who use (or used) their hands. These customs are acquired and culturally transferred, and differ from each other (in the same way as the syntax and some mental categories of the various languages can differ from each other). Nevertheless the gesture of using your hand to put food into your mouth is common to all humans (in the same way as most of the syntax and mental categories are common to the various languages), because the fact that humans have arms, hands and a mouth, which are in a certain reciprocal position, is genetically determined (in the same way as the ability of

carrying out the EOMC is genetically determined) and the fact that we have to put food into our mouth is a common necessity (in the same way as what humans have to communicate is largely common).

2) Psycholinguistics also deals with the comparison between human language and animal communication (for OS's position with regard to this, see above, p 21) and with research into the possibility of a partial learning of human language by animals. *S.O.I.*'s theoretical approach has also been applied to the latter problem. In fact, within the Lana Project (USA, 70's), research into the possibility of linguistic communication between man and animal (the animal was a female chimpanzee, named Lana), a *S.O.I.* member, E. von Glaserfeld, created an artificial language based on Ceccato's theories. This language (which comprised some mental categories) allowed the chimpanzee to show her having acquired such mental abilities to produce sentences, which were grammatically correct and had a sense, even if they were very simple [40].

3) As regards the application of psycholinguistic methods to OS, the eye tracking method, used in psycholinguistics to study the cognitive processes related to spoken language [84], was also used by Ceccato as early as the 60's. We may hypothesize that the methods of experimental cognitive psychology and cognitive neuroscience could also be used to verify the hypotheses about the mental categories formulated in this article. For instance, it can be hypothesized that during the production of the mental categories considered in this article, brain areas involved in selective attention, divided attention or memory (shown by means of techniques such as fMRI, PET, EEG etc) are differently involved somehow according to the analyses proposed here.

Recently, An. and Al. Fingelkarts have put forward the hypothesis that there can be a correspondence between the theory of brain-mind functioning they propose, called *Operational Architectonics* (OA; Fingelkarts & Fingelkarts, 2001, 2003, 2004, 2005, 2006), and OS. OA, which was developed starting from Kaplan's work [57; 58, 59], is an innovative neurobiological theory founded on the joint analysis of cognitive and electromagnetic data (EEG and MEG) and based, similarly to OS, on the central notion of "operation". According to OA, every conscious phenomenon is brought to existence by the joint operations of functional transient (synchronised) assemblies of neurons, called Operational Modules (OM). Experiments have been suggested to verify the putative correspondence between the theoretical frameworks of OA and OS [12].

## § 10. — The limits of Operational Semantics

Even if the theories I have introduced are, at least as outlined in general, correct, we should nevertheless note that OS allows us to understand the nature and structure of the processes of thought and language *only partially* and *only up to a certain level of "depth"*. In fact, even if it is possible to identify the meaning of the mental categories, it is instead impossible to go *beyond* this level. In fact, OS defines the meanings of the aforesaid linguistic elements in terms of operations of attention, memory etc, but it cannot tell us how these functions are carried out and what supports them.

Moreover, OS allows us only to “see” what we may call, to use a metaphor, the “bare skeleton” of thought and language, i.e. the mental operations we perform *on*, and that are elicited by, *our subjective phenomenal experience* (the so-called “qualia”). That is, OS can account for the non-phenomenal meanings (such as the meaning of the word “of” and the morpheme “-s” in the expression “the colours of flowers”, for example), but not the phenomenal meanings (such as the meaning of the words “colour” and “flower”), because OS cannot tell us anything about our subjective phenomenal experience (for a different opinion, starting from the pre-suppositions of OS, see Marchetti 2006).

## § 11. — Possible practical applications of OS

The correlational theory of thought has allowed the conception of a device for the implementation of a machine translation<sup>10</sup> program, which should allow us to achieve a noticeably better translation quality than that of the programs available today, especially when the source language is a language with very little morphology and a lot of ambiguities, such as English, and the target language is a language with rich or very rich morphology (such as French, Spanish, Italian, German, Russian, etc). This device is described in detail in Benedetti 2005d<sup>11</sup>. What the program should allow us to achieve is not a *perfect* translation, but what the programs available today do not guarantee, that is, an output text which is generally *understandable and without big distortions*, so that the user who does not understand a certain language can understand a text written in that language. The characteristics, which make this program different from all others, are the following.

- 1) The device is based on the correlational theory of thought, which is a radically new linguistic theory.
- 2) The program simulates a part of what the human beings actually do when they translate, that is, rebuilding the structure of thought that corresponds to speech.
- 3) The device is the only one that is completely and exclusively based on a single linguistic theory.
- 4) The device is the only one that is conceived by the persons who proposed this linguistic theory.
- 5) The number of ways in which the words making up a sentence can combine according to the correlational theory of thought is a finite number and not particularly high. The program generates all the possible combinations (in order to examine them later), therefore the right combination is also surely produced. The program does not seem particularly difficult to implement from the theoretical point of view. Therefore, this program could be implemented even now. The only problem that the implementation of this program presents is the fact that the

<sup>10</sup> The references for the history and the state-of-the-art of machine translation are: Hutchins 1986, 1992, 1999, 2001a,b, 2002, 2003.

<sup>11</sup> This device was conceived by Ceccato and his collaborators in this project (Ceccato 1969; Glaserfeld, Pisani 1970). Only minor modifications and the description, which is rather different from the original one, are my own.

human work needed to construct the extremely complex “notional spheres” the program is provided with (these notional spheres allows us to simulate the translation of the human being as described in 2) increases exponentially as the number of dictionary entries increases. Nevertheless, a first level experimentation is, on the contrary, rather simple. We can provide the program with a very small dictionary and check that the program does not make the kind of errors that are commonly found with current programs.

## § 12. — Conclusion

In this article, the author has stressed the fact that words and morphemes seem divisible, as far as the nature of their meaning is concerned, in at least two main classes: 1) elements that seem to make an evident and specific reference to something physical; 2) elements that do not seem to refer (or refer only) to something physical. Class 2 consists mainly of the “grammatical” words and morphemes. These linguistic elements are the main and indispensable component of any speech. In this article the author has tackled the problem of their meaning, introducing a radically new theory (Operational Semantics). This theory is based on the fundamental assumption that the meanings of these linguistic elements are sequences of operations within cognitive functions, amongst which attention plays a key role. The author has shown that, basing ourselves on this assumption, it is possible to account for these apparently undefinable meanings.

### Acknowledgments.

I am grateful to Giorgio Marchetti, for his assistance in preparing this article; I am also grateful to Alexander A. and Andrew A. Fingelkurts, collaborating with them helped me outlining this paper. The English has been kindly revised by Mrs Wendy Piemonte.

## References

- 1 P. L. Amietta & S. Magnani, *Dal gesto al pensiero*, Franco Angeli, Milano, 1998.
- 2 A. D. Baddeley & G. J. Hitch, Working memory. In: Bower GA (ed) *Recent advances in learning and motivation* vol. 8, pp 47-90, Academic Press, New York, 1974.
- 3 A. D. Baddeley, The episodic buffer: a new component of working memory?, *Trends in Cognitive Sciences*, 4 (2000), 417-423.
- 4 L. W. Barsalou, Perceptual symbol systems, *Behavioral and Brain Sciences*, 22 (1999), 577-660.
- 5 G. Benedetti, La categoria di “spazio”, and Tavole sinottiche delle analisi di categorie mentali tratte dalle opere di S. Ceccato. In: Accame F., Glasersfeld E. von, Somenzi V., Beltrame R., Panetta M., Menga C.E., Benedetti G., *Studi in memoria di Silvio Ceccato*, Società Stampa Sportiva, Roma, 1999.

- 6 G. Benedetti, *Semantica operativa*, [www.mind-consciousness-language.com](http://www.mind-consciousness-language.com) (2004).
- 7 G. Benedetti, A presentation of Operational Methodology, [www.mind-consciousness-language.com](http://www.mind-consciousness-language.com) (2005a).
- 8 G. Benedetti, Basic mental operations which make up mental categories, [www.mind-consciousness-language.com](http://www.mind-consciousness-language.com) (2005b).
- 9 G. Benedetti, On Giorgio Marchetti's commentary on my book "Semantica Operativa" [Operational Semantics], vol. I, 2004, [www.mind-consciousness-language.com](http://www.mind-consciousness-language.com) (2005c).
- 10 G. Benedetti, A device in order to improve the quality of machine translation, based on the correlational theory of thought, [www.mind-consciousness-language.com](http://www.mind-consciousness-language.com) (2005d).
- 11 G. Benedetti, Operational Noology as a new methodology for the study of thought and language: theoretical aspects and possible practical applications, *Cognitive Processing*, 7 (2006), 217-243.
- 12 G. Benedetti, G. Marchetti, Al. A. Fingelkurs, An. A. Fingelkurs, Mind Operational Semantics and Brain Operational Architectonics: a Putative Correspondence, [www.mind-consciousness-language.com](http://www.mind-consciousness-language.com) (2009).
- 13 J.G. Benjafield, *Cognition*. Prentice-Hall International, Englewood Cliffs, 1997.
- 14 L. Bloomfield, *Language*, Holt, Rinehart & Winston, New York, 1933.
- 15 F. Braga-Illa (ed), *Livelli di rappresentazione. Percorsi tra il naturale e l'artificiale*, QuattroVenti, Urbino, 1997.
- 16 F. Braga-Illa (ed), *A proposito di rappresentazioni. Alla ricerca del senso perduto*, Pendragon, Bologna, 2006.
- 17 S. Ceccato, *Un tecnico fra i filosofi* vol. I, *Come filosofare*, Marsilio Editori, Padova, 1964.
- 18 S. Ceccato, *Un tecnico fra i filosofi* vol. II, *Come non filosofare*, Marsilio Editori, Padova, 1966.
- 19 S. Ceccato, *Cibernetica per tutti*, 1 (edited by Barosso G.), Feltrinelli, Milano, 1968.
- 20 S. Ceccato, (ed) *Corso di linguistica operativa*, Longanesi, Milano, 1969.
- 21 S. Ceccato, *Cibernetica per tutti*, 2 (edited by Giuliani M.V., Zonta B.), Milano, Feltrinelli, 1970.
- 22 S. Ceccato, *La mente vista da un cibernetico*, ERI, Torino, 1972.
- 23 S. Ceccato, *La terza cibernetica* (edited by Zonta B.), Feltrinelli, Milano, 1974.
- 24 S. Ceccato, *C'era una volta la filosofia*, Spirali, Milano, 1996.
- 25 S. Ceccato & C. Oliva, *Il linguista inverosimile*, Mursia, Milano, 1988.
- 26 S. Ceccato & B. Zonta, *Linguaggio consapevolezza pensiero*, Feltrinelli, Milano, 1980.
- 27 N. Chomsky, A review of B. F. Skinner's Verbal Behavior, *Language* 35(1) (1959), 26-58.
- 28 N. Chomsky, Language in a psychological setting, *Sophia Linguistica*, 22 (1987), 1-73.
- 29 B. Comrie, *Language universals and linguistic typology*, The University of Chicago Press, Chicago, 1989.

- 30 N. Cowan, The magical number 4 in short-term memory: A reconsideration of mental storage capacity, *Behavioral and Brain Sciences*, 24 (2001), 87-185.
- 31 N. Cowan, *Working memory capacity*, Psychology Press, New York, 2005.
- 32 M. Denis, *Image et cognition*, Presses Universitaires de France, Paris, 1989.
- 33 M. S. Dryer, Order of subject, object, and verb. In: *The World Atlas of Language Structures*, edited by M. Haspelmath, M. S. Dryer, D. Gil, and B. Comrie. Oxford University Press, Oxford, 2005.
- 34 An. A. Fingelkurts & Al. A. Fingelkurts, Operational architectonics of the human brain biopotential field: Towards solving the mind-brain problem, *Brain and Mind*, 2 (2001), 261-296.
- 35 An. A. Fingelkurts & Al. A. Fingelkurts, Operational architectonics of perception and cognition: A principle of self-organized metastable brain states, VI Parmenides workshop – Perception and thinking, Institute of Medical Psychology. April 5-10, Elba/Italy (invited full-text contribution). URL = <http://www.bm-science.com/team/art24.pdf>, 2003.
- 36 An. A. Fingelkurts & Al. A. Fingelkurts, Making complexity simpler: Multi-variability and metastability in the Brain, *The International Journal of Neuroscience*, 114 (2004), 843-862.
- 37 An. A. Fingelkurts & Al. A. Fingelkurts, Mapping of Brain Operational Architectonics. In F. J. Chen (Ed.), *Focus on Brain Mapping Research* (pp. 59-98), Nova Science Publishers, Inc., 2005.
- 38 An. A. Fingelkurts & Al. A. Fingelkurts, Timing in cognition and EEG brain dynamics: discreteness versus continuity, *Cognitive Processing*, 7 (2006), 135-162.
- 39 E. von Glaserfeld, P. P. Pisani, The multistore parser for hierarchical syntactic structures, *Communications of the ACM*, 13(2) (1970), 74-82.
- 40 E. von Glaserfeld, *Linguaggio e comunicazione nel costruttivismo radicale*, Cooperativa Libraria Universitaria del Politecnico, Milano, 1989.
- 41 E. von Glaserfeld, *Il costruttivismo radicale*, Società Stampa Sportiva, Roma, 1998.
- 42 C. Goddard, Bad arguments against semantic primitives, *Theoretical Linguistics*, 24(2/3) (1998), 129-156.
- 43 C. Goddard, Conceptual primes in early language development. In Putz, Martin, Niemeier, Susanne, & Dirven, Rene (eds.). *Applied Cognitive Linguistics I: Theory and Language Acquisition*, pp. 193-227, Mouton de Gruyter, Berlin, 2001.
- 44 C. Goddard, The search for the shared semantic core of all languages. In Goddard & Wierzbicka (eds.) *Meaning and Universal Grammar - Theory and Empirical Findings volume 1*, pp. 5-40, John Benjamins, Amsterdam/Philadelphia, 2002.
- 45 C. Goddard & A. Wierzbicka (eds.), *Semantic and Lexical Universals - Theory and Empirical Findings*, John Benjamins, Amsterdam/Philadelphia, 1994.
- 46 C. Goddard & A. Wierzbicka (eds.), *Meaning and Universal Grammar - Theory and Empirical Findings (2 volumes)*, John Benjamins, Amsterdam/Philadelphia, 2002.
- 47 G. Graffi & S. Scalise, *Le lingue e il linguaggio*, Il Mulino, Bologna, 2002.

- 48 W. J. Hutchins, *Machine translation: past, present, future*, Ellis Horwood Series in Computers and their Applications, Chichester, 1986.
- 49 W. J. Hutchins & H. L. Somers, *An introduction to machine translation*, Academic Press, London, 1992.
- 50 W. J. Hutchins, *Retrospect and prospect in computer-based translation*. Machine Translation Summit VII, 13th-17th September 1999, Kent Ridge Digital Labs, Singapore. Proceedings of MT Summit VII "MT in the great translation era". Asia-Pacific Association for Machine Translation, Tokyo, pp 30-34, 1999.
- 51 W. J. Hutchins, *Towards a new vision for MT*. Introductory speech at the 'MT Summit VIII' conference. Santiago de Compostela, Galicia, Spain, 2001a.
- 52 W. J. Hutchins, Machine translation and human translation: in competition or in complementation? *International Journal of Translation*, 13(1-2) (2001b), 5-20. Also in: Blekhman MS (ed) *Machine translation theory & practice*. Bahri Publications, New Delhi.
- 53 W. J. Hutchins, Machine translation today and tomorrow. In: Willée G, Schröder B, Schmitz H-C (eds) *Computerlinguistik: was geht, was kommt? Festschrift für Winfried Lenders*, pp 159-162, Gardez! Verlag, Sankt Augustin, 2002.
- 54 W. J. Hutchins, *Has machine translation improved?* Proceedings of the Ninth Machine Translation Summit, pp 181-188, AMTA, East Stroudsburg, PA, 2003.
- 55 W. James, *The principles of psychology*, Holt, New York, 1890 (Reprint 1983: Harvard University Press, Cambridge, MA).
- 56 J. Jonides, Further toward a model of the mind's eye's movement, *Bulletin of the Psychonomic Society*, 21 (1983), 247-250.
- 57 A. Ya. Kaplan, B. E. Brodsky, B. S. Darkhovsky, S. L. Shishkin, Al. A. Fingelkurts, An. A. Fingelkurts, *Change-point mapping: a new technique for EEG brain imaging*. In Proc. First International Conference on Functional Mapping of the Human Brain, *Human Brain Mapping*, 1, 1995, 97.
- 58 A. Ya. Kaplan, Nonstationary EEG: methodological and experimental analysis, *Uspehi Physiologicheskikh Nauk (Success in Physiological Sciences)*, 29 (1998), 35-55 (in Russian).
- 59 A. Ya. Kaplan, The problem of segmental description of human electroencephalogram, *Human Physiology*, 25 (1999), 107-114 (Translated from *Physiologiya Cheloveka*).
- 60 D. La Berge, The spatial extent of attention to letters and words, *Journal of Experimental Psychology: Human Perception and Performance*, 9 (1983), 371-379.
- 61 D. La Berge, *Attentional processing. The brain's art of mindfulness*, Harvard University Press, Cambridge, MA, 1995.
- 62 G. Lakoff, Women, Fire, and Dangerous Things, The University of Chicago Press, Chicago, 1987.
- 63 W. P. Lehmann, *Historical linguistics: an introduction*, Routledge, London-New York, 1992
- 64 G. Marchetti, *The mechanics of the mind*, Espansione, Roma, 1993.

- 65 G. Marchetti, *La macchina estetica. Il percorso operativo nella costruzione dell'atteggiamento estetico*, Franco Angeli, Milano, 1997.
- 66 G. Marchetti, A theory of consciousness, [www.mind-consciousness-language.com](http://www.mind-consciousness-language.com) (2001).
- 67 G. Marchetti, Foundations of attentional semantics, [www.mind-consciousness-language.com](http://www.mind-consciousness-language.com) (2003).
- 68 G. Marchetti, The importance of non-attentional operations for Attentional Semantics, [www.mind-consciousness-language.com](http://www.mind-consciousness-language.com) (2005a).
- 69 G. Marchetti, Commentary on Giulio Benedetti's "Semantica Operativa", vol I, 2004, [www.mind-consciousness-language.com](http://www.mind-consciousness-language.com) (2005b).
- 70 G. Marchetti, A presentation of attentional semantics, *Cognitive Processing*, 7 (2006), 163-194.
- 71 G. Marchetti, Studies on time: a proposal on how to get out of circularity, *Cognitive Processing*, 10 (2009), 7-40.
- 72 G. A. Miller, The magical number seven, plus or minus two: some limits on our capacity for processing information, *Psychological Review*, 63 (1956), 81-97.
- 73 K. Oberauer, Access to information in working memory: exploring the focus of attention, *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 28 (2002), 411-421.
- 74 K. Oberauer, H-M. Süß, R. Schulze, O. Wilhelm, W. W. Wittmann, Working memory capacity - facets of a cognitive ability construct, *Personality and Individual Differences*, 29 (2000), 1017-1045.
- 75 P. Parini, *I percorsi dello sguardo*, Edizioni Artemisia, Ancona, 1996.
- 76 H. E. Pashler, *The psychology of attention*, MIT Press, Cambridge, MA, 1998.
- 77 M. I. Posner, Orienting of attention, *Quarterly Journal of Experimental Psychology*, 32 (1980), 3-25.
- 78 M. I. Posner, Attention in cognitive neuroscience: an overview. In: Gazzaniga, M (ed): *The cognitive neurosciences*, MIT Press. Cambridge, MA, 1994.
- 79 M. I. Posner, Y. Cohen, Components of performance. In: Bouma H., Bowhuis D. (eds) *Attention and performance*, Erlbaum, Hillsdale, NJ, 1984.
- 80 S. K. Reed, *Cognition. Theory and applications*, Wadsworth, Belmont, CA, 1992.
- 81 R. H. Robins, *A short history of linguistics*, Addison Wesley Longman, London, 1997.
- 82 E. Rosch, Natural Categories, *Cognitive Psychology*, 4 (1973), 328-350.
- 83 E. Rosch, Principles of categorization. In E. Rosch & B. Lloyd (Eds.), *Cognition and Categorization*, Lawrence Erlbaum Ass., Hillsdale, N.J., 1978.
- 84 M. K. Tanenhaus, M. J. Spivey-Knowlton, K. M. Eberhard, J. E. Sedivy, Integration of visual and linguistic information in spoken language comprehension, *Science*, 268 (1995), 1632-1634.
- 85 G. Vaccarino, *Scienza e semantica costruttivista*, Cooperativa Libraria Universitaria del Politecnico, Milano, 1988.
- 86 G. Vaccarino, *Prolegomeni*, vol. I., Società Stampa Sportiva, Roma, 1997.
- 87 G. Vaccarino, *Prolegomeni*, vol. II., Società Stampa Sportiva, Roma, 2000.
- 88 L. Weiskrantz, *Thought without language*, Clarendon Press, Oxford, 1988.
- 89 A. Wierzbicka, *Semantic Primitives*, Athenäum, Frankfurt a. M., 1972.

- 90 A. Wierzbicka, Semantic primitives and lexical universals, *Quaderni di Semantica*, X, 1 (1989a), 103-121.
- 91 A. Wierzbicka, Semantic primitives: the expanding set, *Quaderni di Semantica*, X, 2 (1989b), 309-332.
- 92 A. Wierzbicka, The search for universal semantic primitives. In: Pütz M. (ed.), *Thirty Years of Linguistic Evolution* 215-242, John Benjamins, Amsterdam/Philadelphia, 1992.
- 93 G. Yule, *The study of language*, Cambridge University Press, Cambridge, 1996.

Received: September, 2009