www.mind-consciousness-language.com, (2005)

Basic mental operations which make up mental categories

Giulio Benedetti

(Translation from Italian is my own; it has been kindly revised by Mr Nicholas White)

Abstract
One of the fundamental tasks the Scuola Operativa Italiana (S.O.I.) *[Italian Operational School] has devoted itself to has been the task of analysing, in terms of mental operations, what* S.O.I. *calls "mental categories", that is the meanings of the words that clearly do not indicate something physical (amongst these are, first of all, words which are very frequently used and are absolutely indispensable in order to think and to speak, like conjunctions, prepositions, cases, pronouns, fundamental verbs like "to be", "to have" etc., main adverbs etc.). Traditional linguistics and modern semantics have not been able to define such meanings (neither philosophy nor cognitive psychology were successful). Such a task has shown itself to be very hard and, in contrast to other fields of the research carried out by* S.O.I. *about the working of human mind, the methods used and the results achieved are contrasting. Because of this, in this article the author proposes a completely new model of the so-called "elementary mental operations", which, in* S.O.I.*'s opinion, combine to make up mental categories. Moreover, by means of some examples he shows how this model allows us a rather simple analysis of mental categories themselves.*

Key words*: mind, mental operations, attention,* Scuola Operativa Italiana*, linguistics, semantics, philosophy, cognitive psychology.*

The research, carried out by the Scuola Operativa Italiana (S.O.I.) in approximately 50 years since the *S.O.I.* was born, fundamentally thanks to Silvio Ceccato (1914-1997), has led to the production of a wide and complex group of theories about the working of the human mind. *S.O.I.*'s members agree unanimously upon some of these theories, but they do not agree upon some others.
Naturally all members agree upon the most general presuppositions. Obviously they agree upon the fundamental presupposition which is peculiar to the School, that of conceiving the knowledge process not as a simple reflection, a "doubling" of an "external reality" already completely self-given, that is as something substantially *passive*, but on the contrary like a process of construction, therefore *active*, in which the operating of the mind has a fundamental role.
Also the most general theories about the so-called "mental categories" and about their role in the structure of thought are unanimously shared. In fact the whole *S.O.I.* thinks that the meanings of the words that evidently do not designate something physical, like prepositions, conjunctions, cases (in languages that have cases), pronouns, fundamental verbs like "to be", "to have" etc., main adverbs etc., in short all the words grammar is concerned with (which, mind you, are absolutely indispensable in order to think and to speak), and several other words (like "space", "time", "all", "nothing", "cause", "effect" etc. etc.), are something purely mental, that is structures (just called "mental categories") formed by different combinations of the same basic elements, the so-called "elementary mental operations".
Also the most general methodological presuppositions are unanimously shared. *S.O.I.* in fact always used a method based on introspection as the main method of research about such basic mental operations and their combinations making up mental categories. In this method language (which is nothing else but the "public" -that is perceptible by other people- expression, or "translation" of the closely "private" activity that is thought) is used as the main way to understand the nature and the structure of thought itself.
Another conception that is unanimously shared inside *S.O.I.* is that attention has a central role in our mental life. In fact, according to *S.O.I.*, attention has a fundamental role not only in perception but also in the activity of making up mental categories, because the aforesaid elementary mental operations making up mental categories are (exclusively according to some, mainly according to others) operations of attention.
Also the general theory about the structure of thought is unanimously shared, even if with some insubstantial variants. According to *S.O.I.*, in fact, thought is a web of correlations and its fundamental elements are micro-units, the so-called "correlational triads", in which one of the mental categories of relationship (the so-called "correlators", classified by traditional grammars as conjunctions, prepositions and cases) "ties" two elements that can be isolated words or grouped words forming other triads.
Also in regard to more specific theories, as for instance the one of attitudes (scientific, aesthetic, comic, of work or play etc.), Ceccato's proposals are widely accepted inside *S.O.I.*.
Nevertheless there is a field of *S.O.I.*'s research that has shown itself particularly critical. Unfortunately, it is an extremely important field, that is the field of the analysis of the structure of mental categories. In such a field research has proved itself difficult, the method used by different researchers is not the same, the results achieved are contrasting and there are not theories on which all *S.O.I.*'s members or at least many of them agree. All this happens despite the fact that such research is one of the tasks *S.O.I.* has carried out with greater care.
Despite the many problems found and the fact that the theories proposed are very controversial, the results achieved by *S.O.I.* in this field are, in my opinion, incomparably better than the ones achieved by any other discipline. The systems of analyses of mental categories proposed are extremely wide and here it is absolutely impossible not only to explain them in detail but even to provide a summary of them that at least allows the reader to acquire a partial acquaintance to them. Here it is only possible to mention them briefly so that the reader can have an extremely vague idea of what they are.

But before this let's try to outline the problem, very briefly, from as general a point of view as possible. When we propose to analyse the structure of mental categories, we must understand three things:

1) what are the elementary mental operations which make them up;
2) what are the rules according to which these elementary operations combine with each other;
3) what elementary operations, and in what combinations, make up every single mental category.

Naturally, it is also necessary to have a method by which we can carry out the analyses and it is also very desirable to be in some way able to verify the analyses we obtain.

All of this is extremely difficult. We make up mental categories continuously, every time we think, because our thoughts are mainly constituted by them. Nevertheless, even if we know very well how to carry out the operations which make up mental categories, we carry them out in a completely unconscious way, and moreover in an extremely fast way and without fatigue, so that discovering them is really a very difficult task.

Let's try to mention, at least very briefly, the results achieved.

The elementary operations of attention supposed by Ceccato are extremely simple. According to Ceccato, attention can be in only two "states", which he describes this way:

"...un primo stato d'attenzione, che potremmo chiamare stato d'attenzione pura, non applicata, non focalizzata: si pensi, per esempio, allo stato di sospensione, di attenzione 'vuota', che si assume a teatro allo spegnersi delle luci ed in attesa del aprirsi del sipario o, a sipario aperto, in attesa dell'ingresso dei personaggi. Si pensi ancora ad una situazione in cui qualcuno ci dica: 'Attento!' 'Guarda!' prima di mostrarci una qualsiasi cosa. Se però, mentre si è così attenti e 'vuoti', ci viene detto: 'Ecco!', o ci viene mostrato qualcosa, il primo stato di attenzione si 'riempie' di un secondo stato. Quest'elementare combinazione di stati di attenzione costituisce la categoria designata in italiano con la parola 'cosa'."[1]

["... a first state of attention, we could call it pure, not applied, not focused attention: think, for example, of the state of suspension, of 'empty' attention, we assume when we are in a theatre when the lights are turned off and we are waiting for the curtain to open or when, the curtain still being opened, we are waiting for the actors to enter. Think also about a situation where someone tells us: 'Look out!' 'Look!' before showing us something. Nevertheless if, while we are paying attention and 'empty' like this, someone tells us: 'Here it is!', or he shows us something, the first state of attention 'is filled up' by a second state. This elementary combination of states of attention is the category Italian language designates by the word 'cosa' [thing]."]

Ceccato assumes that mental categories are made up by combinations of these two states of attention. So, to give an example of the simplest and apparently most convincing ones, the category of "singular" would be made up by a state of "pure" attention, followed by the category of "thing", followed by another state of "pure" attention. In this way the "thing" would be therefore isolated, that is made "singular". Ceccato symbolised these combinations of attentional states using simple formulas, that give rise to a combination set formed by categories made up by an increasing number of attentional states. Nevertheless this hypothesis is probably too simple, because the number of categories that Ceccato analysed successfully in terms of attentional states, and therefore symbolised by such formulas, is a little more than 120. In fact Ceccato himself tried to modify the ways of combination of the attentional states, yet without obtaining a substantial progress in the number of categories analysed, so that in his last book Ceccato himself seriously calls into question the validity of his system of analyses of mental categories and asserts it is necessary to find something alternative[2].

The limits of this system were soon very well understood by a disciple of Ceccato, Vaccarino, who has built a wide alternative system (more than 2000 categories analysed). In an article like this, intentionally very short, I can't try to give an idea, not even a very vague one, of this system, which is from some points of view extremely complex. Here I can only say that also Vaccarino's system is based on only two attentional states ("moments"), the one of "active" attention and the one of "interrupted" at-

[1] Various Authors (Ceccato S., edited by), *Corso di linguistica operativa*, p. 35.
[2] Ceccato S., *C'era una volta la filosofia*, p. 175-176.

tention, but, in a sequence of three of these "moments", they are grouped in such a way that they give rise to three different elementary combinations that Vaccarino calls "atomic categories" ("sostantività" ["substantivity"], "aggettività" ["adjectivity"] and "verbità" ["verbity"], respectively). Such "atomic categories", combining amongst each other according to only three forms of combination, give rise to a large set of combinations, which exhausts all possible combinations, constituted by structures made up by an increasing number of elements. This system is in some way similar to the periodic system of chemical elements. Since I have given an extremely simplified description of Vaccarino's system, I obviously can't talk about the various problems I believe it presents, in my opinion. Here I can only say that not all members of *S.O.I.* accept Vaccarino's system and that there is nothing that demonstrates that the way chosen by Vaccarino is the only one possible. Therefore it is possible to propose something alternative.
Also another researcher, von Glasersfeld, has proposed something alternative to Ceccato's system, but they are very few analyses only about categories used in arithmetic, like "number", "unit" etc.. Other analyses have been proposed by G. Marchetti.
Nevertheless Ceccato left us not only the system of analyses of mental categories in attentional states, thereby symbolised by formulas. He left us also a far more numerous group of analyses (more than 300) or, to be more exact, sketches of analyses, expressed not by means of formulas of attentional states, but in which the structure of the category is described by words of the common language in a sketched way, without supposing to have perfectly understood what the elementary components of the categories are, that is the attentional states. In my opinion such analyses are a patrimony of immense value. Several of them are so convincing that it seems to me impossible to doubt them: it is only necessary to find a group of elementary, basic mental operations that allows us to "translate" these sketched descriptions in precise structures formed by combinations of these elementary operations themselves.
I have tried to do just this. Using the elementary operations I propose, I have resumed the sketched descriptions of Ceccato, I modified and developed them where I thought it was necessary, and I added many new analyses. I think there are no problems in proceeding in this work.
In this article I introduce, in a synthetic way, the model of elementary mental operations I propose. I show also, as examples, some analyses of mental categories I achieved basing myself on this model.

I think it is extremely reductive to suppose that attention can only be "pure" or "focused on itself", "active" or "interrupted" and similar states. It seems to me that attention can do very much more than this, that is the basic mental operations of attention are more numerous and complex. Moreover, I think there is no reason to exclude *a priori* that among the basic mental operations there are also operations that are not operations of attention, for instance operations of memory or operations of a different kind too.
In order to illustrate what are, in my opinion, the basic mental operations I shall use some very concrete examples.
First let's imagine we are spending our holidays in the Italian Alps, in Cervinia, with a friend who is visiting us because he was by chance passing not far away from us during his journey in Europe. Let's suppose our friend comes from a very far continent and he studied at school and/or remembers very little of European geography. It is possible he notices the mountain above Cervinia "is very high". Let's suppose, as is probable, that we tell him that the mountain is called "Cervino" and it is the third highest mountain in Europe".
A conversation like this needs only a few seconds, and the thought it expresses an even smaller amount of time. It is because of this, besides the rest, that it is difficult to become conscious and to isolate the single mental operations forming this thought. But I don't think it is impossible. If the greatest problem is the speed at which these mental operations are carried out, let's try to think, as Ceccato suggested doing, of a similar situation where instead of sight we can use touch, so much slower than sight. It is okay

to imagine, for instance, that we have to measure, with blindfolded eyes, the height of the door or of the window of the room we are in. Well, let's describe the mental operations we do, clearing from our mind any prejudice about how they must be, using the first words that come into our mind without worrying too much about the fact that they are right or wrong.
I think that in the case of the door or the window (let's choose the former because the necessary physical operating is easier) we operate in the following way. First we try to find the door with our hands and we focus our attention on it. At this point we have to construct mentally a line, a particular line, the vertical one. Once we have imagined a vertical line, our attention, still using touch, performs some "movements"[3] along the door far enough to reach the two opposite ends of the object, in the case of our example the superior and inferior edges of the door. Then attention focuses on these edges discarding the rest of the door. Our brain is some way able also to estimate the entity of the "movement" attention does moving from one to the other of these ends and to integrate it with other data in order to estimate the real, the absolute, distance there is between the two ends. In the case of the example of the door, if we operate with blindfolded eyes, only by touch, we have to estimate the distance our hand covers in moving from the higher to the lower part of the door. Such a task needs a complex integration of kinesthesical sensations, that is sensations of mutual movement of the parts of our body, in this case of our arm and also of our trunk that will have to flex so that our hand can reach the inferior end of the door. Instead, if we operate by sight, as we do habitually, and as it is necessary to do in the case of the mountain, our central nervous system is able to estimate the entity of the "movement" made in order to move our attention from the inferior to the superior end of the object (or vice versa) and to integrate it, by means of operations which are certainly very complex, with another kind of evaluation it habitually does, that is the one of depth, that is how far the objects are from us in the visual field.
Once we have evaluated the height of the object we considered, in order to say it is "high", as we did in the example of Mount Cervino, it is necessary to compare it with something else we use as a term of reference, "high" being a typically relative term. Mount Cervino, that, as the reader has certainly very well understood, has been chosen because it is something, in this case a mountain, that all people (except perhaps those who live near the Himalayas or Andes) would judge "high", now has to be compared with a medium height mountain. Since around Cervinia there is nothing similar and therefore we cannot perceive it, we have to imagine it. Representation is probably one of the most complex operations the human mind is able to do, because sometimes it is far more than simply remembering something and focusing on it by attention, but it often involves an integration of many memories and in some cases also the imaginary, partial or total, construction of things never effectively perceived (we can imagine for instance the Arabian phoenix, a better world, a scene never seen etc. etc.). In the case of the example we made, we have to remember the mountains we have seen and to imagine a medium height mountain. The comparison between a medium height mountain and Mount Cervino will make us say the latter is "high".
Let's make another example. Suppose I am standing in front of you and that I ask you, after having put my right arm out in a horizontal position, if my arm is moving (I am moving my arm so slowly you can hardly see this). What are you doing? I think you keep your attention focused on my arm for a relatively long time, even several seconds. Let's suppose now I distract your attention in some way and a little later I ask you again if my arm moved. In the meantime, while you were distracted, I put my arm in a vertical position along my right flank. Surely you will say, even if you have not seen it, that my arm (you know it is the same arm you focused your attention on before) surely moved, because now it is in a completely different position than before.
Let's make the third and last example. Let's suppose you have to do the following two exercises. The first one is crossing a room with a glass more or less half full in your hand, without spilling it. In the

[3] The reason why the term "movement" here is put between inverted commas will be further explained.

second exercise your task is the same, but this time the glass is nearly full and moreover your eyes are blindfolded. We sense very clearly, I believe, that in the latter case the intensity of attention with which you carry out your task is far greater.
It seems to me that in these three examples we can clearly feel, by means of an act of introspection, the mental operating I have described and I think all or most people would agree with such a description. Let's try now to think of this description again asking ourselves if we can find in it some basic[4] mental operations. Let's try to do it, as I pointed out, without any preconceived idea of how these basic mental operations must be, calling them by the first words that come into our minds and giving a synthetic description of them after.
The operations I think we can find are, so to say "in order of appearance", the following ones. The first operation is surely the operation of attentional focalization, the one clearly shown by Ceccato, that in the case of our first example is represented for the first time by the focalization of Mount Cervino; it appears then several more times regarding other objects or parts of them. The remarkable frequency with which we do this operation already suggests it is the most important of the mental operations. The second operation (omitting for the moment the imagining of the vertical line) is the "movement" of attention along this line. The third operation is discarding what our attention focused on before, that is the whole mountain, except its extremities, superior and inferior. The fourth operation is the evaluation of how much this "movement" is, which allows us, after an integration (which surely is very complex) with other data, the ones permitting us to estimate our distance from the mountain, an evaluation of the height of the mountain itself. The fifth operation is an operation of representation, in our case the representation of a medium height mountain. The sixth operation is an operation of comparison between the height of this mountain and the one of Mount Cervino. The seventh is a memory operation, that is the one that allows us to say, searching our memories of geography, that Mount Cervino is the third highest summit in Europe. The eighth operation appears in the second example, and it is the one of keeping our attention focused on the same object. If, as happens in the example, there are some phases during which the object is not focused on by attention, what happened in these phases can be imagined and integrated with what has been perceived when attention was focused on that object, so that the results of perception united with the ones of representation form a whole. In the last example appears a ninth operation, or a variation of an operation, the variation of intensity of attentional focalization.
Now let's give a name to each of these operations and let's try to describe them, for the moment being satisfied with a summary and approximate description: it will still be possible to improve it later.

1) The first operation, **attentional focalization**, is the most important of the attentional operations. By means of this operation, that we can all sense very well with an act of introspection, attention "focuses", "evidences", "selects" something with respect to all the rest, making this thing mentally present. It is therefore the most important of the mental operations. We can feel this operation very well using the simple experiments suggested by Ceccato. In these experiments, if we voluntarily direct our attention in an appropriate way, we obtain the perception of sensations that normally are subliminal, such as the pressure of our fingers on the paper when we are reading, of our arms on the desktop, of our feet on the floor, of weak and continuous noises coming from the environment etc. etc.. We can add, since I think Ceccato never said anything similar, that attentional focalization is partially under the control of will, and partially it is not. This appears evident if we think of when we perceive particularly intense, sudden and even potentially dangerous stimuli, like for instance a strong and unexpected noise, which always has the power to draw our attention on itself, independently of our will. Moreover, atten-

[4] As "basic" or "elementary" mental operations naturally I mean mental operations which are basic in regard to mental categories; in regard to other operations which in our nervous system can be considered elementary, as the discharge of a nervous impulse or its transmission through a synapse, for instance, operations I am talking about surely are not elementary at all, but they are on the contrary extremely complex.

tional focalization is extremely "mobile", that is we tend to keep our attention focused on the same thing for rather short periods, of the order of seconds or of fractions of seconds, especially if what we focus our attention on is a static situation (if, on the contrary, the situation is a dynamic one, we can keep our attention focused on the same object for longer periods).

2) After we have focused our attention on something, we sense very well that we can then "leave", or "discard" it or a part of it, that is we can stop focusing our attention on it. We may think that this is simply the decaying or shrinking of the attentional operation we considered in the first point, rather than a separate operation. Nevertheless, I have a feeling it is something more active that deserves to be considered as a separate basic operation. Whatever the case, I think it is more useful to consider it like this from a practical point of view. I call this operation the operation of **attentional discarding**.

3) I put the expression "attentional movement" in inverted commas in order to point out that the use of the term "movement" here is a little particular. The movement of attention is its passing from one part to another of the attentional field. Let's suppose that this field is the visual field and inside it there is an object of our daily life, as for instance a window. I believe everyone of us senses very well that we can pass from the focalization of the whole window to the one of a part of it, and that the dimensions of this part can vary as much as we want, for instance an entire glass pane of which the window is composed, the frame, a hinge, the handle, a screw, a nearly imperceptible scratch in the wood etc. etc.; we can also divide the window in imaginary parts, for example the two superior and inferior halves; we can focus our attention on its inferior edge or on the superior one, on a point or on another etc.; we can move our attention from one to the other of these parts or edges or points; and so on, as the reader can easily imagine. If we simply do this all we are doing are just operations of attentional focalization. But we can also *just consider the movement* we do when we pass from an attentional focalization to the other, for instance when we pass from one side to another side of the window. It is clear this movement has nothing to do with the movement of a physical object, but it is a purely mental operation. Nevertheless we can use the same term for it we use in physical situations because its result is still that attentional focalization passes from one part to another part of the object or of the attentional field. In my opinion this operation is the base of all mental categories we clearly sense having something to do with space, like for instance "place", "where", "here", "there" etc., "high", "short", "wide", "narrow" etc., "left" and "right", the various shapes etc. etc.. Because this operation is formed by many possible kinds of movement and because it is the base we use to form a big group of mental categories, I prefer not to name it simply "basic mental operation" but **spatial basic operating scheme**, in acronym form **SOBS**. For example, when we estimate how high an object is what we consider is how long a linear attentional movement is.

4) The **operation of representation** is, using a very concrete and immediate example so you can understand at once what I mean, the one you do if I ask you, who are now reading this page, to imagine it as written in red fonts, rather than in black ones. The word "representation", according to dictionaries, has several meanings, some of them used in the common language too. The meaning we are concerned with here is the one dictionaries usually call "psychological" meaning. Zingarelli's dictionary, for instance, gives the following definition of this meaning: "intuitive mental entity, similar to perception but different from it because its object is not present". Similar definitions are found in other dictionaries. I think this opposition between perception and representation is completely correct. First of all representation is different from perception because we normally use the former when the corresponding perception can't be carried out for lack of the object. Therefore we start from the memory we have of the object, then modifying it if necessary (in all representations, also the most creative, I believe we start from something we have in our memory, even if sometimes we modify and enrich it so much that the end product of representation is something that has little to do with the memories it started from). We can say that the operation of representation is the operation by means of which we supply to attention something that is not present at the moment. We have to notice that the operation of

representation probably is an operation which is partly distinct from the operating of attention, even if its result is destined to be focused by attention itself. Therefore it would be one of the extra-attentional mental operations.

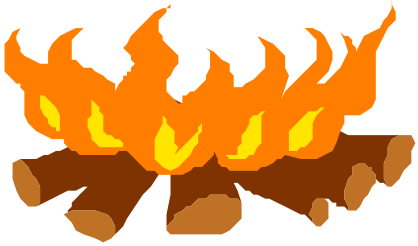
5) In the descriptions of mental categories in linguistic terms given by Ceccato the term "comparison" appears tens times, even if in all his immense work he dedicated hardly two lines to the analysis in attentional states of its meaning, which in Ceccato's opinion is a mental category. Vaccarino confines the execution of the operation of comparison to the "atomic" categories and to their usual modes of combination, but he recognises it should have a privileged position and dedicates an entire chapter (nearly 40 pages) of his treatise "Prolegomeni" to the "comparisons", besides numerous references in his other works. Therefore both Ceccato and Vaccarino attribute to this operation a fundamental importance. I completely agree with this thesis, but I think the **operation of comparison** absolutely can't be reduced to a sequence of attentional states. Therefore I think it is a distinct elementary operation, supported by specific nervous structures. This would therefore be another example of an extra-attentional elementary mental operation. I make a passing reference to the fact that this is probably the mental operation which is easier to reproduce in an electronic machine, inasmuch as computers already carry out many operations of comparison, even if between things that are surely very different from the ones the human mind compares and they do it probably in a different way.

6) According to Ceccato and Vaccarino memory has a fundamental importance in our mental life. As for its relationship with mental categories, according to Vaccarino memory takes part, in form of "structural memory", in the constitution of all categories. Also the little bars Ceccato overlaps to the "S" letters symbolising the attentional states, and that indicate the order in which these states enter in combination in order to make up a mental category, are a form of memory. We can therefore say that according to Ceccato and Vaccarino memory has a role in the constitution of all mental categories, which therefore are not only made up by attentional states. I agree completely with them about this because I think we can't doubt that the structure of a mental category must some way be recorded so that we can both recognise and make it up. Nevertheless in my opinion **operations of memory** are a part of the structure of some mental categories and therefore I think that they have to be considered basic mental operations as the others, also in this case completely distinct from the operations of attention. About these operations here I only say that the two fundamental operations memory carries out are obviously the one of fixation and the one of evocation of memory. Naturally memory, independently from the fact that it plays a role in the making up of mental categories, is a fundamental component of our mental activity: we fix and recall memories continuously.

7) It seems to me an evident thing that the duration of attentional focalization can vary and I tried to show it by means of the simple aforesaid example (the one of the arm which was moving in an almost imperceptible way). I think it is also evident the fact that we can maintain our attention focused on the same object. If, like in the example, there are some phases during which the object is not focused on by attention, what happens during these phases can be imagined and integrated with what has been perceived when attention was focused on the object, so that results of perception and representation united together form a whole. This operating, as we can clearly see, is rather complex and I think it is, as in the case of the spatial basic operating scheme (SOBS), the base of a lot of mental categories, all the ones we clearly feel have something to do with time. Therefore I prefer to name it **temporal basic operating scheme** (rather than simply "operation"), in acronym **SOBT**.

In my opinion SOBT is the fundamental (if not the only) component of the category of "verb". In fact, when we keep our attention focused on an object (or we focus our attention on it at least two times), we always use a verb, even if the situation is completely static (in the case of our example, if we have the impression that the position of the arm is not changing we say that the arm "is keeping still"). In other situations, the fact that when we use a verb is because we have followed by attention the situation evolving in time, may not be so clear as in the example we gave, but this depends on the notions *we*

have already. In order to realise this let's imagine we are in front of a situation like the one shown in picture 1.



Picture 1

Picture 2

Let's first try to describe this situation as "a wood fire" and then as "the wood is burning". The physical situation surely has remained the same, but our mental operating must have changed. What this changing consists of may not be clear at once. We feel clearly that in the first case our attention stopped a very short time on the object, the time we need to recognise it, but we can have the impression that it is like this in the second case too, because someone who already knows what the meaning of the verb "to burn" is needs only a glance to see that "the wood is burning". But this is due to the fact that *we already know* that wood is consumed under the action of fire and transforms itself into ash. If we want to teach what the meaning of the verb "to burn" is to a very little child who does not know it, we have to make it keep its attention focused on the wood so that it can realise this process.
Since following the evolution of objects during time is obviously extremely important, it is clear that such operating is fundamental, and therefore also the category of verb is fundamental. In fact it is not by chance that the verb is a linguistic universal and it is considered by grammarians the essential component of the sentence.

8) As examples like the aforesaid one show, intensity of the attentional state can vary. This should be considered a variation of the operation of attentional focalization rather than a distinct mental operation. I have listed it apart in order to classify in parallel the three possible variations of the attentional focalization, that is its duration, its extension and its intensity. Variations of the intensity of the attentional state are surely indicated by terms like "cautious", "alert", "distracted" and similar ones, but these are quite marginal cases. At the moment, I don't think this operation or variation of an operation has to be considered a component of the structure of mental categories such as the aforesaid operations.

9) In the first example, the one of the appraisal of the height of objects, we did an operation several times that just because of the extreme frequency we do it could have passed unnoticed. Nevertheless it is an operation of really fundamental importance: without it our thought would not exist, not even in its simplest forms, as the ones made up of only two elements (for example: "red pen"). Just because this operation can easily pass unnoticed it is better to use a specific example in order to illustrate it. Let's look at picture 2.
Having this picture in front of us, let's look at the bottle and say "bottle"; then let's look at the glass and say "glass". Now let's describe this picture saying "there is a bottle and a glass". Something different happened in our mind, I believe this can be felt very well. I think we can say, as a first approach, that in the second case we, obviously mentally, "tied" the two objects together, which in the first case we didn't. In the first case when we passed to the glass the bottle has been 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**. A memory is surely involved in it, and this memory is a short term one and has a limited capacity, because no more than a certain number of elements can be kept present. Surely attention is also involved, at least because the thing we keep present must be first focused on. We did this operation several times, as I pointed out, also in the example where we estimated the height of objects. When we considered the window, for instance, first of all we focused on it, then we passed to focus on its ends but, in doing this, we mentally didn't leave the window, we kept it present, and therefore those ends are not just any ends, but are the ends *of the window*. In the same way, we kept the two ends present when we estimated the distance between them and we kept this distance present when we compared it with a term of reference.
It is easy to realise that this operation has a really fundamental importance and that without it our thought would not even exist. In fact, according to Ceccato's theory, thought is nothing else but "tying", correlating one to the other the single elements forming it, keeping the preceding one present when we add the following one, so as to form a web of a particular structure. For instance, the expression "green bottle" is a minimal unit of thought, in which only two things are present, the first being mentally maintained present when we add the second one.

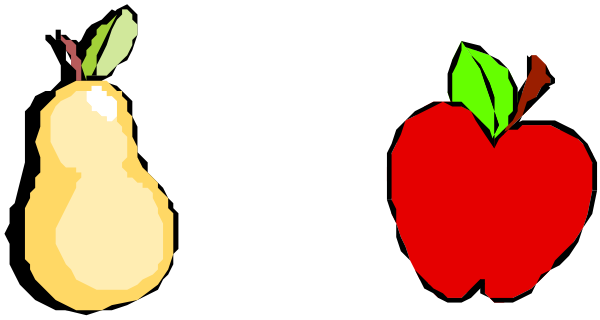
At this point it is useful to resume in a list the operations that therefore would be the basic mental operations making up mental categories (the acronyms, put between parenthesis, can be used as abbreviations):

1) **operation of attentional focalization (AF)**
2) **operation of attentional discarding (AD)**
3) **variation in intensity of attentional state (VIAS)**
4) **temporal basic operating scheme (TBOS)**
5) **spatial basic operating scheme (SBOS)**
6) **operation of comparison (OC)**
7) **operation of representation (OR)**
8) **operations of memory (OM)**
9) **presence keeping (PK)**

I emphasise the fact that this list is not built deductively but inductively, starting from experimental data made up by what we introspectively feel about our attentional and, more generally, mental activity. As it is built in such a way, this list is open and able to be modified as much as we want in each of its parts without the others suffering.
In regard to the modalities of combination of these operations, in the model I propose there is no rigid mathematical combinations system of elementary operations where all possible combinations, within groups formed by a progressively increasing number of operations (2, 3, 4 etc.), come true. There is nothing demonstrating or suggesting a combinations system of this kind really takes place, and, since this possibility has been well explored, we may explore also others and it is appropriate to do it. I think elementary operations combine with each other simply one following the other during time, generally the result of each operation being the base of the following one.
As I pointed out before, I think we can sense very well the mental operations I propose as the elementary ones and which I summarily described above; at least personally I sense them very well and therefore I am led to believe it is the same for other people.
Basing oneself on the elementary operations I propose the analysis of many mental categories turns out to be fairly easy. Up until today I have analysed approximately 300 of them. Here on I quote some examples, intentionally chosen from the simplest.

1) The mental category of "high" has already been practically analysed in the first of the three aforesaid examples. It designates the attentional focalization on something to which we can apply the spatial basic operative scheme (SBOS). We imagine an imaginary line, the vertical one, and attention moves along it until it meets the two ends of the object which are focused on discarding the rest. We estimate the entity of this attentional movement and we compare it with a term of reference. I point out that, using the elementary operations I proposed, the analysis of this category is so simple as to be quite banal. On the contrary, with the ones supposed by Ceccato, mental categories like "high", "short", "wide", "narrow" etc. turn out to be particularly difficult to analyse, so that Ceccato has proposed no analyses of them.

2) Some "classic" analyses of Ceccato, like the ones of the mental categories designated by the conjunctions "and" and "or" and by the Italian preposition "*con*", in their linguistic version, are already practically given in terms of the elementary operations I propose and therefore it is sufficient to remember them. Let's look at picture 3.



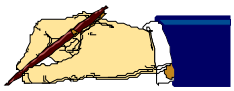
Picture 3

In a situation like this we could say for instance "there is an apple and a pear", but also "I want an apple or a pear". Obviously in these two cases nothing has changed in the physical situation, but evidently it is our mind that has operated in two different ways. What different operations do we do when we use the conjunction "or" or the conjunction "and"? According to Ceccato, when we use "or" our attention, by means of its fundamental selective ability, first focuses on the pear, then leaves it, discards it, while it passes to focus on the apple. The exclusion of an object is obtained therefore when the other is considered. On the contrary, in the case of the conjunction "and" attention, after having focused on the pear, does not leave it, but on the contrary it keeps the pear mentally present while it focuses also on the apple, which turns out therefore joined to the pear.

Picture 4 is used to illustrate the analysis of the Italian preposition "*con*" ("with" in English, in most cases). According to this analysis "*con*" indicates that two distinct objects are found in such a relationship that attention is induced to focus them as a unity, together[5].

[5] This analysis has been modified by me: original analysis was "two things are focused together by attention and then they are divided by it".

cup with handle

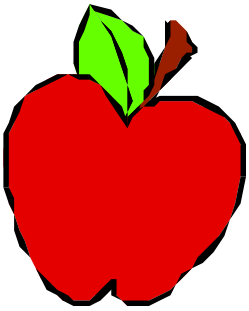


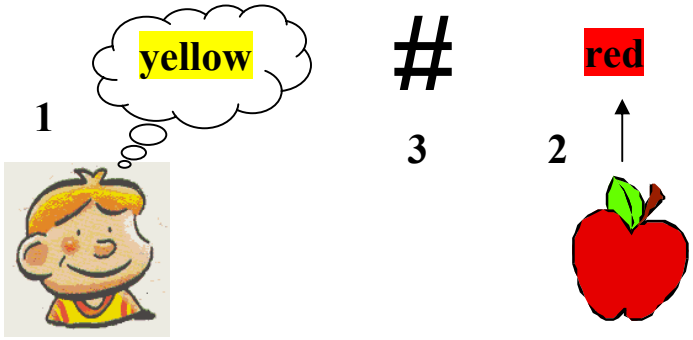
to write with pen

Picture 4

We have to notice that this analysis explains very well the fact that this preposition is used to express both the relationship of company or union between two things and the one of means or instrument between an activity and an object, that is two kinds of relationship that are, from another point of view, rather different (so that some languages, such as Latin, and, partially, also English, express them in different ways). In fact, both when we say "cup with handle" and when we say "to write with pen" what appears to our attention are two objects which are distinct but which are in such a relationship that our attention is induced to focus them together, as a unity. In fact the handle is joined to the cup and therefore we see them together; and as long as we watch the action of writing we see the pen.

3) Also the analysis of negation ("not" as an isolated term, "in-" as a prefix in composed words) is simple enough using the elementary mental operations I propose. Let's look at picture 5 and suppose someone asks us the question "Is this apple yellow?" which obviously must have a negative answer.





Picture 5 **Picture 6**

Picture 6 shows the operations we do to give this answer. First we imagine the colour yellow, then we look at the colour of the apple (that is red), we do an operation of comparison between the two colours and because this gives as its outcome a diversity, we use the negation. In my opinion indeed negation indicates that an operation of comparison between the representation of a meaning and a second term of comparison gives as its outcome a diversity.

4) In regard to the verbs "to look for" and "to find" Ceccato practically proposed analyses only in terms of attentional states, which are not very convincing, in my opinion. I will try to resume them very briefly avoiding using the symbols used by Ceccato. Ceccato starts from the consideration that in the first verb "we have the impression of being suspended and strained, just the contrary of what happens with 'to find'" where "we have the impression of being leant, relaxed, to have concluded what we

began"[6] and he reaches the conclusion that structures justifying these impressions could be: for the verb "to look for", a category of "thing" (what we are looking for?) followed by two categories of "subject" (because the category of "subject" finishes with the state of "pure" attention, that would explain this impression of suspension, tension); for the verb "to find" the same structure but inverted (the two "subjects" followed by "thing"). In my opinion instead the verb "to look for" designates the following operations:

– first an operation of representation, the one of the thing we are looking for (for example a pen);

– the result of representation is kept present while we are moving our attention on a field (let's suppose the visual one) directing it where we think the object can be (for instance on the desktop, in the penholder, on the floor because the pen could have fallen etc.) until...

– an object focused on is the same (operation of comparison) as the thing we initially imagined.

The last operating sequence naturally represents the meaning of the verb "to find".

5) In regard to the categories of "what" and "how much" Ceccato supplied a short analysis of them (referred to the abstract Italian nouns deriving from them, that is *qualità* ["quality"] and *quantità* ["quantity"][7]). This analysis, though perhaps not expressed very clearly, is in my opinion one of Ceccato's most brilliant:

"La qualità risulta da una sottrazione preceduta da divisione, come appunto se, per esempio, dal vetro separiamo la trasparenza e la assumiamo isolatamente, ma conservandone la provenienza, facendone così una qualità, qualità del vetro. La quantità risulta da una addizione preceduta da moltiplicazione, come se, per esempio, da un vetro, un vetro, un vetro, e così via, il 'quanti vetri?' ottiene la sua risposta in 'tre vetri', o 'tanti vetri'."

[Quality is the result of a subtraction preceded by a division, just as if, for example, from glass we separate transparency and we assume it separately, but retaining its origin, therefore making it a quality, quality of glass. Quantity is the result of an addition preceded by a multiplication, as if, for example, from a glass, a glass, a glass, and so on, the question 'how many glasses?' obtains its answer in 'three glasses', or 'many glasses'.][8]

It is easy "to translate" these analyses using the elementary operations I proposed. The category of "what" indicates the focalization of attention on a group of two or more elements, then on one of them discarding the remaining objects and mentally maintaining the origin of the first one. We arrive at the category of "how much" by means of the operation of "counting", that is by means of a series of operations of focalization of attention, one following the other, on each object of a group of objects considered equal (operation of comparison), maintaining mentally present the preceding objects each time we add a new one. Each successive repetition is named by a different name (these are the single numbers: "one", "two", "three" etc.). The word "number" indicates one of these repetitions without specifying what, while the word "how much" indicates to focus the attention on the final result of counting.

I do not introduce here any further analyses because I want this article to be as short as possible. However, even basing ourselves on the few analyses used here as examples I think we can assert, as a conclusion, that the set of elementary mental operations I assumed allows us a rather easy analysis of mental categories and, once it has been shown, easy to understand, I think. It seems to me also that these analyses are not forced and are rather convincing, so as to be a clear improvement in regard to Ceccato's analyses in attentional states (I hope the reader could make a vague idea for himself of Ceccato's

---

[6] Ceccato, S. Zonta B., *Linguaggio consapevolezza pensiero*, p. 220 (original text: *"l'impressione è di essere sospesi e tesi, proprio il contrario di ciò che avviene con il 'trovare'" [ove] "l'impressione è di essere appoggiati, distesi, di aver concluso ciò che si era iniziato"*).

[7] The Italian word for "what" (as an interrogative adjective, like in the sentence "What time is it?") is *quale* and the one for "how much" is *quanto*, so that the abstract nouns *qualità* and *quantità* in Italian directly derive from them. However, also the English words "what" and "how" derive from the same Indo-European roots that "quality" and "quantity" derive from.

[8] Ceccato S. (edited by), *Corso di linguistica operativa*, p. 103 (translation is my own).

analyses in attentional states basing himself on the few words I dedicated to them) and a possible alternative to Vaccarino's system. Although up until today I think the model of elementary operations I proposed is satisfactory enough, I do not exclude at all that there could be some errors in it and it should be modified, even in an appreciable way.

Select Bibliography

Accame F. (1994) *L'individuazione e la designazione dell'attività mentale*, Editrice Espansione, Rome.

Amietta P.L. Magnani S. (1998) *Dal gesto al pensiero*, Franco Angeli, Milan.

Benedetti G. (1999) *La categoria di "spazio"* and *Tavole sinottiche delle analisi di categorie mentali tratte dalle opere di S. Ceccato* in F. Accame, E. Von Glasersfeld, V. Somenzi, R. Beltrame, M. Panetta, C.E. Menga, G. Benedetti *Studi in memoria di Silvio Ceccato*, Società Stampa Sportiva, Rome.

Benedetti G. (2005) *A presentation of Operational Methodology*, in www.mind-consciousness-language.com by G. Marchetti.

Ceccato S. (1964) *Un tecnico fra i filosofi* vol. I, *Come filosofare*, Marsilio Editori, Padova.

Ceccato S. (1966) *Un tecnico fra i filosofi* vol. II, *Come non filosofare*, Marsilio Editori, Padova.

Ceccato S. (1968) *Cibernetica per tutti*, 1, Feltrinelli, Milan (edited by G.Barosso).

Ceccato S. (edited by) (1969) *Corso di linguistica operativa*, Milan, Longanesi.

Ceccato S. (1970) *Cibernetica per tutti*, 2, Feltrinelli, Milan (edited by M.V. Giuliani e B. Zonta).

Ceccato S. (1972) *La mente vista da un cibernetico*, ERI, Turin.

Ceccato S. (1974) *La terza cibernetica*, Feltrinelli, Milan (edited by B. Zonta).

Ceccato S., Zonta B. (1980) *Linguaggio consapevolezza pensiero*, Feltrinelli, Milan.

Ceccato S. (1996) *C'era una volta la filosofia*, Spirali, Milan.

Glasersfeld E. Von (1989) *Linguaggio e comunicazione nel costruttivismo radicale,* Clup Cooperativa Libraria Universitaria del Politecnico, Milan.

Glasersfeld E. Von (1998) *Il costruttivismo radicale,* Società Stampa Sportiva, Rome.

Marchetti G. (1993) *The Mechanics of the Mind*, Espansione, Rome.

Marchetti G. (1997) *La macchina estetica*, Franco Angeli, Milan.

Parini P. (1996) *I percorsi dello sguardo*, Edizioni Artemisia, Ancona.

Vaccarino G. (1988) *Scienza e semantica costruttivista*, Clup Cooperativa Libraria Universitaria del Politecnico, Milan.

Vaccarino G. (1997) *Prolegomeni* vol. I, Società Stampa Sportiva, Rome.

Vaccarino G. (2000) *Prolegomeni* vol. II, Società Stampa Sportiva, Rome.