RESONANCES

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Part one

Chapter I

Who is thinking ? Is thinking a subjective phaenomenon ?

The immediate answer to cross the mind without any previous thought is : The human mind is thinking ! Yes, thinking is a subjective act.

Afterwards, uncertainty rises, along with the first comments or questions that appear,, simple questions thst are linked somehow to this first answer :

1."The human mind" on its own does not exist, but the minds of all people, that means of every human with its own subjectivity, having a higher or lower capacity of working out the "signals" sent by the senses "attached" to those minds, better said, by their assembly, acting globally, like a whole unit. Furthermore, the mind of one human also judges assemblies of such signals coupled with results of the mind activity itself, that means thoughts generated by that particular mind belonging to one of the people living in the present or having ever lived.
2.Why can two different people analyze an assembly of events in different ways, reaching different conclusions?
3.Why different people can analyze in a similar way similar assemblies of events, reaching identical conclusions ?
4.How can the use of the term of „human mind" be justified, as long as the "human mind on its own" does not exist ?

While analyzing these allegations, new questions will arise and depending on their importance or their emergency, we will treat them as soon as they will appear or we will grant them a special and separate approach.

The straight and trivial answer without the necessity of complementary argumentations or demonstrations is that the human mind is the generalization of the concept of "the minds of all people" by taking into account what is common to all particular minds, otherwise said, what is specific to the structure of the species "human", the latter being itself a generalization of the notion "all people".
Taken with this generalized sense, the notions "human mind" or "human" have a significance and they EXIST.
At the same time we must observe that the notion "all the people" has no sense too if we do not know what "human" means. So, just after a few judgments we come already to a paradox, respectively to a vicious circle : what was before, the egg or the hen ?
How do we get rid of it ?

By observing that the human mind, before it undertakes generalizations in an explicit way, that means, by induction, that mind about which we do not know how it began to exist, the mind we are used to speak about without defining it and without fixing it in a rigorous system of axioms leading to a consistent and un-contradictory theory, that mind again being the starting point of our series of questions and comments, generalizes in a natural way, straight and inexplicitly, so that we see suddenly and without any prior notice, that it operates with notions impossible to exist in another way than as generalizations of representations of concrete things or events being or happening in the immediate reality.
Much later, the rational mind, after thousands of years (or at least, during the last three hundred years) of operating with the categories of logic has succeeded to show explicitly the way in which such a natural, implicit generalization occurred.
A very spectacular example of the complexity of that phenomenon is represented by the appearance of the natural numbers.
Details can be found in Annex 1, but the steps of successive generalizations are as follows:
a)"Defining" of the sets, i.e. starting the construction of a theory based on a concept which cannot be defined.
b)Defining functions and relations between sets.
c)Defining bijective functions
d)Defining equivalence relations and equivalence classes.
e)Defining the equivalence class of all sets between which one can define bijective functions.
f)Defining cardinality of a set and the equivalence class of all sets of the same cardinality.
g)Defining the natural number as the equivalence class of all sets having a certain cardinality.

Natural numbers did not appear like this. Their appearance has been made explicit in the XIX-th century by a brilliant mind of a mathematician, whose merits as a mathematician were generally denied and this denial has been undertaken by the very evolved and exercised minds of a lot of mathematicians taken individually. The fables of this extraordinarily brilliant mind of a denied mathematician have reached to represent the fundamentals of mathematics, a "conquest of the human mind", naturally regarded as an inexplicit generalization of the concept "the minds of all people". And this fact is now accepted by "the world" of mathematicians, anew an abstract concept, "not existing" on its own.
Natural numbers appeared by an intuition of the human mind. They appeared naturally, as primitive people used to say "much" and "few", later, "more" and "less" and afterwards "as much as the fingers of a hand", or "as much as the legs of a dog or of a cow".
And how did they get used to tell these things ? It is not sufficient for a human to state something, it is needed that the other people, whom the first is addressing, to take into account what he is telling them. They have **to understand** what he says in order to take into account. The minds of primitive people communicated without any help of logic, but directly, by intuition.
And we are now again in the situation to use an undefined concept, to discuss a characteristic of the human mind existing only as a generalization of the minds of all people, which exists only if the concept of human exists and this is a concept existing before the concept of "all people".
This concept is **at the same time a posteriori** if we consider generalization as an inductive explicit operation belonging to the domain of logic **and a priori**, if we regard generalization

as a natural phenomenon, born out of intuition.
Similarly we will take into account another concept besides the undefined one of "intuition", appeared by "a priori generalization", as explained above. Obviously, we are here interested in the structure of the human mind, which, being looked at from the point of view of another a priori generalization, is identical for all people.
One can observe that, practically, we cannot speak about anything * without a priori generalizations and undefined concepts, because such situations are specific to the "structure of the human mind".

(* *an exception being probably mathematics, but here one also can have reservations because of the notion "set" on which the whole construction of mathematics is based)*

I consider that this allegation has not to be demonstrated because I am relying on the fact that the present text is addressed to the capacity of the human mind to digest concepts and allegations based on a priori generalizations.

After this wide digression I want to return to the subject of the present chapter, resuming that we are entitled to discuss about the human mind and about its structure, also about the fact that, depending on the degree of generalization, it is easy to explain why different people can analyze the same thing in different ways, drawing different conclusions, and why it is possible that, analyzing similar things, different people can reach identical conclusions. Obviously, it is about the same phenomenon, happening on different generalization levels. On a low generalization level, i.e. on a particular operating level, the specific differences between the mental functioning ways of different people are effective and visible. On the contrary, when the abstract level on which the mind operates is high, the specific differences disappear and the basic structures of the "human mind" come into operation and their existence becomes observable.
This is the level on which the laws of logic are acting. They neglect the specific mental characteristics and represent mental structures common to all humans. These laws act all together and simultaneously and they represent the generalization level assuring operation not depending on the physiological, emotional or situational context of a particular person. At this level one can say that thinking is not a subjective phenomenon, because we have succeeded in marking out that there is a generalization "degree" which assures objectivity by the previously mentioned contextual independence.
At this point of our exposure we can say that we have attained a quite satisfactory answer to our question being exactly the title of the present chapter. But the great difficulty starts right now. It consists in how adequate to the object the analysis done by logic can be, that means how adequate it can be to the events analyzed from the objective reality. There is no reason to conclude from the fact that the laws of logic are obeyed and the initial assumptions are undeniable objective events, that the result of the analyzed corresponds to the undeniable fact in the objective reality.
Nevertheless, this is considered to be obvious, beyond any doubt, beyond any argument and unanimously accepted, so that there is no need for another attempt of analyzing it. Furthermore, this is one of the fundamental principles of philosophical and scientific thinking.

This principle is working in the following way :
If the hypotheses, or axioms being the starting point of a reasoning correspond to reality and if the reasoning is logically correct, than the conclusion corresponds to reality too. This assumption is so strong, that there is considered that a conclusion not corresponding to reality implies with certainty that either there has been an error of logic, or one of the hypothesis is false, i.e. does not correspond to reality. In this case, all hypotheses and all reasonings are re-analyzed until one discovers the reasoning error or the bad match of some hypothesis to reality.
Of course, logical errors are trivial, so our concern will be mainly how adequate the hypotheses are fitting to reality. This is an universal considered criterion to verify hypotheses. That means, assuming that there are no logical errors, meaning that all reasonings have been verified and validated, the laws of logic are considered so strong, that the hypotheses have to be adjusted so long, until the result of thinking matches observed or determined elements of reality.
This is astonishing : the scientific spirit considers the consistence of thinking and the consistence of reality having the same degree of relevance, the same value and the same importance for the human mind.
Of course, from the point of view of a subjective idealistic conception, we cannot make the difference between reality and our conception of it, this is why in this case the consistence of thinking can be identified with the consistence of reality.
Most of the thinking systems do not operate this identification to its last consequence and this is why the problem of coincidence of the two types of consistency does in no case seem trivial to me. I admit not knowing any case where this principle is not applied and I did not hear of any serious person to claim having proof of exception from this universal principle, this is why I consider his unfailing validity so astonishing:
the universe has "produced" by ~~a~~ continuous effort of millions, perhaps billions of years systems becoming more and more complex, until thinking has emerged, which finally seems to be co-substantial with his mere~~ly~~ essence, this means with the essence of the universe having generated it.

Could it ever be true ? Is the Universe thinking ?

Chapter II

Non-discursive thinking and significance

If we could discover such surprising findings so quickly and directly when touching on the problem of representation of the objective reality through logical thinking, approaching of non-discursive thinking highly complicates what we are pursuing.
Let's begin this chapter with another aspect of logical thinking, i.e. correctness of reasonings.
How can we verify if a reasoning is correct ?
Any logician comfortable in his domain will of course answer that the laws of logic are so well built, that they offer us some objective and certain criteria, based upon which we can verify. This would mean that we verify thinking with the help of thinking.
So how are we going to proceed ?
Simply, with algorithms being formalised, perhaps embedded in a context-independent language, so that, no matter how complex the network of reasoning could be, the algorithms will tell us for sure if this network contains errors or not. We can let a computer to do this testing and wait for its decision.
So, we are rid of part of the problem !
But if the concepts are not rigorously defined or, better said, because it is extraordinarily difficult, if not impossible, to eliminate all concepts being generalizations a priori, it can happen that the meaning of a notion "slides away" to a related, connatural notion while we are reasoning.
In such a case, the reasoning is formally still without any breach, but from the point of view of the significances implied in the reasoning, we have interrupted in fact the array of reasoning regarding the first notion and have started another string of reasoning, a new one, implying another notion, a new one too, mixing the two strings of reasoning in an incontrollable way **.

*(** This is the way one can cheat in a controversial discussion : one takes the reasoning of the opponent, one replaces the significance of a notion with that of another, one keeps the word with multiple significance and one continues the demonstration on a different path, but having in mind the new significance of the word. The conclusion can be, depending on the "mastery of the speaker", whichever)*

It results that the prime difficulty of accomplishing an unmistaken reasoning consists not in the formal obeying to the laws of logic, but mainly in attributing adequate meanings to the phenomenon about which we are thinking. **Well, who operates this attribution ?**

Look : we find again and again in the same situation of an undefined notion, based upon a priori generalization : **the significance, the meaning....**.

We have to return to **"intuition"**.

We have made the assertion that primitive people were thinking intuitively, without being capable to perceive different degrees of generalization, steps of reasoning or rules for correct thinking.
Intuitive thinking is reality-oriented and represents an inner effort to adapt an assembly of inner emotional states to an "aimed" objective reality. This effort produces results suddenly and is accompanied by a feeling of certitude that the found result is exactly the searched one and this feeling of certainty is duplicated in the act of taking a decision by the confirmation given by reality that the taken decision is well justified. Although we can take the emergence of the solution step by step, the state of certainty, taking the decision and the confirmation from reality, these steps take place apparently in a timeless "region" of the spirit, where those states exposed one after another are in fact coincidental.
Intuitive thinking has nothing in common with barren fantasy playing with images born out of unsatisfied necessities or dreams, and it also has nothing in common with the tremendous visions taking control over their subject, transforming latter into a new person.
Intuitive thinking has been born along with the primitive human, but always accompanies logic where the thinking current follows in a healthy way what has to be understood. The feeling that the reasoning I have just followed or I have just made is correct, overlaps with logic and is not replaced by it***.

*(*** One tells that the mathematician Dan Barbilian has been interrupted by a student while giving a lecture in the moment he asserted : "It is obvious that...." The student asked : "Why is it obvious ?" Barbilian stopped, began to think, got out of the room without telling a word and got back after a quarter of an hour telling : "Yes, it is obvious." and he continued the lecture from the point where he had left it.)*

I want to point out that intuitive thinking can participate at discursive, explicit thinking, but it is something else, I would dare to say, at least as important as logic is.
It highly assures developed human beings that exposing reasoning step by step is in accordance with the meaning of the situation and with the meaning of the conclusion of that reasoning, no matter how high the degree of abstraction of this meaning is. Otherwise told, when meanings of concepts are abstract, one cannot undertake an "experimental" testing of reasoning, and thinking operates as if it would handle concepts emptied of their content, as if it would be "pure logic", independent of their context. In fact intuitive thinking "perceives" a global abstract meaning , "contemplates" it and "walks" on a chrono-"logical" path from one "component to another of that abstract significance and explicitates their inner logic with the feeling that "it is really so".
Testing if the rules of formal logic are obeyed is done post factum, for "the public" for "the exposure", for confirmation, for objectification, for obtaining the acceptance of the other.
But the other too, when following the exposure, begins to "navigate" through the abstract space, led by the feeling that the path for obtaining the demonstration is correct and, if it is correct, they declare their acceptance. This is how an abstract theory is confirmed and not by informatic technologies, nanotechnologies, technologies of high vacuum or high energies. These technologies offer the ultimate testing, in the concrete world, but before this confirmation, a viable theory is confirmed in the hearts of the logicians by their feeling that

the demonstration or the theory "is good".
One can here also add that for a multitude of theoreticians it counts enormously if a theory is not only "good", but it is also "beautiful".
I am sorry to quote without knowing whom, but a famous mathematician, while discussing about a too abstract theory to foresee a practical applicability of it, told about that theory : "It is too beautiful for a domain where it applies to not exist somewhere in the universe".
The feeling of an experimented theoretician that "it is good" has two components : the fact that the string of reasoning is "clean" , i.e. does not contain errors or futile "loops" and the fact that the notions' meanings are unchanged during the performance of the reasoning without supplementary tacit implicit properties being able to "slip away" in an uncontrolled manner from the natural logical path of demonstration. The first one is generated by a "mastership routine", similar to that of a virtuous instrumentalist who pure and simply cannot "take" a false musical note and represents a kind of global perception of the inter-correlation of the components of a reasoning. The second one is also a kind of perception namely one of abstract significances.
These are apparent "perceptions", in fact they are the result of the **integrating function** of the intuitive mind, subconscious or unconscious, however we want to call it. Here is the "reservoir" of ideas, the fountain of confirmations of what is to be analyzed in the surrounding world, as well as in the inner one.
Passing from the logical to the analogical and psycho-logical is done by natural prolongation of complementary and perfect compatible structures. The more abstract a notion is, the more it is based on weaker perceptive "signals" and on their extensive and complex structured integration.

Returning to the principle from the preceding chapter, according to which
"If the hypotheses or axioms being the starting point of reasoning correspond to reality and if the reasoning is logically correct, than the conclusion corresponds to reality too"
and if we accept what is exposed in the present chapter about the feeling of confirmation accompanying a flow of correct and non-trivial arguments, it appears that we can extend this principle to an abstract inner reality of the thinker, confirmed objectively by other thinkers analyzing this reasoning in good faith. Here by "objectively" I mean the fact that a multitude of people have the same feeling of certainty and live this feeling, while stepping through the demonstration and certify its logical correctness before any formal testing****.

*(**** this procedure has of course a certain doses of subjectivity and a higher rate of errors, but it is important that one can reach objectivity even by a procedure that belongs strictly to the domain of thinking)*

Passing from the restricted to the extended principle, i.e. from unspecified thinking to be logical or intuitive to claimed thinking to be both logical and intuitive, is achieved by comprehension, by coverage of the "abstract significance" by the domain of "being adequate to reality".
And if we can accept this expansion of the domain of reality, if we can accept this extended principle, we can wonder again and wonder more and more of the coincidence of the consistence of reality with the consistence of thinking.

And the question ending the preceding chapter, although it appears to raise even more problems now at the end of the present chapter, seems to be asking for an imperious affirmative answer.

Annex to chapter II

Version of thinking by operating concepts emptied of any content

Because of errors of the type mentioned in the footnote **** in chapter II, some thinkers prefer theories based upon concepts defined with the highest accuracy, as used in mathematics, where the sole undefined notions are those of set, element and function. In connection to the use of these concepts there is an unanimous acceptance by convention, even if this convention is not explicit: the fact that nobody in the scientific world is proposing supplementary significances of these notions or is not using them in another way as they have been used until now, is enough for the problem of attributing meanings to the named three notions to be considered as caduceus.

So, the choice of the convention to use could be a subjective one, a very personal one, a preference imposed perhaps by a special talent or by predestination of the kind artists show, expressing themselves through poetry or music. Sounds on their own have no significance, but the musical creation consists of their combination, however in poetry the melodic and rhythmic combination of sounds represents *one* way of "reading" the literary product, while the combination of the significances of words means *another*.

In physics, one tries to use the notions of particle systems, field systems and their states as primary undefined notions, while their acceptability is considered sufficient if the mathematical model associated to them offers a rich enough frame for logically explaining all known experimental observations. A recent example is that of "superstring" which has been accepted by the theoretical physicists as a temporary concept with certain mathematical properties and which will be abandoned and replaced by another one with more appropriate mathematical properties as soon as this new one will appear and impose itself naturally.

This way most physicists protect themselves of uncomfortable philosophical problems which they feel unprepared for and leave issues regarding meanings to bother their peers who wish or are capable to approach these issues.

Returning to the "mastership routine" accomplishing a global perception of the components of reasoning, we can continue the comparison with a musical composition being able to transmit by integrating new unexpected meanings as if a new "word" has been created, a huge one having implicit significance, perceivable by the intuition of those who "understand" that musical composition.

In the same manner, "beautiful" theories have arisen with no utility, but accepted by the brilliant minds of those times, because they revealed intuitively from the ingenious "drawing" of their never yet met logic, new implicit significances : Galois, Riemann, Bolyai and Lobatchevski are representative examples for those creations having found their applicability much later, i.e. their explicit correlation to reality.

Chapter III

Extended implicit significances. Similar structures

Conceiving a literary or musical work as a new assembly of sentences, in the last resort as a new word (a word is a finite string of characters, as well as a novel), changes the perspective we have when regarding the notion of significance. No matter what significance is or how it is defined, the first comment we can make is that the set of all words in this extended sense (from mathematical point of view, this set is called free algebra engendered by an alphabet) is much more comprising than the set of **expressed significances**, because for each such a significance there is a word (= finite ordered string of characters having a point), but there is not for each word (= finite string of characters randomly ordered) a significance .
So, random generated strings of characters do not represent anything for a meaning-searching mind: the concept of significance without a mind or a conscience to perceive it, is as pointless as a quantum phenomenon without an observer.
If we would like to try a formal approach to the problem of significance in the present context, we should be able to characterize clearly, impossible to interpret in several ways, the difference between the words having a significance and those ones being random strings of characters. Furthermore we should search for a criterion to make the difference between words with one single meaning and those having multiple meanings.
And this purpose should be attained in the most general case, where words are finite strings of characters of an alphabet, this one being for example the set of characters of the Latin alphabet, the set of musical notes, the set of standardized gestures of classical Chinese or Japanese theatre, the standardized figures of classical ballet, a.s.o. If we will consider the blank space and the punctuation signs also characters of the alphabet, whatever this could be, it means that we can consider any artistic, philosophical or scientific work regarded in its wholeness, as a word in the above mentioned free algebra engendered by the characters of an alphabet.
Having at our disposal such a rich set of "words" (which we should name in what follows generalized words with significance), it seems that we can establish very fine differences between different significances, so that we could avoid the situation in real life where a word can have multiple meanings, generating well known confusions or contradictions. This could mean that we have found this second criterion, which seems to be formalizable, i.e. easy to control.
But until now we do not know how to differentiate generalized words with significance from generalized words without significance (randomly generated). The sole criterion is offered by intuitive thinking and this is why one has to assume the existence of something besides the words we want to use to describe reality.
As we already have pointed out above, this "something" is the conscience observing and analyzing both words and reality, in a similar way as quantum reality is described together with the observer who is performing the experiments. Instead of "conscience" we could say "the set of all inner states of the assembly thought/emotion of the thinking person, centered

around that person", and afterwards we could be tempted to say that we have found two sets and a correspondence, that means a function between the two sets giving us a formal criterion to differentiate the words with significance from those without.
It would be absurd to think one can operate mathematically with the set of inner states of a person, so we must adopt an option of common sense resuming ourselves to operate with the notion of intuitive thinking and search further for the separation criterion of the two concepts.
To move forward, I propose to take some steps back and to start again from a nearer point to the origins of expressing meanings.
I suppose that primitive people or pre-humans who did not yet develop a language, were behaving like animals in the sense that their actions were **meaningful in the frame of their mode of living**. The movements of their bodies were or are in **correlation with reality in a continuous manner**, because the needs which can be satisfied generate actions aiming their satisfaction. But the assembly of needs not yet satisfied and which cannot generate actions because they are too fuzzy to be perceived correctly (adequate to reality) or because there are external barriers hindering actions, are aggregating in time and create a "pressure" bringing the need to ex-"press". The actions of expression do not seem to be adequate to reality because they don't transform anything from reality, they have no effect on the environment : they consist of movements which are meaningless from the point of view of adaptation mechanisms to the environment, and the environment does not answer in any way to this liberation of inner pressure. These movements without any material meaning are gestures, rhythmical movements and sounds, the germs of the spiritual "point", the rudiments of dance, rituals, music and words.
How did this phenomenon happen ?
In similar repeated inner states the pre-human has felt the need to discharge the inner pressure in similar ways : to emit the same sounds, to make the same gestures, etc. Different people, based on their similar structure, have found similar sounds and gestures to express similar inner states, or if they couldn't generate "by own effort" those sounds and gestures, they have **recognized** them when seeing or hearing them done by one owns kind and have had the feeling of confirmation, this "yes, that's it !" and have answered by repeating those sounds or generating other strings of sounds in view to complete the first ones or containing the "declaration" of recognition and confirmation.
Here, attention is to be paid to two fundamental characteristics of the notion of significance : one points to "resembling structures" and the other to "recognizing", these two building together a "system of direct communication". Apparently this is not a direct communication, because one could say that it is realized through sounds, gestures, etc. We could even rush to the conclusion that we deal with a language and a communication convention, even if they are rudimentary. But in the situation we have just described, there is not yet a language and the sequence of sounds is not yet memorized in order to put the basis of a convention, here it is about direct transmission of an emotional state from one individual to another, in a way that the emotional state is identified with the sequence of sound and/or gestures. In this identification, an emotional state of one individual "calls" or "triggers" a similar state in another individual through a kind of resonance*, similarly to the way in which a natural phenomenon triggers another.

(We have now arrived to the rudiment of the notion representing the main theme of this paper : the*

resonance. We will try along the paper to create a generalization and to analyze the consequences and the properties of this generalization of the notion of resonance of physics waves. We want to study the way similar structures "call" one another based on the fact that, on a higher level than usually perceived, the abstract structures corresponding to them are "of the same kind", are connatural.)

If we agree with the above assertion that there are two different ways to emerge of that "pressure" asking to be expressed, let us try to "explore" the differences between them :
The inner states leading to forming sounds, gestures, etc. and the inner states leading to actions ; not spontaneous ones specific to the primitive human or to the animal, but actions emerging after a certain time of "incubation" of the "pressure".
Let us call the first category "states generating significance" and the latter "states generating action".

Chapter IV

Primordial words. Sounds and gestures with significance. Appearance of memory. Circumventing the problem by appealing to memory

The sounds and gestures made by the primitive people had implicit significances : not only the primitive words as sequences of sounds represented an inner state of the individual, but every sound for itself. These people were nearer to the model "poetry" than to that of "music", as mentioned them at the beginning of the chapter II bis. For them, everything had a significance, the rythmicity and the melody of the sequence , as well as the sounds themselves.
The mechanism responsible for the appearance of speaking definitely comprises memory too (See Annex III). Repeating and recognizing repeatedly the same sounds during similar inner states lead to the feeling of confirmation that "this is the right way to communicate" and fixed through that confirmation the need to repeat. But memorization is a curious phenomenon : the more it reaches precision, the more it loses contact to the deep source of direct expressing an inner state. At the same time it creates ways of easy communication between individuals, including also the settlement of conventions. So, the process of expressing different states by different sounds has stopped when humans realized during the development of their memory and of their capability to generate conventions, that it is more productive to express yourself combining memorized sounds than creating new sounds for each new state.
Of course, memory did not appear in this evolution stage of humans : animals have memory too, but the difference consists in the fact that the animals are not conscious of having and using their memory. One of the most pregnant leaps in passing over from animal to human is the **conscious use of memory.**

This change of "procedure" together with the just mentioned stopping has led to the situation that potential infinite set of states is waiting to be expressed by a finite set of sounds. And the cause of that stopping is the limited capacity of the memory : to be able to communicate through this "new system with memory and convention", a much better and faster system, it is necessary that all individuals "adopting a convention" keep in memory all sounds underlying to their "convention of significances". Any new significance will be expressed in the following way : the inner "pressure" will no more generate a new sound or a new gesture never ever been perceived or memorized by anyone, but from the memory of "fundamental state/sounds" more elements will be extracted, which through their combination will transmit the significance waiting to be communicated.
In this way, step by step, there has been a displacement from the model "poetry" to the model "music", while the sounds and gestures lost their initial significance in a much deeper zone of memory. This zone is very difficult to access because it can be explored only with the help of the vivid and integrating emotion to which the whole being is participating.
In the present paper we feel tempted to tackle a similar procedure : to give up finding a way of describing the resonance of similar structures directly as an observable and immediately describable phenomenon, but to try to explore the relations between the successive coverings

represented by the languages describing sets of states of assemblies of systems.
In other words, expressed more intuitively, we give up the mode “poetry” adopting the mode “music” in order to be able to describe more precise the hidden significances of the mode “poetry”.

To this purpose we have to see what we could obtain by this tackling : we could approach the taboo theme, i.e. “intrinsic significances directly perceivable” bypassing it continuously nearer and nearer to the aim, describing the subject with help of a language built up by the just mentioned association between alphabet, convention and memory.
And before trying to debate the subject, we will again introduce a notion without any definition with the same grounds as we have introduced the notions of intuition, significance, meaning, etc. It is about the notion of **system**. Although there exists a theory of systems and although this theory apparently starts with a definition of its object, the situation is similar to that of the notion of set, even more, this definition is based on the notion of set, to which are added three new attributes, called states, inputs and outputs : anyone who is interested in that theory can understand by these three words what he wants and, as long as no contradictions or major objections appear by following the exposition of the theory, everything is all right.
Yes, this is how set theory and system theory developed and...., really, everything is all right.

CHAPTER IV bis

(Annex III)

About memory

(Nascence of memory and of some of its most important secondary products : space, time and the other physical quantities)

No matter how we would tackle a problem about thinking, it is impossible not to also stop at the concept of memory.
I don't know if one can establish an origin of memory, but it is obvious that only for humans this notion can fully have the value we normally attribute to this word. Highly evolved animals can also show a mechanism similar to that of learning, even of things unnatural to their standard way of living. Those things are designed mainly to astonish a curious public and eager for show, a circus show, of course.
But the new born is learning too, it is learning all those attitudes and actions said to be based on instinct, it learns them by trying, by experiencing : its acting in the frame of the preexisting "pattern" of instinct is attained after the cub is "finding" that "pattern" by many tries and afterwards its movements become ~~sure~~ confident, as the short memory, the individual one, has found and connected to the memory of the species, to the genetic "scheme".
If we have ended up by considering that the origins of memory as we use nowadays this word in everyday's language belong to the domain of genetics, than **we have to think memory as being specific to life.** And I think we can, as extensions of the word, like "archaeological memory" or "geological memory" are rather "poetic" extensions than proper ones. This is because these two concepts mean really specific signs, which scientifically interpreted, can offer to a well trained researcher indices about events lying far away in the past of many hundreds, thousands or millions of years, but these signs do not have specific characteristics of memory, meaning that the "memorized" information is not useful to the system having memorized them, but to an exterior and much more complex system; namely to mankind.
The movements an animal performs during a circus show are memorized schemes "triggered into real life" by a mechanism based on the animal's wish to obtain a pleasure or to escape an event of which it is afraid. Even in such a simplistic example the will of the animal is present too, as the animal is not a machine made to avoid a terrifying event or to obtain satisfaction triggered by its own wishes, but it can show its own will by refusing to execute the scheme of trained movements and to give up the pleasure of eating something with good taste or running away in order to avoid the punishment.
Regarding the trained animal, his unnatural movements are not an adequate response to a challenge from the environment, they have been "inoculated" to the animal's memory by the trainer, but the primitive human who did not yet know speaking and dancing had no trainer, these unnatural movements emerged from his own inner : from the inner pressure being accumulated due to the impossibility to find an adequate answer towards the environment to the myriads of almost unperceivable impulses.

The motor of expressing, i.e. of generating completely new sounds or gestures is not yet will nor desire, but the unbearable pressure; we could perhaps say that it is a kind of desire : a desire to not bear the pressure any more.
Memory is the depositary of slightly perceivable impulses, which are accumulated there, creating in this way the pressure.
The threshold determining if this pressure is still bearable or not is established by will, as an unconscious or semiconscious act of the primitive "pre-human" : "I am expressing myself" is a display of intention and this is the rudiment, the germ of consciousness.
This act of will- the displayed intention- will be "deposited" in memory too and it there creates a "coagulation point", a "crystallization germ", which by repeating the event, begins to have sharper outlines and to accumulate new events, building through the subjective importance of the events, through the magnitude of the pressure, through the excitement tied to taking a decision, etc. , the structure of a memory of which the pre-human begins to become conscious.
He will now **willingly** repeat certain gestures or sounds strengthening the structure that is being born. And this structure represents an accumulation of reflections of situations, events and states from the environment, which by and by becomes more and more complex, trending to "catch" better and better the outer reality.
This reflection is dynamic, because the external stimuli are continuously coming to interact with the memory being in a continuous growth, strengthening and complexification. This way humans as they are today are beneficiaries of two interconnected and overlapping structures : the memory as an "imprint" of reality, as an already existing and realized structure on one hand, and on the other the memory as a vivid receptacle of the indescribable looking for the most adequate structure.
Any new stimulus adds to something in already continuous movement and as long as the memory does not become a rigid "organism" with points forever fixed and as long as the border between conscious navigation through memory as a reflection of reality on one hand, and on the other always "hosting" new impulses as a guarantee of an open mind, well, as long as this border does not emerge, does not get fixed and rigid, man can consider himself as a free thinking being.

This dynamic structure called memory, as long as it does not admit a neat border between the "saved information" part and the part being continuously "on reception" and as long as memory is an adequate and complex structured reflection of reality, it represents the fundament thinking is built on both logic and intuitive at the same time.
The human spirit navigates through this structure while exploring the "cosmic space" of the never ending reflection of reality.

Nevertheless, the part with saved information contains the eternal temptation to consider itself as a closed definitive image. This is why memory is treated often as limited. In some cases this point of view is even justified. By what ?
By the fact that there is always a trend of the border between the two parts to emerge and to set. The less the spirit is "trained"and evolved, the more it is tempted to believe that "what I know" can be overlapped with "what is".
Memory is unlimited only if it is non-local, only if it is not attributed the limited capacity of

the brain to save data. This is similar to the comparison between the physical memory of a computer and the virtual possibility of internet to save no matter how much information. The important thing is not the concrete physical boundary, but the permanent possibility to rearrange contents and to move borders.
Regarded in this way, the vivid memory, the unlimited one, offers to the observing spirit the possibility to navigate through a secondary, reflected, but objective reality. In fact, the observing spirit does never explore another reality than the reflected one, because any new element, any new aspect of reality is first perceived and then correlated as well as possible with other elements of the already reflected reality. So the observing spirit can never perform an excursion into reality without showing these two latter aspects.
Let us come back to the animal and to the primitive pre-human : the boundary mentioned above does not exist in his case, because he uses his memory unconsciously and is permanently open to the new. The only barrier set to the openness to the new could be the panic facing a new terrifying situation, a tremendously unusual one or to the forefeeling of an imminent catastrophe. Faced to such a situation, the curiosity specific to the exploring mind disappears and only the conservation instinct is what remains. Such kinds of extreme situations do not help us to understand the nature of thinking, so we will not treat them here.
While that part of memory with saved information becomes more and more consistent, the trend appears to consider this part as a "haven", as a sure region and this is why the aspect of limitation of memory is thought of as being more important, because a limited region is more comfortable facing the "beyond" without boundaries and in continuous motion. A potential unlimited range of sounds and gestures will be replaced by a finite, even small number of elements, chosen by a continuously increasing number of primitive people to serve them as common inner references to a set of fundamental inner states. These are the fundament for the emergence of the alphabet of sounds, of the "bricks" building words, of the conventions communication is based on.
So, the "solid" memory, trending to limit itself, is gaining more and more ground, while the fuzzy and diffuse part admitting crossing the borders and boundaries, this part open to transcendence remains a space reserved to the exploring minds.
And how will these minds express themselves ?
Building new words, seeking to perceive and transmit new senses, by keeping an uninterrupted bond between the sure and solid part and that foggy one bearing significance.
How can the discovered significances become "objective" and how can they be transmitted ?
One way could be the direct one, a sort of "short-circuit" from one mind to another, a kind of resonance allowing to the minds of a few people to commonly contemplate a certain reflection of reality. We do not have to think directly of mystical examples, there are also some well known from common life : the joy of dancing or the joy of musicians to play and improvise together an exciting part, etc.
Another way, and this is the most common, is the one intermediated by conventions and by words, even if they are generalized words with the meaning introduced in chapter III.
How does the exploring spirit act when it is about to transmit a new sense, discovered during his contemplations and navigations ?
It exposes the freshly enriched content of memory, **after** the enrichment took place. The act of conscious perceiving is separate of the act of transmission. And the transmission cannot be performed at once, but by queuing, by stringing, as the word, the sentence, the phrase, the

exposition, in other words the generalized word is representing a string of fundamental elements by convenience called the "bricks" of communication, the elements of the alphabet. Stringing is the first operation of the human mind, other than concrete adaptation to the environment. It is the first natural generalization, the f**irst step in the process of abstractization, of separation of the intrinsic sense of the object from the concrete object itself.**
The significance of stringing includes the idea of order inseparably, afterwards that of natural number, as we have pointed it out in the first chapter.
The idea of numerical continuum has arisen very late in the history of mankind, in modern times, and although the expression "time is flowing" seems to have existed since the beginning of the world, the human mind has used until the appearance of numerical continuum a representation of time as being a string of moments. But **marking moments means establishing a rhythm,** no matter if it is about ritual dance, ordinary dance, music or cosmic events.
If we will consider this sketch of argumentation as plausible or even acceptable, we are justified to admit that
•the idea of string
•the idea of separation between limited and transcendence
•the idea of time and
•the idea of word

are "co-substantial", i.e. have a common root of significance.

All that reasoning came from analyzing the situation in which the inner pressure is accumulated by adding enormous amounts of very weak stimuli, of which man was not conscious and what we have called at the end of chapter III "states generating signification". At the same place we used the expression "states generating action", i.e. pressure man is conscious of, because it comes from strong stimuli, too strong to be adaptable to in a natural and unconscious way, as it has been the case for millions of years with animals. It is about the stimuli addressing to the conservation instinct, not generating an immediate adaptation to the environment, because they are either too unusual, they have been never perceived and they don't trigger an instinct based mechanism, i.e. a genetically earned automatism, or they are too strong to be part of the usual life of the pre-human still in the state of an animal. These stimuli accumulate in memory, because they lead to many repeated tries with subsequent failures of adaptation based on the earned mechanisms, as they have become a permanent "menace", a kind of obsession associated permanently with the wish to escape that unbearable pressure. Exactly this unbearable state "crystallizes" the memory and creates the conscience of its existence.
What goes on further ?
That part of memory open to new stimuli paying attention to any detail, permanently lurking, perceives something new. It has a flash of understanding, an **intuition of the retrieving solution, the desire to escape the unbearable pressure and the will power, shown by taking a decision, transforms that accumulated pressure into manifested energy, into freed energy, and the huge satisfaction felt by that liberation creates in memory a fundamental reference**.

The actions generated this way become examples for the others, who begin to imitate what they have seen to be a retrieving solutions and as long as this is repeated by more and more people, it becomes a common good of the species, being fixed at the beginning by imitating repeating and afterwards, by conscious adoption.
What does such a process create in memory ?
The freed energy creates the awareness of the phenomenon which the energetic exchange is implied in, and the feeling given by the awareness of the possibility that events can string one after another. The fact that they can have their own rhythm creates the capability to plan events in the future, to fix the event until the case is that it becomes transmissible. Perhaps the event is even communicable with the aim to perform a group action, which implies a more detailed description of the elements of the action.
In this way conscious planning generates fuzzy intuitions, half-conscious ones of the existence of space as displayed energy *.

*(*above we have taken into consideration that displaying energy is a consequence of the act of will power)*

Together with space, other properties of reflected reality emerge too, but only as a germ, i.e. without visible display distinction. Those properties are called nowadays physical quantities.

In fact, the physical quantities are the result of the need to compare between them the different signals transmitted to memory (this ever expanding entity fixing the past events and being eager for new impressions and stimuli), by different perceptions coming from the five senses.
1.) The perception of the existence of the own body, the sense of equilibrium, the position of the eyes "in front" and the liberty degrees of the movements of the head have created the perception of the **3-dimensional space** : "front/back", left/right" and "up/down" are primary perceptions, un-decomposable and irreducible. This is why we live in a space with three dimensions, because this is the way we refer to what is surrounding us. (The rational logic discursive integration of time in that system has been made very late and the theory of relativity with its 4-dimensional space-time continuum is still a simple representation compared to the representations of the great visionaries of the ancient time, who integrated in extra-logic, irrational, but global systems representations of time much more complex and still unexplored by conventional science).
2.) The notion of speed is strictly tied to the notion of **time**, much more than that of space, but it also lies on direct perceptions, no matter if it is about linear translation, rhythmic movements, spinning or changing in the appearance of an object. Nevertheless, it is the most important expression of connecting different points in space and this is why it is the first step from 3-dimensional to 4-dimensional space.
3.) Seeing differentiates and compares not only forms (ambits) and distances (far/near), but also colors. This is why the **optical quantities** have their origin in these perceptions.
4.) Hearing is obviously, without the need of any further comments or arguments, the origin of **acoustic quantities** and of those from the theory of waves.
5.) The perception of using different forces to lift different objects has led to the crystallization of the notion of weight. The concepts of **mass and weight** have been differentiated very late,

because the notion of inertia is much further from any direct perception than that of weight.
6.) Smell and taste are the basis for **chemical quantities**.
7.) The tactile sense is the base for **thermal** quantities.
Electricity and magnetism are not the object of any of the five human senses. They have been perceived for the first time by their effects : the force of attraction and rejection; and the luminous, thermal and acoustic effect of lightning.

A first conclusion could be that the **physical quantities** do not **represent characteristics** of objects or phenomenon, but of **our way to perceive them.** The well defined physical quantities in axiomatic theories are generalizations of these rudiments presented above, based on ascription of numerical functions, on comparisons and on transforms resulting from operations with numerical functions. Furthermore, one of the most important aspects is the rigor of comparisons, obtained with the help of devices and instruments extending the five human senses to regions where the latter ones have no access. These extensions are artifacts and have the generic designation of sensors. As we will point out in chapter XII, they represent the core element of the measuring instruments, in other words, the top of the hierarchic pyramid given by the couple dictionary/preexisting theory, as they are defined in chapters IX and XII.

The sensors have been conceived to refer to the outer reality in the same way the five human senses refer to what they have to explore : so we can observe three ways with great principal differences between them :
One of the ways is to study the sensor receiving signals from the system lying at another location as the sensor (for example, the eye, the ear, the photomultiplier, the photodiode, the photosensitive paper, etc.) in such cases we are studying the object emitting light or sounds and not light or sound themselves.
A second way is to have the sensor in direct contact with the system to be studied, when one cannot make a neat distinction between the system and the sensor, at least one cannot exactly tell where the sensor is ending and where the system is beginning (the taste, the smell, the chromatograph).
A third way is an existing interface between the sensor and the system, for example the nervous endings responsible for tactile sense and the classic thermometer (not that one with IR technology).
In fact, the way we are mentally insulating a certain domain of reality in order to study it, is defining the way we conceive the natural material system and the way we will design the sensor to study the system.
However, the sensors cannot be correlated directly to the physical quantities and nor to the systems themselves, they are always correlated to both these concepts, because a physical quantity measured by a sensor is characteristic for a certain system in certain state, this quantity cannot be measured in the absence of any system. Better said, a certain value of a physical quantity measured by a sensor has to be associated necessarily to a certain state of a certain system. Furthermore, the sensors must be adequate to the systems they are measuring, because there does not exist, for example, a sensor for the electric energy of a battery being usable to measure the chemical energy of an engine fuel.

Chapter V

Some details about the notion of system. Different levels of generalization

Continuing with the comparison to the notion of set and reminding what the common sense is telling us about the way the concept of "system" is being used, we can observe that the meaning given to this word is different from one utilization to another and that in most cases the meaning is deduced from the context. This inference is often intentional, meaning that the one who wishes to communicate something using the word "system" assumes that the people reading the text will understand during the exposition in what sense the word has been used. Here we can stop saying that the model "music" is even stronger than we have assumed in chapter IV, because there we were talking about describing significances using words, even if they were generalized ones, and here it is about the effective use of the word without any description or explanation, the meaning having to result from the way the word is used. That means that the description of the word's meaning is coincidental with using the word; this gives an extraordinary force to the model "music" and opens to us the following problem : Would it be possible to identify "significance" with "functionality" ? And further we can ask ourselves again and again if we are not forced to introduce a new word without the possibility to define it, namely that of **functionality**.
It seems to be inevitable and it also seems that we always need to use these two words together : system and functionality. And if we would let ourselves be guided by common sense while asking our "perception of significances" about using the words "set" and "system", we are led by this common sense to the conclusion that the set is a concept as fuzzy as it has no properties*, than the system is a couple "set/functionality".

(or their properties are without any relevance, because only the properties of their elements lead in a definitive way to the selection, i.e. its definition as a set)*

And look : a new word from the same category : **property**.
And if "set" and "property" have the same degree of generality, we can see that "functionality" is from a more restrictive category. It is tied to time, to a chronological evolution :
While telling that a system is functioning, we cannot imagine something else than it has a time evolution, that it transforms something from an initial state to another state, appearing later. Functionality and time appear to be "co-substantial".

So, if we can speak on a level of higher generality about set and properties, when we talk about system, the level of generality gets more restricted by the fact that the properties of the system are tied to time.

And if we would go further in the direction of restricting the generality, after the systems with logic functionality (where time is translated by stringing, by succession) we can talk about material systems, whose properties are tied not only to time, but also to energy**.

*(** the more an object has properties, the more its degree of generality gets restricted)*

The first kind of systems, that of logical functionality, based on the idea of stringing (recall Annex III) is almost present under the form of theoretical or philosophical systems, built up as sets of propositions where three kinds of order relations are established : one is based on set inclusion, another on concatenation, specific to free algebras and the third is one of logic implication, based on the meanings of the propositions and on the rules of formal logic.
The second kind of systems, that of material functionality, has a restricted degree of generalization and cannot be well characterized otherwise than by assemblies of complex structures.
In order to start a sketching out the interdependency of those structures we will recall the observation from Annex III that we will not study the systems as they are, but as their reflection in human consciousness, which is a dynamic process of continuous adaptation to the reality being explored, in other words, which is in a process of continuous objectification.
Furthermore, we have to observe that the logical system can be observed directly, while the material system has to be first "reflected" into an "objective memory", recognized as being objective by most of the minds whose opinions are counting in the world and the study of the system will be that of the "reflected image". As an argument for this assertion we can recall the fact that a certain physical system can be researched either by combinatorial logical manipulation of the assemblies of propositions describing it, or by organizing an assembly of propositions describing the instruments necessary to investigate the physical system, also describing the interactions between the system and those instruments, or by combination of the two methods.
To the existent complexity we have to add the fact that most times the instruments are measuring physical quantities, meaning that to the structure of assemblies of propositions describing the instruments and their functioning one also has to add connections of those propositions to numerical spaces.
For the time being we can deduce complex structures on four levels :

1.) The conceptual one comprising the assembly of propositions responsible with the logical consistency of framework necessary to describe the chosen physical system.
2.) The descriptive one comprising the assembly of propositions characterizing or defining (identifying, labeling) the objects and the physical systems themselves and/or the instruments made to interact with the physical systems.
3.) The level of data collecting, meaning the one describing the interactions between the

instruments and the physical systems, while measuring and collecting the characteristic amounts to those interactions*.

(only the specific amounts or quantities and not the type of interaction, because every instrument, generally every experimental arrangement determines another type of interaction. Theoretically it is irrelevant to take into account different instruments giving information about the same interaction, although practically, this is very useful to increase the certainty of the results)*

4.) The level of interpreting the collected data and of correlating them to the conceptual level 1.)

Let us go back to the idea from the beginning of this chapter, the idea **to assimilate the functionality with the significance**, trying to follow on which of the above levels this assimilation could be realized. To that purpose we will start with a simple case, where the physical system to be studied is an ordinary instrument in the household or in a workshop, even a device, i.e. a simplest apparatus. Its description is subordinated to the point of the apparatus, to the purpose it has been created. Its under-devices are even simpler and they have purposes combining harmoniously, working together to accomplish the purpose of the main apparatus. The number of examples is unlimited.

Chapter VI

Some examples of constructed material systems

1.) The pump (Cylinder + piston + valve)

This system is described by combining four different ways :

A.) The materials it is realized from
B.) The geometric forms of the components
C.) The way the components are joined together
D.) The way of functioning

In fact, these four ways are characteristic to all constructed material systems. All three ways A, B and C are subordinated to the way D, meaning that the system in this example is transforming the manual rocking motion into the pressure of the air being able to swell up a tire or a ball. Beyond the mode D.) one can see also a mode E.) being the point of this device, its purpose, it can be its generic designation, for example "system transforming mechanical work into pressure". E.) is not a new level, but it is the assembly itself of the levels A.) to D.) regarded as a unit, it is the synthesis, the significance, the point, the meaning of this assembly.

Alternative : Instead of the mode A.) and B.) implying definitions which can be sometimes too complicated because of the need to characterize the materials in a complex way, we could use the method of labeling. That means we could label a concrete specific piston of a certain specific pump in the same way one identifies the objects in a store when inventorying them. **In this way we could have a preparing stage to the stage of describing systems, that one of identifying and labeling the concrete objects.**

To go over to a more complex system, let us take :

2.) The steam motor or the inner combustion motor (Cylinder + piston + 2 valves + crankshaft)

This system which is also describable by the four modes above makes the reverse transform, from pressure to mechanical work and the supplementary component, the crankshaft transforms the linear motion into circular motion.
We should observe that the mode B.) could imply the drawings of the objects, as a matter of fact, they are always implied, but theoretically they are not compulsory, because correct reasoning can also be made with just the descriptive propositions, without drawings, meaning that the laws of logic apply to the propositions and not directly to the drawings. ***The alternative of labeling concrete objects*** can avoid the difficulty arisen by the need for drawings, because having chosen the objects in an appropriate manner, we do not need their drawings any more, but only the description of putting together these objects uniquely identified by their labels, together with the description of the assembly's functioning as built by them.

Based on these two simple examples we can observe that the point of any of these two systems is fulfilled, or consists in the way the components act together to fulfill the purpose of the system. That means that the **functionality of the system** (the above named level E.) is synthesized and **can be communicated through the propositions realizing the levels C.) and D.) together.**
If, for example, one of the components would lack from the assembly, let us take the piston or a valve, the assembly of the remained components will be a pointless rag-bag of objects.
This observation immediately leads us to the idea if hierarchy : the assembly of propositions from level C.) is hierarchically subordinated to the those from level D.)
And we can further and without any difficulty observe that the hierarchy can go on downwards to levels B.) and A.), because the point of the systems disappears too when the geometric forms do not fit one with another in order to realize the functioning and it disappears too when the materials the objects are made of do not fit, i.e. if their properties of resistance, hardness, friction etc. are not appropriate to the purpose of the system.
No matter how the descriptions are made, one cannot avoid using physical quantities, ***unless we appeal to the method of identifying concrete objects by labeling them.***
Otherwise, at level A.), one has to define well the values of the physical quantities* mentioned above, at level B.) the exact geometrical dimensions and reciprocal positions of the components have to be indicated, at level C.) one has to define the paths of any motion and at level D.) one has to define the time steps in which the components move with respect to one another.

(This implies measuring the values of some physical quantities, what anew implies the existence of systems being able to attribute numbers or numerical intervals to some relations between objects. After a short description of usual devices we will go over to describing measuring instruments).*

(The alternative of identifying objects by labeling can avoid the need to measure, to indicate dimensions, generally speaking to declare values of certain physical quantities before establishing what physical quantities really are.)

Only at level E.) the quality of the system emerges, the purpose to which the system has been created is fulfilled. In the examples of the present chapter to transform linear motion into pressure and to transform pressure into circular motion.
If we do not know how to define such a transformation, we could **identify it by the above described subordination chain**, meaning that the functionality, level E.), is in fact the hierarchic tree-like structure A.)- D.)
The hierarchical subordinations are not obtained by a formal operation specific to propositions sets, but by the significances of the words, what leads us to the point of trying to define the significance of a system using other significances as elements, namely those of words describing the components of the system. We are about to built a recurrent chain, probably the only method to avoid a paradox or logical loops of redundancy.
Let us try to begin that construction :

At level A.) we have to define the materials. One can define these either by the manufacturing

formula (for example "steel" is that material obtained by melting in high ovens iron ores with coal, etc., etc.) or by the assembly of intervals of values (a nominal value and a tolerance) of the physical quantities necessary to build the physical system, the desired apparatus *.

(this second way of defining is not unique : it is not defining the nature of the material, but the list of conditions needed to be fulfilled in order to use this material for constructing the apparatus. Only if these conditions are restrictive enough, one can define, or better said, select a unique material)*

So, level A.) establishes an equivalence, a double logical implication between a new, unknown word and a string of words with significances supposed to be known. Practically, level A.) establishes an explanatory dictionary, under the assumption that on the free algebra generated by the alphabet we have decided to limit upon, there exist still other dictionaries where the explanatory definitions of the words used for explanations can be found.
Going over to level B.), we can see that here too we define some objects (parts) with a set of words used at level A.), plus a new set of numerical intervals, representing the forma and dimensions of the parts, being equivalent to their drawings.
At level C.) and D.) we define the motions of the parts one in perspective of the other and their rhythmicity, so we define new concepts with the help of the definitions created at levels B.) and C.), plus some new numerical intervals.

(We continue to present the alternative based on labeling of the objects : in this situation there is no need to measure or to indicate values of certain physical quantities, because we will refer to specific objects labeled before. Of course, this approach is much more concrete and cannot be used to build a system based on its description, as we do in the case of a manufacturing drawing, but it can be used to reveal the significance, the point, the purpose of a concrete system by understanding the way of functioning obtained by its description.)

Resuming, we can observe that in order to approach the functionality (= the purpose = the point = the significance) of a simple material system (an apparatus) we need a hierarchic tree of explanatory dictionaries, while there are at each level words from a lower level dictionary together with sets of numerical intervals corresponding to the level itself. Furthermore, we have made the observation that the dictionary from level A.) assumes the existence of other lower explanatory levels, each with its own dictionary. But we cannot go lower and lower in an unlimited manner, as we will for sure meet at a certain moment words which cannot be explained any more with the help of other words without obtaining a logical loop. Those words will be a kind of "fundamental" words, remaining without definition, as we have also proceeded in the present paper with the concepts set, significance, etc.

(If we will label the objects the system is made of, the dictionary should contain besides the fundamental words, the labels of those objects. In this concrete way of describing, all assertions about measured values of physical quantities will be replaced by expressions of the type : "...in order to fit the object with the label..." or : "the moment the object with the label.... reaches …, the object with the label …., begins to …."
Proceeding this way, all associations with numerical intervals on all hierarchic levels can disappear, while the only remaining hierarchies will be those of descriptions, of hierarchic

dependencies on the immediate lower level, respectively on the immediate higher level.

And because we have mentioned so often the notions of physical quantity and measurement, let us go over to the way we could describe a **measurement instrument**.
Resuming one of the examples given above, this of the steam motor, we could imagine a way to measure the pressure that the steam generator is feeding the assembly cylinder/piston, by the number of rotations the motor can generate in certain time interval.
Or we could imagine measuring the pressure we can feed to a pump through the output valve, which has been modified by reversing the valve direction and by blocking the piston movement. Assuming that the assembly cylinder/piston/piston shaft is long enough, the moment the blockage of the piston will be released, one could measure the pressure by measuring the length of the displacement of the piston shaft produced by the detention of the gas.
If, generally speaking, a device is transforming a kind of energy into another kind, we could theoretically transform any device whose output energy is measurable in a well known way and generally accepted, into a measurement device of the kind of energy that is put in. So, we do not need extra constructions, but only to associate a new set of numerical intervals to a device already described in the four modi A.) to D.), besides the sets of numerical intervals already in use. We will associate this new set of numerical intervals to the level E.).
So, the difference between an utilitarian device and a measurement instrument consists in the last level E.), where the utilitarian device has no sets of numerical intervals associated to it, but the measurement instrument, on the contrary, has such an association.

Let us give examples :
3.)Let us take an automobile
It can be considered an apparatus to generate motion. In fact, it is a device to transform chemical energy into kinetic energy seen as circular motion, the latter being transformed with the help of the wheels into linear motion.
The automobile has a speed reader of the linear motion of the mobile, as the reverse pump from our above example has a device for reading the displacement length of the piston in the cylinder.
The rotation speed of the motor or the speed of the automobile, or the displacement length of the piston in the cylinder are directly proportional to the chemical energy of the fuel, respectively to the pressure of the gas introduced into the pump.
Both speed and displacement length are easy to measure, the methods are not questionable, so they are accepted, we could say unanimously accepted. This is why they can be used as a measure of the chemical energy of a fixed amount of fuel. This is only one of the possible measurement methods, although it is not used in real life, but this example has been given to show that one can attach to an usual apparatus a certain device being able to attribute numerical intervals to an assembly of sub-"assemblies", which regarded subjectively from a certain point of view or a certain purpose, can be called "measurement instrument".
This device will wear the generic name of sensor.
This subjective way of regarding the apparatus can make one and the same device to be considered as complete different instruments, depending on the way one wants to use it. So, the automobile is considered to be for most of his users a mean to personal displacement for

quite long distances, but to an inventive ingenious who lacks the standard means it could be a system to determine the chemical energy of fuels, a fashion designer can use it to launch a new collection, a poor peasant can carry with it to the market a pig or his cabbage crop and a murderer can think of it as a weapon to kill. The perspective we use to the hierarchic assembly of the levels A.) to C.) and partially D.) can determine partially in D.) and integrally on level E.) the significance, the point, the meaning of that material constructed system.

But what goes on with a natural system ?

Chapter VII

Some examples of natural material systems

Let us take for example

4.)**a physical phenomenon** : the waves emerging by throwing a stone into a lake with a still surface of water.
Apparently this phenomenon is not a system able to suggest the comparison to an instrument.
However, when the human mind is analyzing this phenomenon, it chooses to focus on the surface of the water before throwing the stone, on the falling stone and on the surface of the water after the stone has fallen. So the mind insulates these four elements from the assembly of all elements present in nature and decides that the height of the man throwing the stone, the color of his eyes and of his hair, the plants growing on the border of the lake and the animals living there have no influence on the phenomenon.
This is why a vessel with water in it, for example a bowl, together with a system of hanging and releasing the stone into the water, lead to the idea of a construction with four levels A.) to D.).
Furthermore, if one finds the solution to fix above the bowl a ruler in order to measure the distance between two successive waves *,

(or an equivalent experimental arrangement, for example a photo camera followed by measurements on the resulting images)*

we have obtained an experimental arrangement similar to an apparatus, to a measurement instrument, as we also have added something similar to plan E.)

5.) a chemical reaction

This is indeed not a construction of the human mind, so it does not undergo the above descriptions on 4 levels A.) to D.). But the experiment to produce the reaction can be constructed and described in a similar way.
Let's suppose we have defined vinegar by its traditional way of generation by oxidation of wine and chalk by the description of its extraction from a stone quarry.
Let's also suppose we have defined the concepts of “vessel” and that of “pouring”.
Under those assumptions, we can say that we have vinegar and chalk at level A.), the vessel and the quantity of chalk at lovel B.), the description of fitting the quantities of vinegar and chalk so that they could be put together into the same vessel and the vinegar should flood the chalk, at level C.) and at last, at level D.) the effective pouring of the vinegar into the vessel and aftrewards introducing the chalk into the liquid. Finally carbon dioxide will be liberate, of course with a small yield.
If we will replace vinegar by hydrochloric acid, we could regard this system as a device for generating carbon dioxide. But if instead of having a vessel, we would take a rag soaked with

vinegar and the chalk would be actually the limestone deposited on different kitchen vessels where water is boiled (probably water having a high hardness degree), the assembly rag/vinegar/limestone/vessel will represent a cleaning system, I. e. a system of passing from a vessel with limestone deposits to a vessel with clean walls. So the same phaenomenon can have different names and can really represent different systems, depending on the attitude of humans towards it, in other words, depending on the purpose of taking it into consideration, on the point of the system, on differrent changes made on the level E.)

6. **A system to reveal the existence of atmospherical electricity**

as it has been imagined and realized by Benjamin Franklin : a kite launched during the rain in a day with electrical turbulencies, so that the body of the kite should be loaded electrically from the atmosphere and the obtained electricity should be transported along the wet cord of the kite. At the lower end of the cord was a metallic ring and the electrical charge gathered by the ring has been discharged by contact with another metallic object.

From these three examples one can see that the material systems and the natural systems are somehow kindred and this similarity consists in the fact that in all three examples there has taken place a changement of **state****.

(we have used anew an undefined concept)*

Let us go along the list of example with ones being nearer to what is happening normally in research laboratories or in industrial plants.

7. **A system for corrosion studies**

implies the existence of three electrodes immersed in a solution sampled from the medium supposed to be corrosive, one of the electrodes being made of the material supposed to be corrodated. These electrodes will be connected to an instrument measuring the potential, the corrosion current and/or some derived quantities.

8. **A system to determine the chemical composition of an alloy by studying the characteristics of the light of a spark**

implies the existence of an electric generator of the spark with unipolar discharge from the alloy to be studied to a neutral electrode and an optical system to decompose and to measure the light produced by the spark.

9. **A system to follow the growth of the cell cultures**

implies the existence of a flask containg the cell culture medium, of a thermostatting system obtain an optimal thermic ambient for growth and an optical system to measure the growth of the colony after certain time intervals.

10. **A system to accelerate elementary particles and to follow the effects of the collisions between the accelerated particles**

implies the most complex equipments ever built and controls a huge amount of energy in order to penetrate in the deepest structures of matter. It is about a whole complex of plants

comprising particle generators, huge trajectories through electrical and/or magnetical fields in order to amplfy the energy of the particles under very strong conditions of ultra-high vacuum and superconductivity obtained at temperatures in the proximity of absolute zero, furthermode it is about high performance systems to control and measure the results of particle collisions.

Let's stop after these few examples and let's observe some characteristic features :
First of all, scientists do not study the natural systems as they are, but a kind of "artificial natural systems" meaning instruments to reveal the existence or to measure the effects of some natural phaenomena. Let's also observe that revealing the existence and measuring are quite kindred, as both of them imply a change of state in a system (see the underlined comment aftre the example no. 6), so that the the resulting state should be directly observable by means of the senses in the first case, while in the second case measuring the effects of the phaenomenon is either used to obtain quantitative evaluations in advanced studies, or is the only way to reveal the existence of the phaenomenon, as this one cannot be perceived by the senses, but only through complex logical operations based on the comparison of the mesurements' results.

It is also worth observing that the utilitarian devices and those used to study natural systems do not differ strongly one from another as they appeard to do at the beginning of sketching out this comparison, because both of them are using a natural phaenomenon, in other words a state transition in a natural system which can take independently of the presence or of the existence of the human senses or of their instrumental extensions. Furthermore, a lot of utilitarian instruments can be equipped with measurement devices, this fact being another diminisher of the differences between these two types of material systems described in the former chapter and in the present one. The most important is the relationship between the human and the instrument, that what the human intends to do with the instrument, the purpose to which he has constructed it and his secondary destinations initially not assumed, but which have resulted after one has begun to use the instrument.
This is why the point, the significance of a material system can be multiple, depending on this attitude of human, depending on his way of approaching the system. But no matter how this approach can take place, the definitive feature for the concept of system is the harmonious joining of the 5 description modi A.) to E.), meaning **the existence of the structure of hierarchic tree of dictionaries and propositions, associated on every level (or not, in the case of the alternative with labelling the objects) with sets of numerical intervals**.
The main difference between any desired instrument and a measurement instrument is the existence of that element of revealing the existence or measuring, that "artificial extension" of the human senses, we generically have named "**sensor**".
We have to remind also the conclusiona already drawn regarding that difference, namely that measurment instruments have on the highest level E.) **a supplementary association with one or more sets of numbers or numerical intervals**, as it is pointed out in the paragraph before the example no. 3 from chapter VI.
Regarding the alternative with identifying concrete objects by labelling, the association of numericla intervals appears only at level E.) and this association is strongly connected to the

concepts of **physical quantity, measurement, gauge, calibration, mesurement units**.
And regarding that association of numercial intervals at level E.), we also have to observe a highly important aspect, especially in the case of systems which cannot be perceived directly by the human senses, but only by help of the sensors taken together with all technologicla equipment (amplifiers, modulators, codifiers and decodifiers, etc.) realizing the extension from what we can perceive through our senses to those domains of reality which are inaccessible in a direct way :
It is about **models** of parts of reality which have been isolated in order to be studied. The expression "parts of reality" has been intentionally chosen instead of "systems", because the parts of reality do not imply the existence of humans and their measurement instruments, while the systems, as we have pointed them out in the present paper, imply the unknown objects to be studied taken together in a complete functionalty with all experimental arrangements, while this functionality arises from the conception of the researcher about the way the named part of reality isolated in order to be studied is "built" and "is functioning". And this conception is revealing itself, is shaping itself into a **model**.

Chapter VIII

The difference between the objective phaenomenon and the assembly human/instrument/phaenomenon. Theories, models, quantities

This distinction is made on theoretical level, on philosophical level, more exactly. It results from the question if it has a point to make any assertion about an universe having excluded the existence of the reflection made permanently by humans mentally and by means of their senses.
The opportunity of rising this question comes from simple observations, like the following : to speak about a thing which has been seen does not mean strictly to speak about that thing, but about the image built on the retina by the light passing through the lense of the eye ; or to do reasonings about a thing means strictly speakng to operate logically with propositions about the images memorized by the brain resulting from signals sent by the senses about the named thing.
At the same time, a sound philosophical conception is based on the fact we can never estonsih enough about, that these reflections mentioned above are in a - let's call it – cosmical compatibility with the universe we live in.
Resuming ourselves only at these few comments, we believe that the distinction we have begun with, is pointless, because it places ourselves into a pure speculative philosophical act, while the purpose of the present paper is to try to characterize the proper, intrinsic structure of cerain systems, in view of following the way these structures can emerge a generalized state of "resonance", and not to amplify the excursion into speculative regions.
On the other hand, following the characterisation of an intrinsic structure, proper to the system, seems to lead to the impression that we lay weight on treating the phaenomenon separately from the existence of the mind to receive and interprete it, but this is only an appearance. In fact, this is a try to reveal essential information from a rag-bag of unstructured informations. Not the quantity of information is generating knowledge, but the complexity of its structure., in the same way as a complex structured relational database needs less memory in a computer than a high resolution photo of trash clump.
Let us stay with this word, **knowledge**, to continue our discourse about systems.
The natural systems conceived as they have been presented until now, as "instruments to reveal the existence or to measure the effects of natural phaenomena" have as a main purpose the konwledge, while the utilitarian instruments are supposed to deliver material advantages: comfort, efficiency of energy using, obtaining material values, etc.
Although knowledge can also be regarded as useful, focussing on material, on substantial, implies stagnation on the same level of abstraction, while knowledge "uses" to get access to higher and higher levels, more and more abstract, more and more subtle ones, having a more advanced degree of generality, seeking for those regions of human spirit maximizing the information by minimizing its quantity.

This is why we intend to search for the root of the differerentiation between staying on the same level of generality and seeking for "regions" of higher and higher generality.
When analyzing the hierarchical tree of dictionaries and propositions structured on levels A.) to E.), we can observe that fitting, harmonizing the purpose with the way of funtioning, i.e. exactly what we are looking for, the functionalty, the significance, the point of the system is reched by regarding all levels simultaneously : what is evident on level E.), what is more difficult to observe at level D.), more hidden at level C.), but still present also at levels A.) and B.).
To look simultaneously at more realities does not mean to string one after another the characteristics of all aspects, but to reveal the hidden structures binding them. This is what we undesrtand by intrinsic properties of the system or by properties inherent to it.
This "simultaneous regard" is in fact an integrating phase, one of the most creative phases of mental activity. It is the "objectivation effort done by intuition", highly valued until now in former paragraphs. The objectivation is synonimous with **giving rise to the model** of the part of reality under study. In that way, something emerges in the reflected image of reality which is not the integration of signals reveived from the outer world, but is a new object which could represent something real, it is namely a thought object operated by thinking as it would be real.
In this way the system as a hierarchic dictionary **richens**, passing from being an **assembly of components collecting** by research and **synthetizing data from the outer world** to an **assembly which contains also that part of reality** being under study.
The model is that difference between the objective phaenomenon and the assembly human/instrument/phaenomenon in the subtitle of the present chapter.

The generation mechanism of a model seems to be the following :
That part of the mind using the already consolidated memory creates permanently connections between its elements, but more important, it tries to create connections between the consolidated memory and new, not yet processed elements, originating from "fresh perceptions". The consolidated memory is structured basing on a **preexistent theory** (see later, in another chapter). Between such a theory and the new elements a tension emerges, appealing now to intuition in order to be released.
The intuition creates an image unifying the new elements into a well-rounded image, having the appearance as it had been generated by a complete set of perceptions of that part of reality being under study. Afterwards the mind begins to create links between this image and the elements of the preexistent theory in order to give to the image more and more sharpness. The preexisting theory is used to perform reasonings and calculations linked to the imagined system and to the imagined states of the assembly "real instrument/real sensor/imagined system". If the results of the calculations, numerical and propositional, done based on the preexistent theory applied to this imagined system are coincidential to the results obtained by measuring with the real instrument and the real sensor on the real unknown system, one considers that that the model and the theory are confirmed in the case of that system, so the unknown system can could be really so as it has been imagined.
That means that the image of the unknown system can be considered an objective reflection of reality, and the system instrument/real sensor considered from the beginning as an objective reflection of reality together with the unknown imagined object, confirmed itself too

(temporarily, until a contradiction appears) as an objective relection of reality, can be represented temporarily too in the framework of the formalism hierarchic dictionaries/sensor/preexistent theory.

In fact, the whole effort of the research is oriented on sharpening the image of the model, so that the latter can be tested by means of some measurement instruments regarded as systems of the type hierarchic dictionaries, but without the model. So, if the system without model is put to face reality and produces measurements being in accordance with the theory associated to the system, the model will be validated and considered to be real.
The fact that we suppose a model to behave in the reflected image by thinking in the same way as the reflected image of a real system leads us to the idea that the model can be represented exactly as a real system by hierarchic dictionaries. As a practical result, in that formalism, we cannot differentiate the real "something" from the model.

Later in another chapter we will approach more carefully the concept of **physical quantity. What are finally the physical quantities, these "miraculous" properties allowing us to operate mentally otherwise than with concrete physical objects ? How do we define them ?**

A possible approach is to start again from instruments, working our way through similar steps. We have mentioned above that the difference between an utilitarian instrument and a measurement one consists in the fact that the measurement instruments have on the last level E.) a supplementary association with a set numbers or numerical intervals.
Going over by generalization from instruments regarded as concrete objects to those realizing certain relationships between classes of objects, we can reach the concept of "property", as well as that of "**physical quantity**". In any case, before going on to abstract considerations about the content of the concept of physical quantity, it would be interesting to resume and to **reanalyze at the level of common sense the paragraphs at the end of chapter IV bis (Annex III) (About memory) concerning this subject**.

And if a constructed material system is what we can simply see as a concrete intrument, **a natural material system** which cannot be perceived and analyzed directly by the senses and by processing of the signals sent by them, i.e. a submicroscopic system or a giant one being located at light-years, can be regarded finally as **an assembly of classes of systems whose structure depends on the capacity of human mind to generalize**.

This seems to be a to general assertion and perhaps it might also appear as misty, this is why we need to seek more precision, resuming what we have obtained until now :

We chose a natural system whose behaviour or whose submicroscopic structure ew want to study, for example a mixture of substances. These can enter a chemical reaction and the research could follow the changes in time of the concentrations of the initial components or of the rection products, or, on the other hand, it could be a stable mixture and in that case the study could imply finding out the qualitative and quantitative composition of the mixture. Without to worry we can assume that the amount is so tiny, that our senses cannot tell us anything about the substances, for example the sample could come from a crime scene

invstigation, being a trace of “something” hardly perceivable.
This “something” can be analyzed by spectral, electrochemical, cromatographical methods, or by mixed ones, these methods being generical designations for a lot of different of types of instruments, each of them revealing another aspect of the “something” we are looking for, meaning other characteristic quantities, as deposition or polarization potential, characteristic wavelength for absorbtion or emission, current intensities or densities, radiation intensities, a.s.o.
In order to be as complete as possible, the characterization is done complementary, meaning through all methods, by collecting from each instrument the measured values specific to that instrument and by computing statistically the numerical intetrvals in which all measured values of a cerain kind can be included with a certain probability.
We can conclude that we, the researcher of that certain unknown something, are identifying that something with a mental model which, after having built it, we can associate it to the set of instruments necessary to the research together with the values or intervals of values obtained by measuring and with the theories existing already before the construction of those instruments.
So, operating with physical quantities leads to a view about hierarchical dictionaries wich becomes more complicated, as besides the definitions characterizing a cerain system, we have to take into account the numerical relationships between the defintions and the tree of logical implications of those relationships.
We need to put some order in that “mess” before things are getting too complicated. This will be made in a separate paper judging things in a mathematical view trying to represent rigourously what we have described until now.

It will have the title **Resonances Part Two** and will contain the chapters IX to XI, XIII and all chapters after XIII.

Chapter XII

The point of the natural system regarded as a detection and measuring sensor

In many situations the submicroscopic object under study is in a strong correlation, contact, or even in the interior of what we call generically the sensor of that system or, more exactly, the couple "signal generator/sensor".
Here one detects and measures aspects of the paenomenon to which the unknown object to be studied is taking part.
The sensor can be placed in the same module of the instrument studying the unknown object or it can be in a completey distinct component of the instrument/natural system. It won't be wrong to say that the couple "signal generator/sensor" is or contains the interface of the unknown object with us, the observer of that system.
For example, a natural electrochemical system, as it could be a metallic object being in contact to a corrosive solution is placed in an electrochemical cell, which is the central element of the assembly measuring instrument/electrochemical system. The electrochemical cell is the point of buiding up this system, all the components of the assembly instrument/sensor are coming under this point, their functioning is subordinated to the purpose of measuring effects of applying different electrical signals on the components of the cell : the electrodes and the solution.
In another example, the emission spectrometer, the component generating the phaenomenon under study is completey different from the sensitive element : the excitation of the material being the system under study by means of a electron beam, in order to obtain the emission of the charactertistic radiation, takes place in a completely different compartment of the instrument than the one where the emitted radiation is measured. (Not to speak about the fact that we are dealing here with two "sensors", because we are measuring both the wavelength and the intensity of the radiation.)
Those generic names "signal generator" and "sensor" can be so complex, that they can be themselves considered as self standing instruments and the other components of the measuring instrument to be looked at as auxiliary instruments to these main assemblies incorporating both the functioning principle and the point, the purpose of the instrument.
In the two former examples, the "sensor" for wavelength is the spectral chamber itself having as prime importance element the diffraction or refraction system, while the "sensor" for the radiation intensity is the photomultiplier or the CCD detector. The electrochemical "sensor" can be, depending on the purpose which is intended, another electrochemical cell, as it could be, for example a pH electrode or an ion selective electrode.
Coming back to the overwhelming importance of the couple signal generator/sensor in ciphering out the point, the sense of an instrument, it means that this couple has to stand on the top of the pyramid of hierarchic dictionaries described in the former chapters.

This means that this couple has to be aimed when constructing the hierachic tree, starting from alphabets, fundamental words, axioms, propositions, theories in the typical way an axiomatic theory is built.
One can go also the opposite way, reaching the same construction by starting from the purpose and going step by step until one obtaines the smallest details, in the same way as engineers proceed when they design a new instrument :
The purpose is isolating the system under study in his significant environment, so that by means of certain stimuli "launched" by the researcher with his auxiliary instruments, measurable "reactions" of the system should be ingenerated. And in order to finalize the construction, all designing steps have to be followed downwards, from the purpose to the detailed desciptions of the instrument's components. The downwards constructions aims too the beautiful, clear, linear exposure, but the basis of the hierarchical pyramid will be obtained while the details of the components emerge from defining the needs to fulfill in order to accomplish their purpose, their point, subordinated to the point, to the purpose of the whole assembly, which is the instrument.
Finally the hierarchic tree is a hierarchy of points, because the functionality of the constructed instrument (which is identical to its purpose) is accomplished by the hierarchic functionality of its components.
And this tree is very much alike the sketches made by engineers to design an instrument. We have initially the principle sketch, then the assembly sketch and finally the exact drawings of all the components and their characteristics. The hierarchy in the dictionary describing an instrument is stronlgy connected to the hierarchy of the graphs being in fact the functioning sketches of the same instrument, followed into the smallest details as they are lined out in the fabrication drawings.

There is still to observe that a sensor to measure effective and directly a physical quantity is a very rare situation, meaning that there is not for every physical quantity a sensor to "feel" exactly and directly that quantity : most sensors measure a current or a voltage generated by a phaenomenon which is not specific to pure discipline (or preexistent theory) of electricity, for example piezoelectrical, electrochemical, photoelectrical, etc. This current is proportional to a certain physical quantity in conformity to a preexistent theory and that quantity enters as per the same theory into certain relationships to other quantities specific to the same theory or to other preexistent complementary theories. In that way, the same sensor can be used to determine more than one physical quntity, similar to what we have shown anecdotally how an automobile can be, in dependence of the inventivity of its user, more and different measurement instruments.

If we should forget all technicalities needed to bring into concrete life an instrument and all detailed calculations imposed by making a measurement, we can resume that technicality in the hierarchical pyramid dictionary/theory and we could stay out of it, without any formalism, only with the attitude of human spirit face to the unknown phaeonmenon, while exploring it. We could than see **the attitude of human spirit acting in two ways** : **in generating the physical quantities and in isolating the explored unknown from its environment** by keeping in that isolation only those connections to the environment specific to that "something" and relevant for it. This is what we will define in the "more formal" part

of this paper as the ***cut-out***.
The way one performs this isolation and mainly the way one keeps the relevant connections to the environment being specific to the unknown under study is exactly the way the vivid human spirit acts, by attracting always new stimuli from the exterior world in order to process and to assimilate them, in view of permanently erasing the fronteer between the fixed memory and that memory being on its path of becoming.

But we should add that the principle of "cutting out" cannot stand alone, it cannot act without its complementary principle, that of ***"equating"***: we mentioned it at the very beginning of the present paper, in chapter I, page 2 and it is about using equivalence relations and classes of equivalence generated by those relations. Approaching them will be the purpose of a second paper which should be regarded, on the one hand, as a continuation of the present one and on the other hand, as a new effort to pay our respect to rigour and logical formalism.
But in order to be able to define an equivalence, one has to "perceive" with the intuition's "eye" similarities and states of communications between systems, so before coming to an end of the non-formal part of the paper, let us tell a last thing about systems being in a state of communication, a kind of generalized state of resonance of structures. It is our belief that the "raugh" structure given by the hierarchies dictionary/theory is irrelevenat to what is ineffable, new, uncomprised by any formalism. The state of communication between the two systems should be regarded as a new system, being something completely different of any kind of "composition" of the two systems and our instruments to study this new system, his specific sensor should be a completely new one, having possibly no resemblance to the generalized sensors matching the two separate systems regarded as individually. And the more far off the structures of the two systems are, the higher is the level of abstraction needed to "take an image" of their resonance.

To be continued with

Resonances Part Two.