ON PRAXIOLOGICAL INFORMATION:

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If I have seen further it is by standing on ye shoulders of Giants"
Letter from Isaac Newton to Robert Hooke, 5 February 1676

ABSTRACT:

In this paper an action-oriented philosophy of information, namely praxiological information is outlined.
The praxiological kind of knowledge and some of its species (behavior, communication, computation, information, attention, learning, language) are introduced by the method of generalization and classification.
By exploiting the metaphor of the spectrum of colors, the architectures of behaviour, communication and computation are shown as if they were primary colors: red, jellow and blue. The architecture of information (green) is introduced by joining together the architecture of computation (blue) and communication (jellow). The principle of information, that is the Data Operational Principle (DOP), is stated, the informational bearers, that is the messages, are explained, the informational criteria, that is connectivity and compatibility, are outlined;
The architecture of attention (orange) is introduced by joining together the architecture of behavior (red) and that of communication (jellow). The criterium of attention, that is relevance, is pointed out.
The architecture of learning (violet) is introduced by joining together the architecture of behavior (red) and that of computation (blue). The criterium of learning, that is effectiveness, is pointed out.
The architecture of language (indac) is introduced by joining together the architecture of attention (orange), that of learning (violet) and that of information (green). The criteria of language, that is relevance and effectiveness, are pointed out.
The architecture of knowledge results to be an architecture composed by the integration of all the preceding architectures. Exploiting our metaphor, it can be seen as the Newton's prism through which, when the colors (phenomena) are projected, the white light (knowledge) is obtained and viceersa. A new epistemology in which the kaywords are pluralism, integration of phenomena and synthesis, is propounded. In the new epistemology knowledge results to be information which is relevant and effective. In the new epistemology the problem of the location of information is solved.

Kaywords: generalization, classification, praxiological-information, system, behavior, communication, computation, message, attention, learning, relevant information, effective information, synthesis.

ON PRAXIOLOGICAL INFORMATION:

INTRODUCTION: THE PRAXIOLOGICAL KIND & SPECIES OF INFORMATION:

The seeds of the philosophical meditation on the notion of information-action oriented were planted very early by Rosenblueth, Wiener and Bigelow in "Behaviour, Pourpose and Teleology" (1943).

In this article I will present the trees of knowledge which are grown from those seeds. They are trees of different species and I name the kind of which the several trees are species the praxiological kind. The fruits of those trees are informational phenomena and, being them of the species of which the particular tree is, they represent the several species of the praxiological kind of knowldge.

At the philosophical lecture the paper of Rosenblueth, Wiener and Bigelow (1943) is relevant because it introduces a method of generalization and classification of the external structural properties or invariants of the objects by which the study of the objects is carried out irrespective of the analysis of their internal functional structures. The method of generalization is a method quite intuitive and particularly used in mathematics (Mac Lane, 1986) and in science in general, being it the usual method of laboratory of the scientist which consists in isolating the object in an experimental stance and which consists in the classification of the object in terms of its external observable properties, that is in terms of its input-output relations. This relation input-output is the cause of the change and therefore it is regarded as the behavior of the object which, observed in its input-output relations, becomes a system or, philosophically speaking, a phenomenon. Here the philosophical sharping difference between what is hidden, that is the internal and not observable structure of the object, and what is not hidden, that is the external and observable and classifiable behavior of the object, applies.

Now, if the black box is the metaphor from the point of view of the internal functional analysis of the structure of the system[1], I will propose, from the point of view of the analysis of the external structural properties or invariants of the system, the metaphor of spectrum of colors. In according to the theory of colors, the spectrum of colors is composed of the primary colors: red, yellow and blue; by the secondary colors: green, orange, violet, which are obtained by the union of the primary; by the indac which is obtained by joining together the secondar colors; and by all the other infinite gradations of colors which are obtained by joining together the primary and secondary colors.

I will name architecture or colored box the external structural properties or invariants of the system and, in according to the common use, I will name internal structure or black box the internal functional structure of the system. Another way, to name the architecture or the colored box, is to refer to it as category in its mathematical sense. As I see the things, there is not difference among category, architecture and colored box and I prefer colored box and architecture only because it results more effective.

In the distinction between black box or internal structure and colored box or architecture the point is to stress what are the primary constituents of the ontology

1 The internal functional analysis of the structure of the system is carried out from the semantic conceptions of information and from the logical pluralism which shares with the semantic conceptions the method of abstraction.

of the theory. In the case that the study is carried out on the internal structure the primary constituents of the ontology are objects and set of objects, whereas in the case in which the study is carried out on the external properties or invariants of the structure (that is on its architecture) the primary constituents of the ontology are structures and set of structures.

Naturally, as an Italian, I prefer to put the difference in term of esthetic, but I have to alert that, because of the subtle threat among beauty, good and right and of course among their contraries, the metaphor of black box and colored box is much more than an esthetic metaphor. Evidently, given that my framework is that philosophical between power and action, here we are facing that dilemma between the white side of the force and the dark side of it.

According to the above metaphor the architecture of the system is represented by the red box (fig. 1).

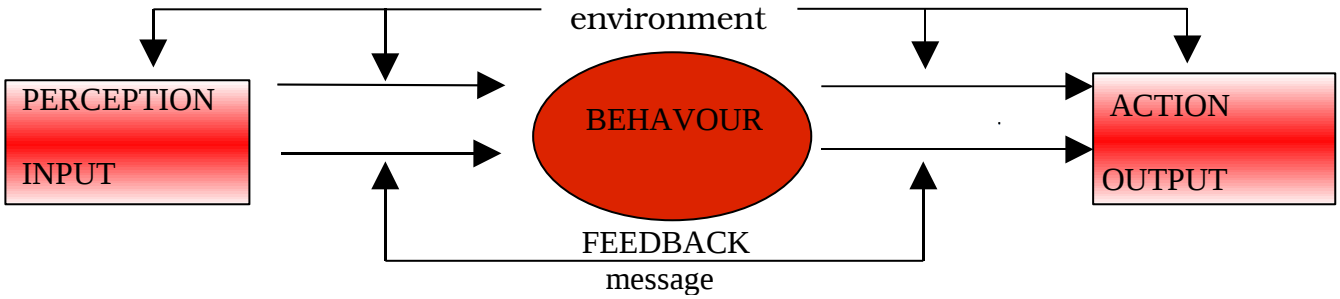

Fig. 1: The architecture of behavior (adapted from General System Theory, von Bertalanffy, 1950)

If the above is the architecture of the behavior, it is to note that it is isomorphic to many informational phenomena. In fact the method of generalization and classification of the external properties of the object (that is of its behavior), is at the core of the discovery that the input-output relation is a general servomechanic category which includes and is isomorphic to the perception-action apparatus of animals and plants, to the afferent-efferent physiology of neurons and, as I will show, it is a generalization loaded of isomorphisms with many informational phenomena. I will enlarge that discovery by showing the isomorphisms among communication, computation, information, attention, learning and language. At first, in the next paragraph, I will show the isomorphism with the communicational system. My move is perfectly coherent with the idea of N. Weiner (1961) who founded the Cybernetic as the science of control and communication and envisioned that the apparatus input/output of the servomechanisms is isomorphic to the process of communication. And at least this is my way of seeing the things. In the following paragraphs I will show all the other isomorphisms constructing them, step by step, with the metaphor of the spectrum of colors.

But before to proceed it is to note that, by the method of generalization and classification, the teleological cause is introduced in the classification of the behavior and therefore in the scientific explanation of the system. It is to remark that the teleological cause distinguishes completely this behavioristic approach from

the psychological behaviorism in which framework the cause is reguarded always as an efficient cause.

According to the relation input-output, the behavior is classified in active/non active behavior. The active behavior is classified in purposeless-purposeful and for purposeful behavior is meant that the action is directed to a goal. In turn the purposeful behavior is classified in teleological or feed-beck and non-teleological or non- feed-beck behavior where for feed-beck or teleological is meant that the output reenter in the incoming input. The servomechanich concept of feedback is the generalization of the physiological, biological and ecological concept of homeostasis (Cannon 1932). The concept of teleology was challenged in biology by that of teleonomy (Pittendrigh, 1958) to emphasize that the goal-directedness does not carry a commitment to Aristotelian teleology as an final causal principle and subsequently the term teleonomy has replaced the term teleology in Cybernetics (Monod and Francois, 1961) and it has entered in the scientific practice, from the natural to the social sciences, being it closely related to the concepts of emergence, complexity theory and self-organizing systems.

Again, the feedback behavior is classified in positive and negative feedback. For negative feed-beck is meant "control by the margin of error at which the object stands at a given time with reference to a relatively specific goal" (Rosenblueth, Wiener, Bigelow, 1943, p. 2). Finally the feed-back purposeful behavior can be classified in extrapolative or predictive and in non-extrapolative or non-predictive; and the predictive behavior can be focused at several degrees of complexity[2](fig. 2).

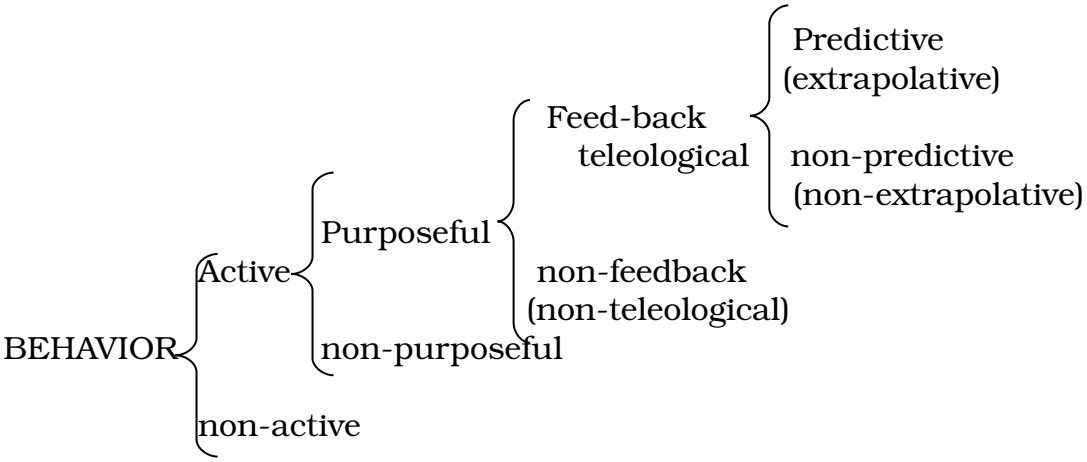

FIG. 2: Classification of behavior (taken from Rosenblueth, Wiener, Bigelow, 1943, p. 3)

2 The unicellular organisms known as amoebas merely follow the source to which they react and there is no evidence that they have predictive competences. Predictive animal behavior, on the other hand, is a commonplace and examples of both predictive and non predictive servomechanisms may also be found readily. The compass, like the amoeba, merely reacts to the magnetic North, whereas the radar can reacts to a moving source and the navigator show a height level of communicational and computational behavior which is responsible of its height level predictive behavior. The story that goes from the compass to the radar and from the radar to the navigator is one of the most fascinating story of scientific discovery and technological inventions, but it can not been outlined here in few lines.

Standing to the above classification behavior is an architecture of which its specific criterion is its being active at different levels of complexity. "Active behavior is that in which the object is the source of the output energy involved in a given specific reaction and in passive behavior the object is not the source or energy" (Rosenblueth, Wiener and Bigelow 1943, p.1).
Moreover at some level the active behavior manifests as teleonomical where for teleonomical is meant negative feedback which consists in a sort of circular causality by which the output is returned in the incomining input of the system and it corrects its outcome.

1. THE PRAXIOLOGICAL ARCHITECTURE OF COMMUNICATION:

By the praxiological genus of information the Shannon and Weaver's model of communication is considered as one of the species which manifests an informational nature and it is investigated in the usual laboratory approach which consists in to live aside its internal structure and consists in to focus the attention on the architecture of the channel of communication.
The channel of communication, used to convey the information from the transmitter to the receiver, is constituted from a couple of systems: input and output, everyone assuming a finite number of states, and by a channel by which communication flows. Any state of the input is codified by a symbol of the finite alphabet X and any state of the output is codified[3] by a symbol of the finite alphabet Y, and if the input is in a certain state x belongs to X, than the output assumes any state of Y with a certain probability depending exclusively from x.
So that the external structure of the communicational model configures as architecture input-output and it is isomorphic to the architecture of behavior. Accordingly we assign the yellow color to the architecture of the communicational model, which considered in its input-output relation, becomes a system (fig.3) or, philosophically speaking, a phenomenon.

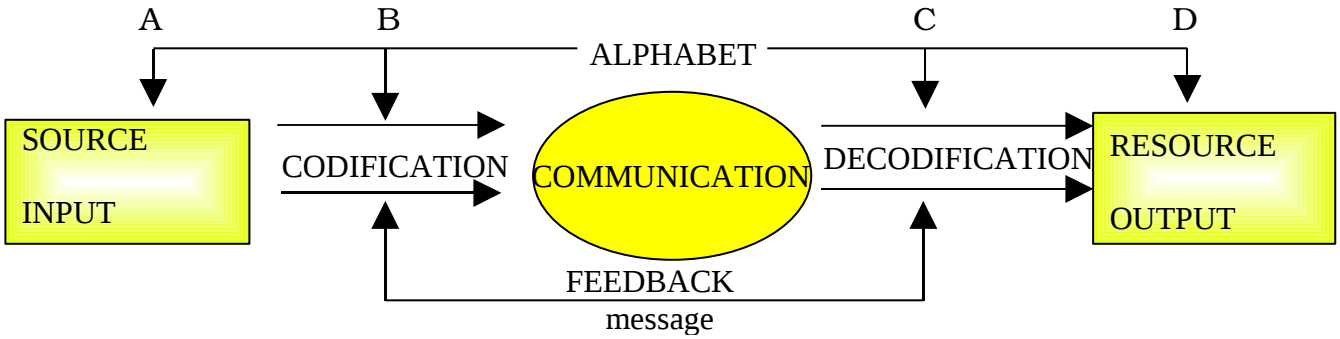

Fig. 3: The Architecture of Communication (adapted from Shannon, 1949)

That figure drawn above, which represent the external structure or architecture of communication, can be formalized by the language on category theory. In fact it is a category which satisfy the associative law:

$$If\ A \xrightarrow{f} B \xrightarrow{g} C \xrightarrow{h} D,\ then\ (h \cdot g) \cdot f = h \cdot (g \cdot f) \qquad ASSOCIATIVE\ LAW$$

3 It is to note that the correspective of codification, that is decodification, holds as well. We will stress this in the other paragraphs.

Now, just this architecture holds for a praxiological approach of the study of communication. Our praxiological approach consists in observing the relation input-output of the system, that is in observing the behavior of the system, and consists in a classification of the communicational behavior.
Standing to the architecture of the system the communication is classified in connected/non-connected. The connected communication is classified in purposeless/purposeful. For purposeful communication is meant that the communication is directed to a goal. In turn the purposeful communication is classified in feedback/non-feedback communication; and the feedback communication is classified in positive and negative feedback. Again the feedback purposeful communication can be classified in predictive/non-predictive (fig. 4).

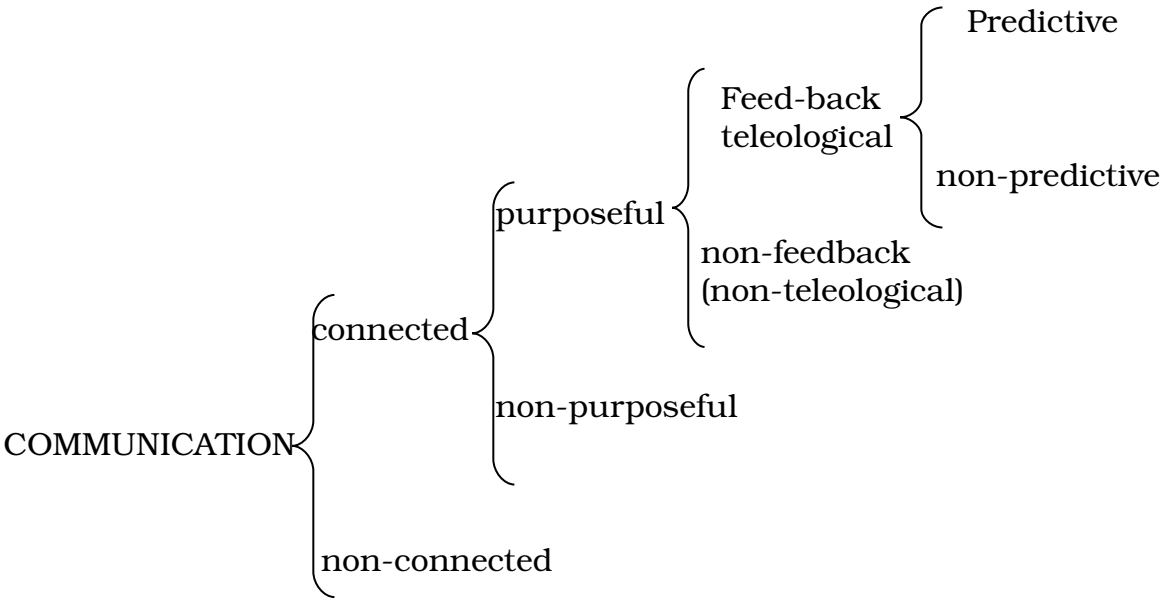

FIG. 4: Classification of the architecture of communication

In the above classification the first criteria is the peculiarity of the communicational architecture in respect to the behaviorist architecture and it deserves a deep investigation. The following criteria of the classification are identical in the behaviorist system and in the communicational system given that our praxiological genus is behaviorist in its nature and it derives from it, even if it is more inclusive than classic behaviorist approach of Rosenblueth, Wiener and Bigelow (1943). Otherwise it is quite intuitive that the communication is directed to a goal; that the communication benefits of some negative feedback in the process of achieving its goals; and that the communication manifests some degree of predictivity.

2. THE PRAXIOLOGICAL ARCHITECTURE OF COMPUTATION:

From the praxiological genus of information computation represents one of the species which manifests an informational character and it is considered in the usual laboratory approach which consists in to live aside its internal structure and which consists in to focus the attention on the architecture of the computation.

Today computation represents a broad field of investigation, from automata theory to complexity theory to the algorithmic theory of information. But the first, most representative and yet actual model of computation is the Turing Machine. When the idea of computing machine was proposed by Turing the computer was not yet born but the theory of the Turing Machine is at the core of any computer which is nothing more than a physical implementation of it.
The Turing Machine, used to compute information, is constituted from a couple of systems, input and output, everyone assuming a finite number of states, and from a type, which already in the behaviorist approach of Turing's famous paper (1936) was regarded as a memory, on which the computation is made.

Standing to the Church-Turing thesis any computation that can be performed by a computing machine can be performed by the mind of a human being. From the Church-Turing thesis has been derived the computational theory of mind which is at the core of the interdisciplinary field of research of cognitive sciences: brain is a computer and mental processes are computations.
There are two architectures of computation: the classic and the connectionist. In the classic architecture, mental processes are symbolic structures governed by rules and they generate mental representations which are abstract objects that exhibit semantic properties (content, reference, truth-value, ...). In the connectionist architecture mental processes are activation in a network and the mental processes consist of pattern activations. The two alternative architectures produced two approaches in AI: the symbolic and subsymbolic paradigm of representation and learning. If the classicists are essentially semanticists, it is not the case for many of the connectionists which declare to be eliminativists[4]. The latter is my position too.
So that, accordingly to the metaphor, I assign the blue color to the architecture of computation, which considered in its input-output relation, becomes a system (fig. 5) or a phenomenon.

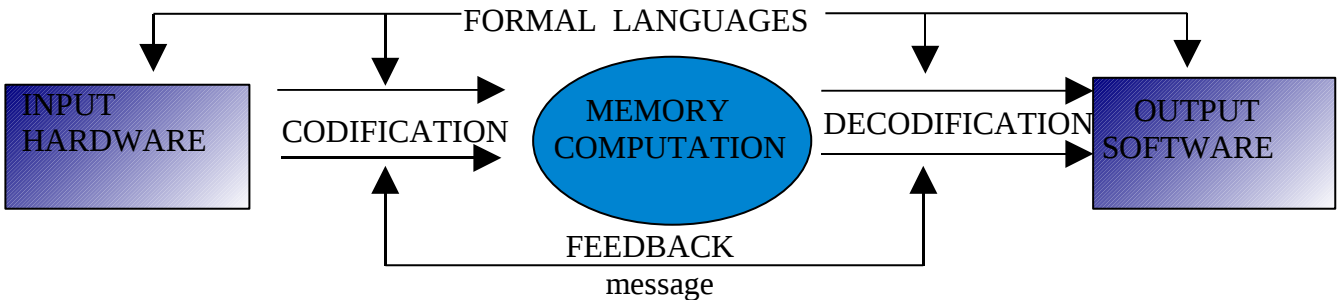

Fig. 5: The architecture of Computation (adapted from Turing Machine)

It is to note that the metaphysical hypothesis known as pancomputationalism - at first proposed by Zeuse (1967), subsequently reformulated as the Church-Turing-Dautsch thesis and also known as the “it from bit” hypothesis (Wheeler 1991)- which tells us that the Universe is essentially digital and it can be reguarded as a computer (or a cellular automaton or an universal Turing machine or a quantum computer) of which the states are represented by the states of computation is out of metaphor here because our system is an opened system and

4 Clark (1997) has sustained the thesis that both architectures agree on the real existence of representations but his thesis seems to me too strong and not defensible.

instead the Universe is considered a closed system. This is too an answer to the problem of Floridi (2004) who believes that an hard task is to show, in a computational perspective, what phenomena are non-computational: the closed systems are non-computational.
Otherwise Floridi (2003,2008) (of which handbook calls "Handbook of Philosophy and Computing" but in which there is nothing of computational a part the presence in some editions of that book of the articles of Chaitin and of some other computer scientist), as an alternative to the above digital realist metaphysical monism, proposes a idealist metaphysic of information. The hypothesis of Floridi (ISR) is that reality is not digital but it is composed of informational structural relations, that the objects that these structural relations relate are unknowable, although there are, and that those objects are themselves relations. Floridi names Informational Structural Realism (ISR) his hypothesis. But of course the Floridi's hypothesis is that of an idealist metaphysics rather than that of genuine realist one. In fact the informational structural relations (they are semantic interfaces or Level of Abstraction (LoA)) suffer of the same paradox of the Kantian ego: from one side they are a condition capable of realization only in the presence of the empiric and from the other side they are an ipostatic condition of the thought capable to account of reality without any empirical presence.

Now, just the above computational architecture holds for a praxiological approach of the study of computation. Our praxiological approach consists in observing the relation input-output of the system, that is in observing the behavior of the system, and consists in a classification of the computational behavior.
Standing to the architecture of the system the computation is classified in compatible/non-compatible. The compatible computation is classified in purposeless/purposeful. For purposeful computation is meant that the computation is directed to a goal. In turn the purposeful computation is classified in feedback/ non-feedback; and the feed back computation is classified in positive/negative feedback. Again the negative feed-back purposeful computation can be classified in predictive/non-predictive (fig. 6).

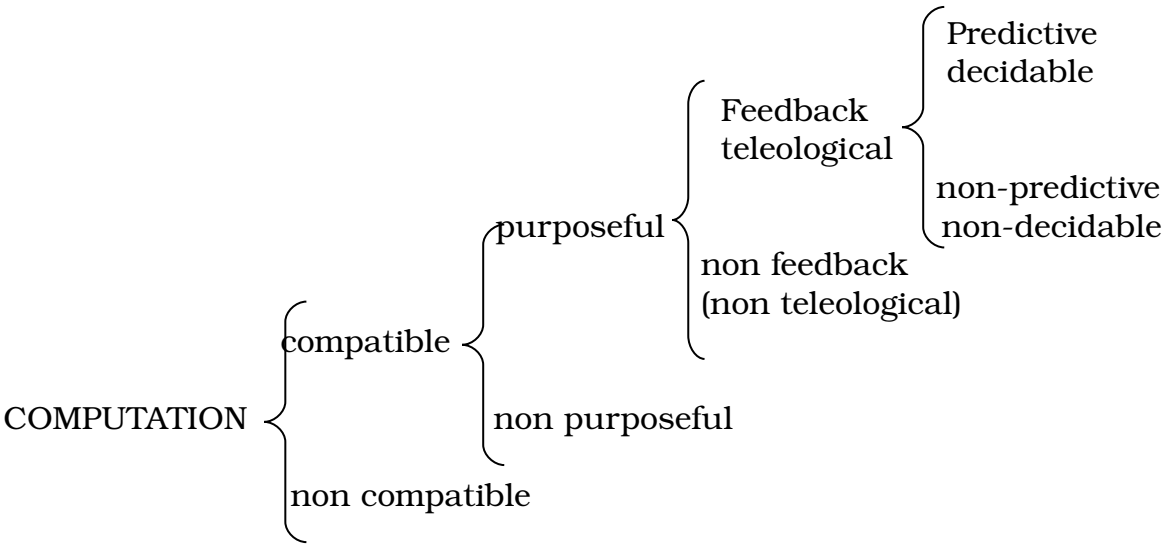

FIG. 6: Classification of the architecture of computation

In the above classification the first criteria is the peculiarity of the computational architecture in respect to the behaviorist and to the communicational architectures and it deserves a deep investigation. The following criteria are the usual criteria of the praxiological genus. Otherwise it is quite intuitive that the memory is directed to a goal; that it benefits of some negative feedback in the process of achieving its goal; and that it manifests some degree of predictivity.

3. THE ARCHITECTURE OF INFORMATION, MESSAGES & THE DATA OPERATIONAL PRINCIPLE:

At this point I have analyzed, and of course the method of generalization is fully loaded already of synthesis, three different but isomorphic informational architectures and, accordingly to the metaphor, I have assigned a primary color to each one of those. Now my task is to make a synthesis, in the philosophical sense of synthesis as the moment following the analysis. Accordingly to the metaphor the synthesis will consist in the union of the primary colors to obtain the secondary colors and to complete the spectrum of colors.
At first we join together the architecture (yellow) of communication with that (blue) of computation. Joining the architecture of communication and that of computation we obtain the architecture of information which results to be of green color (fig. 7).

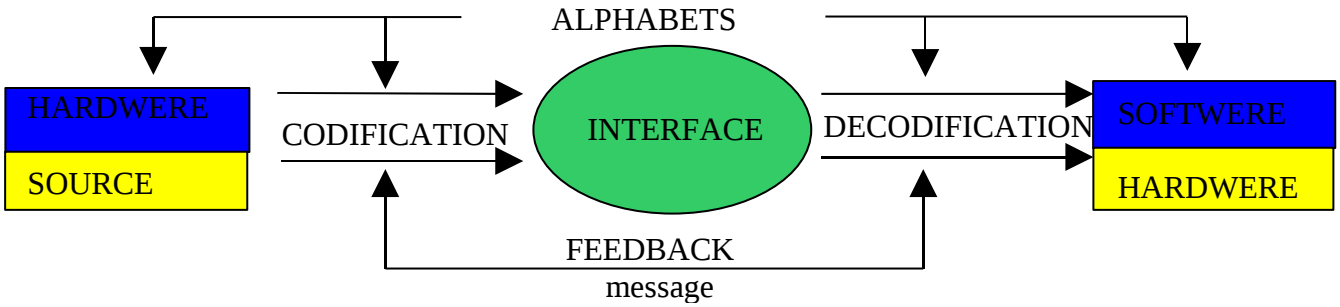

Fig. 7: The architecture of Information

The formalization of the above architecture can be outlined step by step using the language of category theory and it results to be a middle level category.
It is to note that the modern computer which, in confront to the first generations of computers is an engine not only computational but communicational too, is a model of this architecture. It is to remark again that any metaphysical computer centric hypothesis is out of metaphor. Otherwise it is pacific that the metaphysics are techno-centric: yesterday the clock was the model of universe in the metaphysics of Leibniz, today the model of the universe is the computer in the modern metaphysics known as digital physics or digital ontology or digital philosophy, and tomorrow the model of the universe will be the GPS navigator and the day after tomorrow it will be again another thing. All these metaphysical hypothesis will leave very soon the time that they find. In this respect it is to note that it is the computer a model of our architecture, another being the navigator, as well as everything that can be considered as an interface is a model of our architecture. But it is not our architecture the model of the computer or every other thing. It is important to realize

that as the computer is fully an operational engine so it is our architecture: there is not room for semantic in our architecture.

But now there is to ouline the informational bearer. Messages are our candidates and this is in agreement with the scientific practice. Certainly messages have more than fifty years of well established scientific status. In fact they have a quantitative measure[5]. But we do not want only a quantitative measure; we are searching for the architecture that all the messages share. This architecture is our guarantee of the functionality of messages to play the rule of atomic constituents of language. The architecture of message is composed of three alphabets (fig. 8):

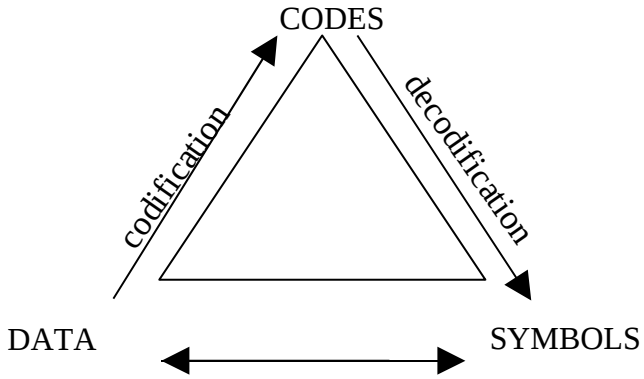

Fig. 8: The architecture of message

1) INFINITE ALPHABET DATA: A datum is a difference; the shortest and simplest datum is the bit, binary unit of information, made of [1,0]. You can look easy if I write 0 and 1 as $x \neq y$ that it is a difference. It is a relation of difference (Floridi's Diaphoric Definition of Data (DDD), 2003a, 2005) ot it is "a sign who stay for something else". The infinite set of data is called the Alphabet Data (AD).
2) FINITE ALPHABET CODE: The Bit (1,0) as Code is the finite and simplest binary and digital Alphabet Code (AC), made of data, of information. The Code is derived from data: from the bit units [1,0] to the Bit Code (1,0).

5The basic idea of "The mathematical theory of communication" and of those theory of Semantic Information in the paradigm of Carnap & Bar-Hillel (1953) and Floridi (2004b), that paradigm that in according with van Benthem (2005) we know as "range paradigm", is the measurement of the quantity of information or entropy H of a massage with the logarithm N of the number of equiprobable message:

log(N)= bit for Msg.

If the occurring messages are equiprobables, the quantity of information of every message is given from the probability of occurring of that message multiplied for the logarithm of such a probability:

H= p1 log p1

The function that defines the quantity of information generated from source is defined as the natural logarithm of the sum of messages:

H= (log (N)+log(N)2 +…) bit for msg

If the occurring messages are not equiprobables, like in natural language, the function that defines the quantity of information generated from the source is the sum of probability p1,p2,p3,… of the occurring messages multiplied for the logarithm of such probability:

H= (p1 log p1+p2 log p2 +…) bit per Msg;

3) INFINITE ALPHABET SYMBOLS: With this finite and digital Alphabet Code (AC) that we call Bit (1,0) we can produce all the infinite symbols and the strings of symbols of the Alphabet Symbols (AS). Symbols (or messages) "are that something else which data indicate or for which data stay".

By the Alphabet Code, data are codified in symbols and symbols are decodified in data. The Code AC (1,0) is a bijective function. It is a bijective correspondence (one to one), injective (from Alphabet data to Alphabet symbols) and subjective (from Alphabet Symbols to Alphabet data):

1) injective: $f(x) = f(n) \rightarrow n=n;$

2) subjective: $\forall m \neq c \; \exists n f(n)=m;$

Practically the Alphabet Code AC becomes a free monoid AC^* (Alphabet Code star) that is the set of all strings that we can make with AC. Where $x \in AS$ means that a string of the Alphabet Code star AC^* belongs to the Alphabet Symbols AS. The alphabet code AC is a function from the set of data to the set of strings of symbols: $Ac^* \leftrightarrow As$. In informatics jargon it calls Interface.

Now from the architecture of the message we directly derive the principle of information that we name the Data Operational Principle (DOP) which completely distinguishes our approach from the semantic, pragmatic and logical pluralist approaches to information which take as principle the Data Representation Principle (DRP) (Floridi 2005, Allo 2007).

The DOP, in its negative formulation, tells us that there is not information without data operation and, in its positive formulation, asserts that information is made by the data codification and defodification operations (fig. 8).

At this point we have outlined the architecture of information and the principle of information but now we have to face with one of the deepest questions of our epoch: where is information?

4. WHERE IS INFORMATION?:

The story of "Where information is" is a bit the story of relevant information. As Saracevic (1975) reveals, "relevant information is an elusive human notion and Information Science comes to the light for treating, with logic and philosophy, the concept of relevance". As Mizarro (1996) point out , "relevance is the fundamental, even if not completely understood concept in documentation, information retrieval and information science".

The story of Information Science is a bit the story of the virtual library of the future. It is an on-line library and the total knowledge is in the books of that library. It is a bit as the library of the magic, all the magic that exist is in the books of that library. As far as the production of knowledge increases and the library becomes more and more comprehensive, in the virtual library, as well in the library of the magic, the question of the location of information, that is "where is information?", become more and more relevant.

As it is emerged by information science literature, there are two way of theorizing the phenomenon of relevant information: agentive oriented relevant information and system based (objective) relevant information.

The Semantic theories of information share the same bipartite and out-out

analysis with Information Science. In fact objective and subjective are semantic and representationalist features. The semantic and pragmatic theories of information, in according with Nauta (1972), are representationlist and post linguistic theory of information. In fact they assume as principle of information the data representation principle (DRP) which states: "no information without data representation" (Floridi 2005 and Allo 2007). Representation, from the antiquity up to now, involves a theory of truth. Truth, in fact, from the antiquity up to now, means correctness of the enunciation and an enunciation is correct if it is directed towards the entity and what it claims *represents* the entity. It enunciates about the entity "what it is like". The enunciation is the place of truth, but not only, it is the place of falsity, of the lie. Now, for the semantic and pragmatic theories, taking information as the content of the enunciation (the content of the factual sentences as "the lawn is green" or of the intentional sentences as "she believes that the lawn is green") would mean that information does not distinguish from content. At this point the semantic theories of information elect as criterion of information the truthfulness of it and this is enough to distinguish the content of the enunciation, which can be true or false, from the content of information which is only true. I think that the truthfulness of information, if not a dogma, is nothing at all. But in anyway, analyzing information in terms of true content, factual or intentional, that is to say that in the most part of cases we are merely informed and we do not know really. So that the semantic conceptions of information need a theory of justification which asserts that not only the content of information is true but, to count as knowledge, it must be justified. Therefore they assume as theory of justification the relevance of information.

Now, there are two way of interpreting the Data Representation Principle which depend on two way of interpreting the representation. The doctrine by which *representation* directs toward the entity, for showing it in the enunciation in the manner in which it is, holds for the opinion that representation joins the things (res) in themselves and what the things belong (reality) and it is called realism. The doctrine of representation that doubts that the *representation* joins the entities in itself, inside of staying in the environment of its proper activity: soul, spirit, conscience, ego, holds for the opinion that the representation refers only to itself as *representation of a representation* and it is called idealism. Standing to this antique philosophical dispute, the semantic theories of information divide in two doctrines. The doctrine that considers the data representation as representation of the physical and material reality, that is to say "no information without physical implementation", holds for a realist view of information. This is the view of Dretske and of the correlation paradigm in general. The doctrine that considers the data representation central for information, given that, by the principle, there not could be information without representation, but nevertheless rejects the thesis that information requires a physical implementation because there could be information as representation of a representation, holds for a idealist view of information. This is the view of Floridi and of the range paradigm in general[6].

6 Certainly I will not wear out the time of the reader proposing a technical definition of data, given that the interested reader can find a lot of definitions in Wikipedia and perhaps the better one is that of Floridi (2003a, 2005), the Diaphoric Definition of Data (DDD). What I will say is only that, being data those vehicles of representation, then, evidently, about data we have more than two thousand years of philosophical investigation. Many thanks to the prof. Larrazabal who recalled my attention

Now, being information a subjective magnitude for the idealist, subjective is too the theory of justification that the idealist can offer for his epistemology. In fact Floridi (2006) offers a subjective theory of relevant information which implicitly is too his answer to the question of where information is: it's in the subject.
Conversely, being information an objective magnitude for the realist, objective is too the theory of justification that the realist can offer for his epistemology. In fact Dretske (1981) holds for an objective theory of relevant information and it's too his answer to the question of where information is: it's in the object.

The logical pluralism is not in a better situation with the question of relevant information. Standing to the logical pluralism the information bearers are not the factual or the intentional sentences, but they are the rules of inferences in the logical systems.
In the reasoning there are some propositions called premises and some propositions called conclusions. The passage (or better, the linkage=logos) between premises and conclusions is what is called inference. The problem is that the rule of inference of classic logic does not permit anything in terms of gain of information. In fact, looking to the theorem of deduction, that is at the core of the structure of classic logic, we easy can show that no information can be gained by inference: If A1…….An‖—B (that is a theorem) then A1 Λ…… Λ An→B (that is a tautology). The problem with classic logic is that we can not derive anything that is not included already in the premises. The structural rule of classic logic is the Modus Ponens and it is the preservation of truth from the premises to the conclusion.
At this point intervenes the logical pluralism[7]. It, focusing on the structure of the logical systems, invents structures by which different combinations of premises gives us different kinds of inferences. For ex. logics in which is formalized the non-monotonic reasoning, or logic systems that formalize the relevance, or intuitionist logics, or adaptative logics, or paraconsistent logics, all of them are sub-structural logics. It means that they use different rules of inference in respect to classic logic. If we put the focus on structure we understand that these logics pick out the notion of "form" of logic. The structure is something that "gives form", that informs. The gain is pluralism, the gain is in forms. But for the logical pluralist perspective, information just depends on the structure of the logical system under consideration and therefore this implicitly holds for the view by which information does not exist really but it is completely parasitic of the logical system under consideration.
Now, regarding relevant information, the logical pluralist proposes a logical system which calls relevant logic. From a semantic point of view it comes from the idea of Lewis to avoid the paradoxes of the material implication of classic logic by the introduction of the strict implication.
From a model theoretic point of view relevant logic it is a modal logic because it can

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on this point.
7 Some logical pluralist holds the view that logical pluralism is necessary to solve the paradoxes of classic logic. In effect adaptative logic has been used to solve the Bar Hillel-Carnap paradox (Allo, 2005). The problem with this view is that once you have solved the paradoxes changing the rules of the logical system you have to demonstrate the effectiveness of the new logical system not only in solving the paradoxes but in respect to other logical systems. But the effectiveness of adaptive or paraconsistent logic or whatever in confront to classic logic is a little thing. After all they are subsets, or better sub structures, of classic logic.

be characterized as a set of formulas valid in the Kripke's frames. In Kripke semantics for relevant logic, the implication operator is a binary modal operator, and negation is usually taken to be a unary modal operator. In this way, the accessibility relation governing the operator is ternary rather than the usual binary one that govern unary modal operators. The ternary relation is a set of triples forming a subset of Cartesian product A·B·C of three sets A,B,C. A Kripke frame F of relevant language is a triple (W,R,*) where W is a set of worlds indices, R is a ternary accessibility relation between worlds and * is a unary function from worlds to worlds.
From a syntactic point of view relevant logic is a substructural logic which is able to remove some problematic rules of inferences, as the non sequitur inference, by constrainting that premises have to be really used in the derivation of the conclusion. In the propositional calculus premises and conclusion have to share atomic formulas. In predicate calculus premises and conclusion have to share variables and constants. This can be achieved by some restrictions on the rules of a natural deduction system by indexing them with a number for each line of an inference indicating the premises relevant to the conclusion. A notable feature of relevance logics is that they are paraconsistent logics, that is the existence of a contradiction will not cause explotion. This follows from the fact that a conditional with a contradictory antecedent that shares no propositional or predicate letters with the consequent cannot be derivable.
Of course the logical pluralist names this system “relevant logic” but it can be called as well the logic of “pizza capricciosa” without anything happening. In fact logic pluralists are nominalists and for nominalist information is a flatus vocis and relevant information is again a flatus vocis: really they do not need relevant information and after all it is impossible to understand what relevance is by relevant logic. You can have a proof that they do not need it asking to the logical pluralist where information is. He will be completely lost in searching in vain an answer given that an answer of the type “information is in the inference” is not an answer at all because there are several inferences.

But I have other views and other fly to propose. At first I assume the Data Operational Principle (DOP), as outlined in the paragraph number three, as principle of information. Second I take the messages as information bearers, being this in complitly agreement with the scientific practice, and therefore it is in the messages that the phenomenon of relevant information has to be searched. Third I propose two informational criteria: one being the relevance and, of course a message could be perfectly relevant and to be completely false or perfectly true and completely irrelevant, the other being the effectiveness.

5. RELEVANT INFORMATION & THE ARCHITECTURE OF ATTENTION:

Relevant information is a human communicational notion and for this fact it is the core problem of Information Science. Its generalization is the servomechanich connectivity in the communicational process; and connectivity is the criterion of communication.

But if connectivity is the servomechanic criterion of communication, it is

relevance that is the human specific criterion of communication. In fact, relevant information is the criterion of attention for humans.
Attention is a communicative and behavioral process and it emerges by the union of the two. But, from one side, it distinguishes from behavior, being it a selective human process of that and, from the other side, it distinguishes from communication, being it a specific human process of that. Attention, which operates to convey the relevant information from the reality to who experiences that reality, is constituted by a couple of systems: input-output, everyone assuming a finite number of states, and by a channel, which in the behaviorist approach can be regarded as a sense organ by which information flows.
I will show what attention is by jointing the communicational system (yellow) with the behavioral system (red). By this union we obtain the architecture (orange) of attention (fig.9).

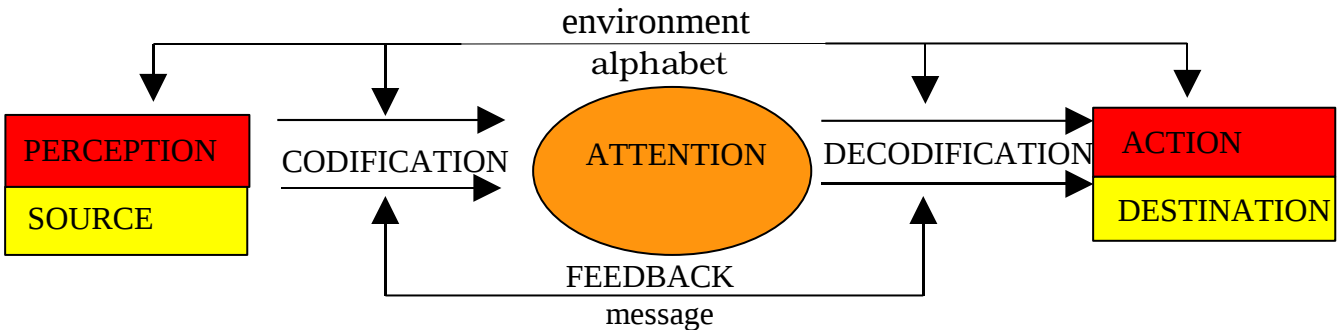

Fig. 9: The architecture of Attention

Just this architecture holds for a praxiological approach to the study of attention. Our praxiological approach consists in observing the relation input-output of the system, that is in observing the behavior of the system, and consists in a classification of the attentive behavior.
Standing to the architecture of the system the attention is classified in relevant/non-relevant. Relevant behavior is the connected and active behavior in which the object is the source of the output energy involved in a given specific reaction. That is to say that just what kind of relevant information may be picked up by depends upon just what kind of device the agent is and upon just what kind of organs the agent is equipped with. Plants and machine can be assumed as perceiving agents and their criteria is the connectivity. Attention with his criteria of relevance is a peculiarity of some high level complexity animals and human beings.
The relevant behavior, that is attention, is classified in purposeless/purposeful. For purposeful attention is meant that the attention is directed to a goal. In turn the purposeful attention is classified in feedback/non-feedback attention; and the feedback attention is classified in positive and negative feedback. Again the feedback purposeful attention can be classified predictive/non-predictive (fig. 10).

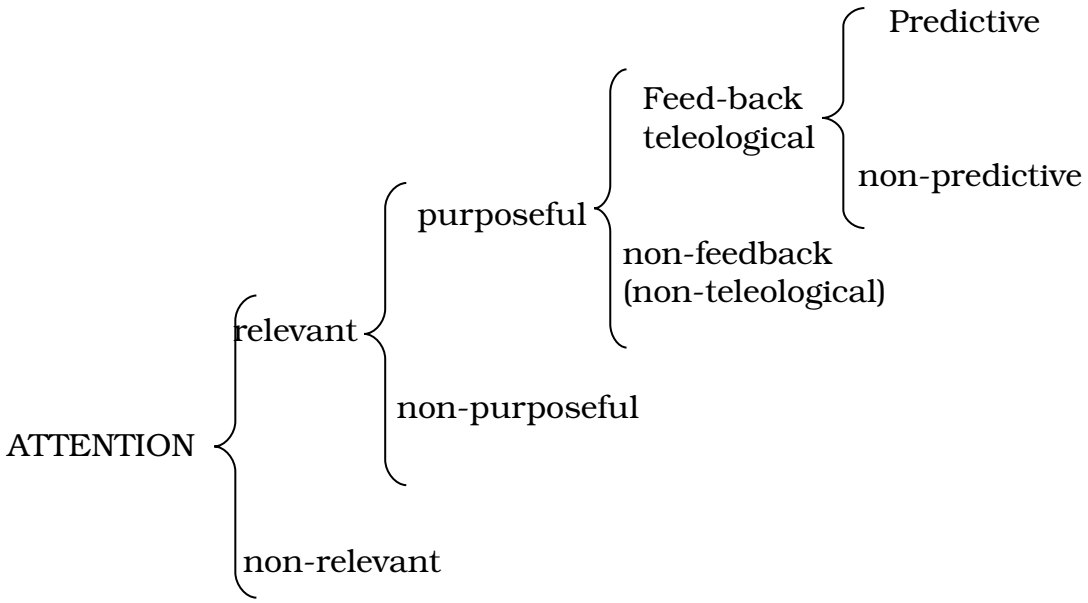

FIG. 10: Classification of the architecture of attention

In the above classification the first criteria is the peculiarity of the architecture of attention in respect to the behaviorist, the communicational and the computational architecture. It is obtained joining together the criterion of the architecture of behavior, that is activity, with that of communication, that is connectivity. Otherwise is quite intuitive that from an active and connected behavior emerges the attention. This is too one side of the answer to the question about where information is in human beings: it is in the attention.
The following criteria are the usual criteria of the praxiological genus. Otherwise it is quite intuitive that the attention is directed to a goal; that it benefits of some negative feedback in the process of achieving its goal; and that it manifests some degree of predictivity.

6. EFFECTIVE INFORMATION & THE ARCHITECTURE OF LEARNING:

I have remarked that the story of relevant information is only a bit the story of where information is. To complete that story we have to take in consideration the phenomenon of effective information. This phenomenon, if not completely discarded from Information Science, it is at lest very underestimated by that as well as from the modern philosophies of information.
In regard to information science there is to say that as far as the production of knowledge increases and the library becomes more and more comprehensive, in the virtual library where to the book is assigned an address as location as well as in the normal library where the books occupy more and more three-dimensional space, the work of the librarian in storaging and retrieving information has to be efficient as well as the problem of searching "where information is" become the question of searching where the effective information is.

Effective information is a human computational notion. Its generalization is the servomechanich compatibility in the computational process; and compatibility is

the criterion of computation. But if compatibility is the servomechanic criterion of computation, it is effectiveness that is the human specific criterion of computation. In fact, effective information is the criterion of learning for humans.
Learning is a computational and behavioral process and it emerges by the union of the two. But it, from one side, distinguishes from behavior, being it a selective process of that and it, from the other side, distinguishes from computation, being it a specific human process of that. Learning, which operates to store in the memory the effective information about the way in which reality is organized by who operates in that reality, is constituted by a couple of systems: input-output, everyone assuming a finite number of states, and by a type, which in the behaviorist approach can be regarded as a memory in which information can be saved or deleted.
I will show what learning is by joining the computational system (blue) with the behavioral system (red) to obtain the system (violet) of learning (fig.11).

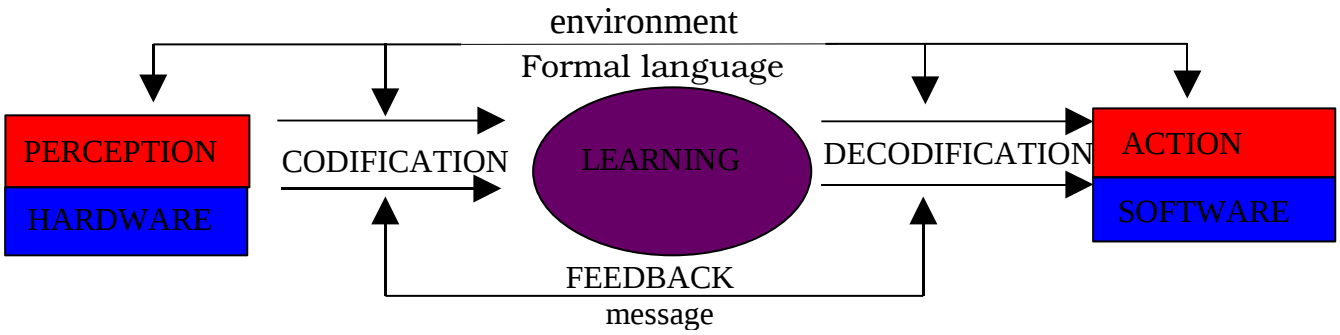

Fig. 11: The architecture of Learning

Just this architecture holds for a praxiological approach to the study of learning. Our praxiological approach consists in observing the relation input-output of the system, that is in observing the behavior of the system, and consists in a classification of the learning behavior.
Standing to the architecture of the system the learning is classified in effective/non-effective. Effective behavior is the compatible and active behavior in which the object is the source of the output energy involved in a given specific reaction. That is to say that just what kind of effective information can be learned depends upon just what kind of device the agent is and upon just what kind of memory the agent is equipped with. Plants and machine can be assumed as computational agents and their criteria is the connectivity. Learning with his criteria of effectiveness is a peculiarity of eigh level complexity animals and human beings.
The effective behavior, that is learning, is classified in purposeless/purposeful. For purposeful learning is meant that the learning is directed to a goal. In turn the purposeful learning is classified in feedback/non-feedback; and the feedback learning is classified in positive and negative feedback. Again the feedback purposeful learning can be classified in predictive/non-predictive (fig. 12).

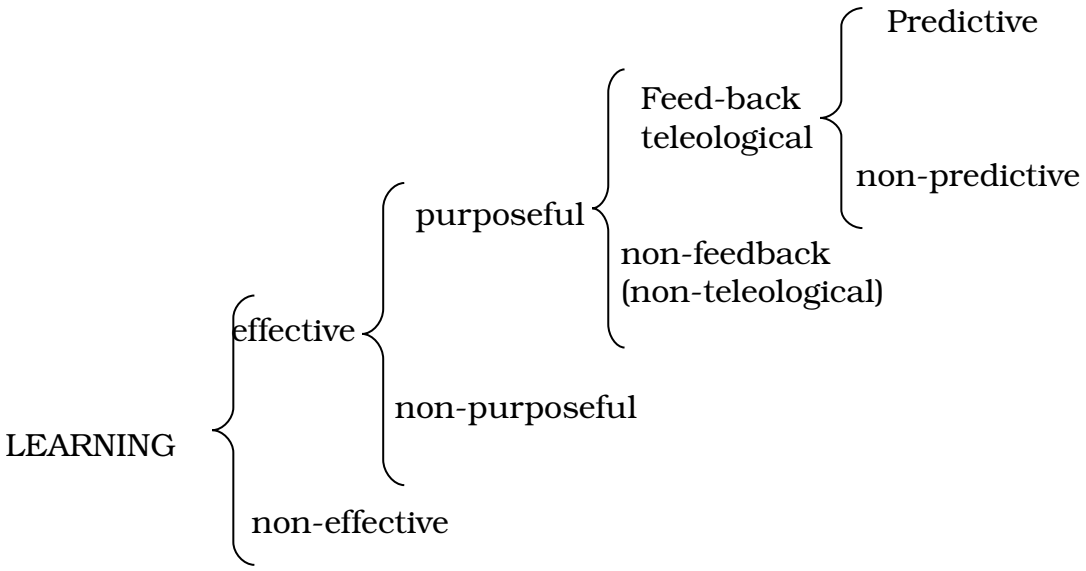

FIG.12: Classification of the architecture of learning

In the above classification the first criteria is the peculiarity of the architecture of learning in respect to the behaviorist, the communicational, the computational and the attentive architecture. It is obtained joining together the criterion of the architecture of behavior, that is activity, with that of computation, that is compatibility. Otherwise is quite intuitive that from an active and compatible behavior emerges the learning. This is too the other side of the answer to the question about where information is for the human being: it is in the learning.
The following criteria are the usual criteria of the praxiological genus. Otherwise it is quite intuitive that the learning is directed to a goal; that it benefits of some negative feedback in the process of achieving its goal; and that it manifests some degree of predictivity.

7. THE ARCHITECTURE OF LANGUAGE:

At this point we need only one color to complete the spectrum of colors, the indac. The indac is obtained joining together the orange, the violet and the green. That's the architecture of language. In fact language is a integrated architecture obtained by joining together the architecture of attention, learning and information (fig. 13).

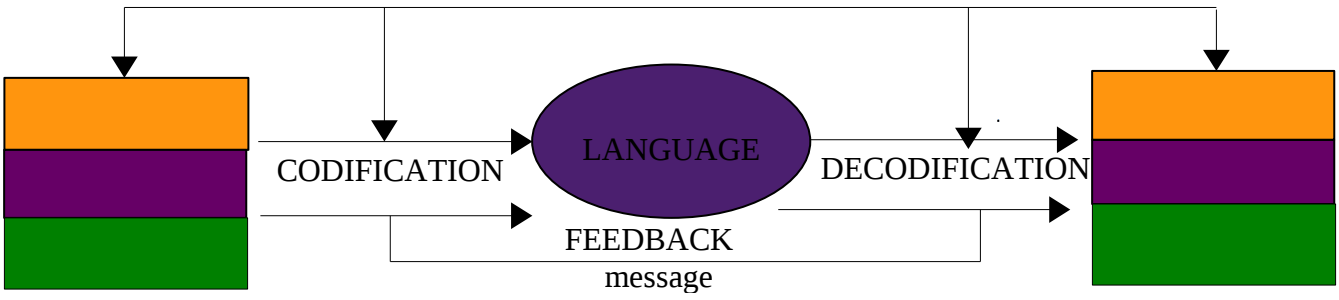

Fig. 13: The architecture of Language

Just this architecture holds for a praxiological approach to language. Our praxiological approach consists in observing the relation input-output of the system, that is in observing the behavior of the system, and consists in a classification of the linguistic behavior.
Standing to the architecture of the system, language is classified in connected/compatible, effective/non effective and relevant/non relevant. As a result, language is the informational, relevant, effective behavior in which the object (human interface) is the source of the output energy involved in a given specific reaction. That is to say that just what kind of language may be spoken by the agent depends upon just what kind of device the agent is and upon just what kind of memory and sensory organs the agent is equipped with. Plants and machine can be assumed as communicational and computational agents and their criteria are connectivity and compatibility. Language with his criteria of effectiveness and relevance is a peculiarity of some high level complexity animals and human beings.
This is too the complete but not ultimative answer to the question of where information is for the human being: it is in the language. In fact language is the being informative for humans (Florio 2009).
It follows that the relevant and effective behavior, that is language, is classified in purposeless/purposeful. For purposeful, effective and relevant behavior is meant that the language is directed to a goal. In turn the purposeful language is classified in feedback/non-feedback; and the feedback language is classified in positive and negative feedback. Again the feedback purposeful language can be classified in predictive/non-predictive.
In the above classification the first criteria are the peculiarity of the architecture of language in respect to the behaviorist, the communicational, the computational, the informational, the attentive and the learning architectures. They are obtained joining together the criterion of the architecture of attention, that is relevance, with that of learning, that is effectiveness. Otherwise is quite intuitive that from an relevant and effective behavior emerges the language.
The following criteria are the usual criteria of the praxiological kind. Otherwise it is quite intuitive that the language is directed to a goal; that it benefits of some negative feedback in the process of achieving its goal; and that it manifests some degree of predictivity: forecasting

8. THE PLURALISM OF PHENOMENA & THE INTEGRATIVE EPISTEMOLOGY OF INFORMATION:

At this point the spectrum of colors is complete. Now we have to make a synthesis of all the phenomena (colors) that we have outlined. We have to join the architectures of behavior, communication, computation, information, attention, learning and language. To do this we need simply to join together the architecture of attention and that of learning (being there all the colors of the spectrum) and we obtain the architecture of knowledge (fig. 14). In fact what is knowledge, from a fully operational and action oriented perspective, if not attention and learning?

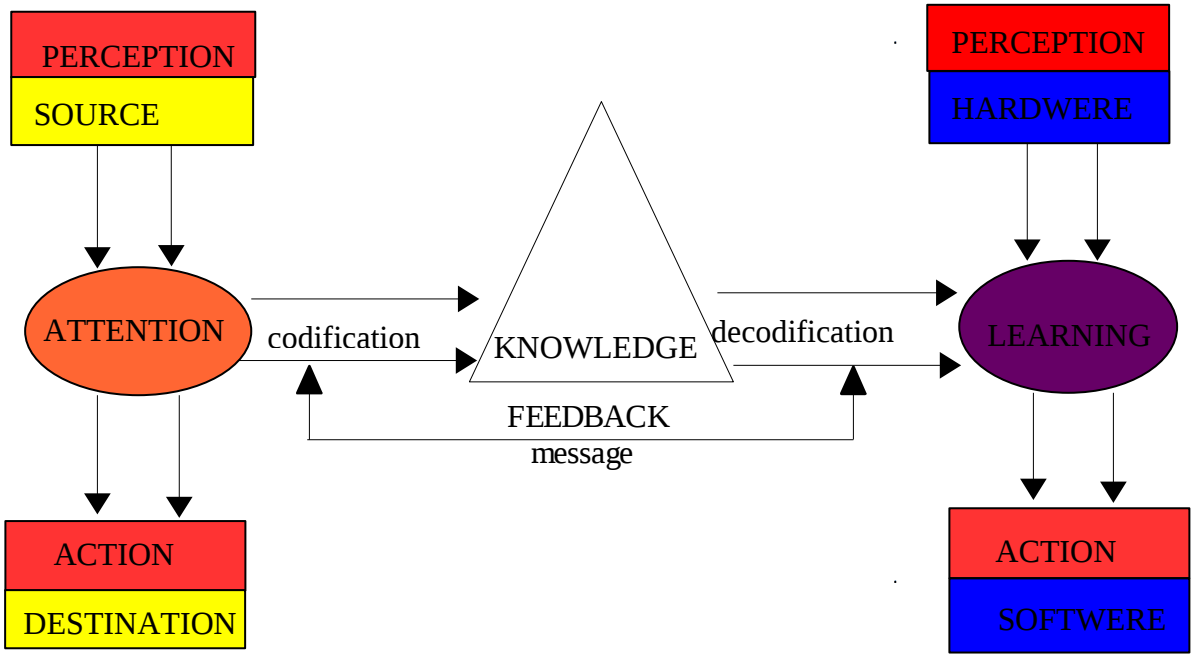

Fig. 14: The architecture of Knowledge

That drawn above as knowledge is a prism with its faces: interface, codification and defodification. But this was clear already by the architecture of message and the Data Operational Principle (DOP). The reader will fully appreciate the effectiveness of the metaphor that I have exploited. In fact, standing to the theory of light, the white light is obtained when all the colors are projected through the prism and viceversa. Standing to our metaphor, the knowledge is obtained when all the phenomena are codified in the actions of human beings and viceversa.

Just this architecture holds for a praxiological approach to epistemology. Our praxiological approach consists in observing the relation input-output of the system, that is in observing the behavior of the system, and consists in a classification of the epistemic behavior.

Standing to the architecture of the system, knowledge is classified in effective/non-effective and relevant/non relevant information. As a result, knowing is the relevant and effective behavior in which the object (human interface) is the source of the output energy involved in a given specific reaction. That is to say that just what kind of knowledge may be gained by the agent depends upon just what kind of device the agent is and upon just what kind of memory and sensory organs the agent is equipped with. Animals, plants and machine can be assumed as communicational and computational agents and their criteria are connectivity and compatibility. Knowledge with his criteria of effectiveness and relevance is a peculiarity of human beings.

It follows that the relevant and effective behavior, that is knowledge, is classified in purposeless/purposeful. For purposeful, effective and relevant behavior is meant that the knowledge is directed to a goal. In turn the purposeful knowledge is classified in feedback/non-feedback; and the feedback knowledge is classified in positive and negative feedback. Again the feedback purposeful knowledge can be classified predictive/non-predictive.

In the above classification the first criteria are the peculiarity of the architecture of

knowledge in respect to the behaviorist, the communicational, the computational, the informational, the attentive and the learning architectures. They are obtained joining together the criterion of the architecture of attention, that is relevance, with that of learning, that is effectiveness. Otherwise is quite intuitive that from an relevant and effective behavior emerges the knowledge. This is too the complete and ultimative answer to the question about where information is for human beings: it is in the knowledge.

The following criteria are the usual criteria of the praxiological kind. Otherwise it is quite intuitive that the knowledge is directed to a goal: wisdom; that it benefits of some negative feedback in the process of achieving its goal: trial & error; and that it manifests some degree of predictivity: forecasting.

It is to note that knowldege and language show the same criteria. In fact language is the specific way of knowledge for human being. More than that it is the being informative for humans (Florio 2009). The difference between language and knowledge is that language is a sufficient condition for knowledge but it is not the necessary one. In fact that unfortunate persons that have the handicap to be dumb can know as well as all the others. This is too the case for those sages that some or many time prefer to be silent.

At this point there is to answer to a question. “What remains of the representationalist analysis of knowledge as true and justified belief of the normative as well as of the naturalized side of the analytic rationalist, rather than rational, reconstruction of knowledge?”

Nothing at all. I have ideas and theories to defend or reject but about beliefs, if I have some of them, they are for me like the clothes which I change every day. And I like colored clothes. Some new I buy and some old I move to the trash. After all I'm born naked and naked I would die (the modern sense of morality allowing).

About truth, it is a big question, but not for science. For science it represents the end of inquire (Peirce 1901, Misak, 1991) and it is where religion impinges science. That is to say, only God, at the end of the world, will judge about what is true and what false. But I do philosophy, epistemology and science, no metapysics no theology. On this earth there is the Pope and I'm sure that he will assume the haghtiness to legislate about what is truthfull and what is trythless.

About justification, never I have accepted uniforms (of any color) and justification are due to the uniforms which represent the authority. In science there should not be authorities but unfortunately there are many and in most of the cases they are represented by the most privileged and conservative persons. And I'm sure that to try to convince the analytic philosopher to look through the prism of phenomena is, more or less, like the task of Galileo, who tried to convince the metaphysicists to look through his telescope, that is an impossible task. But some good there is in our universities. I hope that my proposal will be appreciated from those few.

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