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No Cognition Without Communication

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The author will present work on the central role of two virtual human constructs of man's nervous system and brain confronted to their real environment, both natural and social. These two constructs, the mind and language, are the results of the development of the general pattern-capturing potential of the brain's architecture. The mind and language develop simultaneously, reciprocally and in close coordination transforming the pattern-capturing potential of the brain into the mental and linguistic conceptualizing power of men/women. It comes in six stages: sense; perceive; discriminate/recognize patterns; experiment; speculate; and conceptualize. Long before birth, a child is bombarded with physiological and verbal communication to which he/she cannot respond verbally. As soon as born, he/she is cast into a communicational situation crucial for his/her survival: call—respond—feed—nurture—speak. That produces the development of Henceforth, a fourfold personality (Lacan's Square). A phylogenic and psychogenetic approach of the connected pair mind/language captures this cognitive conceptualizing power, using the architecture of the highly parallel, hierarchical, and pattern-discriminating brain. This leads to a cognitive procedure: Bertrand Russel for the first three steps and Lev Vygotsky (Jean Piaget) for the last three steps. Language is the first and main tool of this procedure that starts yet for the child in pure action. The Internet and artificial intelligence (AI) minimize authority/other. Are social networks the new anti-social, anonymous, uncatchable killers of cognition, or supreme absolute cognition and total freedom of expression? Can a processing framework guarantee true cognition or at least as little false cognition as possible?

Keywords: communicational situation, mind/language, conceptualization, cognition, education, Internet, artificial intelligence (AI), womb-memory

Introduction

This paper will deal with cognition and communication in their diachronically phylogenetic potential and in their synchronically psychogenetic empowerment of individuals. The author will not consider the phylogenetic emergence of articulated language in Homo Sapiens starting some 300,000 years ago as a prolongation and development of communicational abilities of previous Hominins. But the communicational situation the author will examine in the first part is the same for a newborn today as it was for Homo Sapiens in his emergence. The phylogenetic potential and process that are invested in this psychogenetic acquisition and development is the same or similar to that of a newborn Homo Sapiens confronted to his own survival emergency 300,000 years ago within his Homo Sapiens community emerging from Homo Ergaster, and inventing and developing human articulated language at the Quba at same time. This invention-development of

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language within this emergence of Homo Sapiens has been published as a book since then (Coulardeau, 2017b).

This paper will be divided into two parts. The first part is based on the paper presented in Chengdu, China, 6th International Psychology and Health Conference (PHC 2018), Engineering Information Institute, on Sunday, June 3, 2018, fairly modified and expanded (Coulardeau, 2018). I integrated at the end of this first part a synthetic graph of the expanding heart of cognition I put forward in this presentation. The second part is based on the presentation in Paris on July 11, 2018, 15th International Conference of AIPL (Association Internationale de Psychomécanique du Langage—International Association of Psychomechanics of Language), Université Paris III Sorbonne Nouvelle (Centre Universitaire Censier).

First Part: Mind-Language, the Expanding Heart of Cognition

Introduction

First let us refer to already published research (Coulardeau, 2016; 2017a; 2017b) about the phylogeny of language within the emergence of Homo Sapiens in Black Africa and then in connection with the successive migrations out of Black Africa. First to Northern Africa develops first articulation root languages, mainly known as Semitic languages (about 180,000 years ago). Then to Central Asia and Asia gives birth to second articulation languages known as character or isolating languages (about 110,000 years ago). Then to the Middle East and Europe first gives rise to the agglutinative third articulation languages (about 75,000 years ago) and also expands to Central Asia, Siberia, and the Urals, and slightly later but to stay for a long period on the Iranian Plateau the third articulation languages (about 50,000 years ago) that will give birth to Indo-European and Indo Aryan languages when these people moved from the Iranian Plateau west and east respectively after the Ice Age, to Europe and to the Indian sub-continent (about 15,000-12,000 years ago).

When speaking of the psychogenesis of language in first-language learners, the author deeply convinced the process a child learns his/her first language is in many ways parallel or similar to the way Homo Sapiens developed language and languages. Language is a system of systems architecturally constructed with three articulations in order for a speaker to communicate with people within a communicational situation that is forbidding and awe-inspiring to the newborn who only wants to survive in comfort with the help of people he/she has to progressively capture and mobilize by his/her calls, crying, and later words.

Language leads to full conceptualizing power within 15 years, making these abstract notions more and more complex. The brain bombarded by sensory impulses processes them to identify and discriminate patterns and it virtually constructs the mind that enables the learner to learn the language/languages spoken around him/her. This language is the second virtual construct of the human subject devised in his/her communicational situation; a second construct that immediately reacts on the first construct, the mind, and in its own development.

There is no cognition possible if these mind and language/languages are not virtually constructed by the brain from its processing all received sensory impulses. Both constantly expand in the child, teenager, and adult. They are simultaneously and mutually developing. There is little mind without language and vice versa little language without the mind.

Language Before Language

Starting in the 24th week of pregnancy, a child can hear and it was proved after birth that the child had actually registered some clusters of sounds he/she had heard from inside his/her mother. In Roubaix, France

maternity in the 1980s, some doctors wired the fetus inside the mother's uterus to record what the child could hear: Everything said by the mother or within one meter of the mother was distinctly heard. After birth, they orally submitted the newborn to words among which they added the names of the siblings (large families with several grown children). The newborn reacted with his/her eyes to the clusters he/she recognized; he/she had registered in his/her brain. At the top of these clusters were the names of the siblings. The fetus had isolated these clusters and memorized them. Before birth, the brain of the child is already working the way; it is going to work systematically all lifelong. That is what could be called "womb-memory" thus proved for linguistic clusters. David Lewis-Williams (2004) in his discussion of neuropsychological universal images coming back to the consciousness of subjects when in an altered state of consciousness that he considers as being images of the nervous system (he includes in these images the entoptic "signs" that come up in the child's brain which are in a way different since they are visual and the still unborn child has no visual opportunity, except self-produced by the visual apparatus that can only capture variations in light and darkness in his/her mother's womb) said that most visions (he works on shamanism in West-European Cro-Magnon settlements) include entering a tunnel, getting into a dark environment, and images of floating or connected with a water environment, at the same time or alternatively images of flying or connected with flying, and the exit through some kind of tunnel to come back to the light of day. He constructs this experience for Homo Sapiens in pre-Ice-Age Europe living and painting caves, like Chauvet, France. This desire (as such very regressive) to go back into some underground narrow fully enclosed and isolated place in total darkness producing such images of floating or flying and then the exit from this dark subterranean place through a narrow gullet is quite clearly the "womb-memory" of the experience of the still unborn child in his/her mother's womb, a fully liquid environment in which the child floats or flies, and the subsequent exit from it is a memory of his/her experience of his/her own delivery.

This womb-memory is all the trickier when we know most (3 to 1) of these spiritual individuals painting the caves and having the experience of isolation in dark subterranean spaces in altered states of consciousness were women. Their own womb-memory could be then reinforced by their own memory of the delivery of their own children. But that is another topic of research.

The brain receives sensory impulses from the various senses and sensors in the body. The highly parallel hierarchical brain processes these impulses (sensations) to turn them into perceptions. Then, the brain can capture or isolate patterns in what it perceives, or later on recognize patterns already captured and isolated in some cerebral machine code or brain machine code (Hawkins, 2004). The child's brain works like any animal's brain. Animals recognize us, are able to orient themselves in space, to recognize places, though some pretend they do not have real memory but just some kind of immediate only present recognition (Lewis-Williams, 2004). The first stage develops in three steps:

- To sense, sensations, and nervous impulses going to the brain;
- To perceive, perceptions, and sensations turned compatible with the brain, that the brain can then analyze;
- To identify/isolate (later recognize) patterns, perceptions: anything making items specific and particular.

The brain codes and memorizes them in cerebral machine code or brain machine code.

As soon as the baby is born, he/she is confronted with the world and human beings moving, speaking, and doing many things. At birth, the continuous flow from the mother stops and the child starts feeling thirst and hunger, cold, and heat, and he/she is going to attach some memorized linguistic clusters to actual referential

items. But his/her immediate urgency is to satisfy his/her needs and since he/she is so locked up in his/her impotence he/she expresses his/her needs the only way he/she can. He/she cries. The first time, it is the mark of his/her being alive outside his/her mother. But the next time, the baby expresses a need and he/she discovers that crying is a call, that one of the people around him/her will answer the call and satisfy the need. Within a few hours, the baby is able to learn that he/she is in a communicational situation and that his/her calls bring a response. The baby thus learns:

- He/She has needs creating some discomfort;
- He/She can "call" and someone will respond;
- He/She has acquired the dynamic of the communicational situation.

This communication is fundamental, and the level of consciousness of the child is irrelevant here: It is purely experiential and existential action. The persons taking care of the baby must speak to the baby, touch the baby to express care, love, emotion, empathy, and most of all establish eye contact as soon as possible, all the time. Eye contact is communication. It is essential for children who may develop some form of autism. These communicational situation and eye contact, when used properly and with intensity and empathy, may help children who may find it difficult to establish contact later on.

On the basis of this experience, the child will learn one or two languages from the very start in just a few months.

Learning the First Language(s)

The baby cannot speak a word but the mind constructs a matrix of the communicational situation (see Figure 1). The baby does not differentiate the relation established by this action of calling from the caller to the callee, from the theme of this calling which is the dissatisfied need, the call itself. Later, when the call becomes something else than crying, the child devises a phonetically processed call. This will take time. What is important is that this situation is the matrix of the agentive relation or the ergative relation. The two may be indiscriminate for a long time. They will differentiate from each other when the child learns his/her first language or languages. We should study agentive and ergative structures in a child's language within his/her learning process when from birth the child is confronted with two languages, one agentive, and one ergative. A child confronted to two languages, if clearly determined by the people speaking them and the situations in which each one is spoken (for example, one language for use by parents and children within the closed family circle and the other when people from outside intervene, the language of/from the outside society), that child learns both languages equally. What happens when the two languages are different or antagonistic in their levels of articulation and/or syntactic elements?

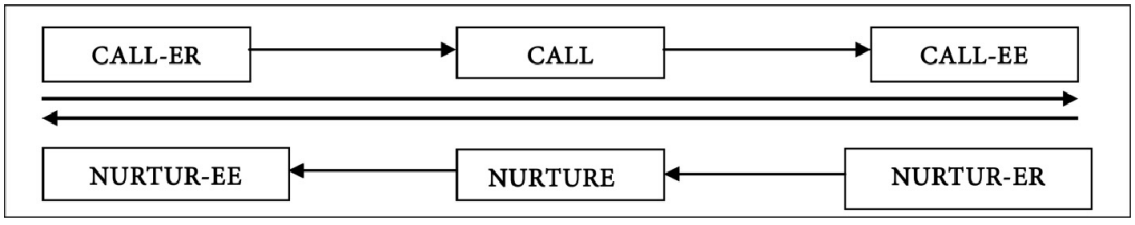

Figure 1. A baby's communicational situation.

The agentive relation for food requires the child to differentiate the action from its theme that is called for by the caller (to the callee), then provided by the feeder (to the feedee). The material communicational and

caring situation makes the child build in his/her mind the two elements: the relation and its theme, by discriminating them in the symbiotic calling, and this leads to the situational differentiation between the feeding relation and the food theme of this relation (see Figure 2).

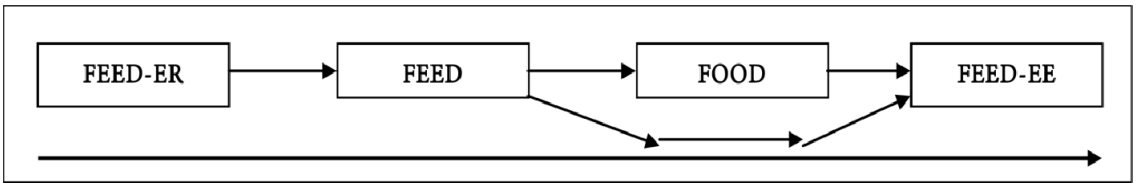

Figure 2. Basic twofold feeding relation.

This existential and purely circumstantial matrix produces in the mind of the child who cannot speak yet the matrix from which the language will be constructed. The author gives the agentive relation but the ergative relation—or the passive relation if a language builds its architecture on a basic passive structure—are similar in terms. This graph is a meta-communicational structure. The capture of this relation as agentive, ergative or passive distributes the elements in the linear space of discourse and grants them various markers accordingly (see Figure 3).

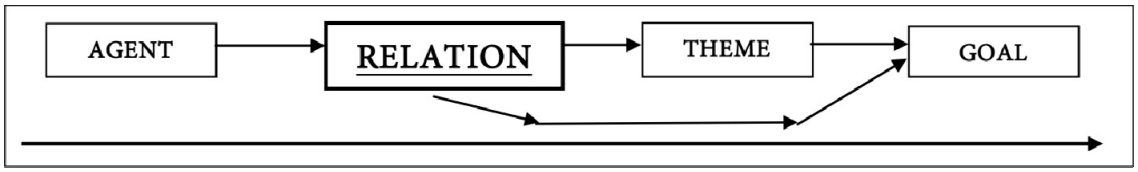

Figure 3. Basic agentive relation.

The emphasis on the agent leads to an agentive relation. The emphasis on the theme leads to a passive or ergative relation and the emphasis on the goal (here the beneficiary) leads to a passive or ergative relation. Some languages accept the two passive relations and some only accept one centered on the theme, within this type of relation. In English, we can say "Paul is fed by his mother," "Paul is fed some soup by his mother," "Soup is fed to Paul by his mother." In French, we can say "*Paul est nourri par sa mère*" and nothing else (three versus one). The verb "*donner*" has a wider choice, such as "*Le livre a été donné*," "*Le livre a été donné par Paul*," "*Le livre a été donné à Pierre*," and "*Le livre a été donné à Pierre par Paul*." English has a greater choice, e.g., "The book was given," "The book was given by Paul," "The book was given to Peter," "The book was given to Peter by Paul," "Peter was given the book by Paul," "Peter was given the book." The two passives on the goal of the action are impossible in French (six versus four).

This is not inborn in the child but constructed by the brain bombarded with stimuli, confronted to the communicational situation. It is constructed in the mind and the mind is not an organ but a virtual construct. The child builds his/her mind before he/she starts speaking (and it starts before being born and it is retained after birth due to womb-memory). The matrices he/she builds in his/her mind are the matrices in which language will be cast later. Just the same matrices that enabled Homo Sapiens to develop articulated language a long time ago.

The child's learning the language or languages he/she is surrounded by is the slow maturation of the body (lowering of the larynx and growing of teeth) and the exploitation of the vocal potential this maturation brings, enabling the construction of the mind and articulatory power.

From Cerebral or Brain Machine Code to Articulated Language

This second phase of language learning or constructing only develops in the mind. It is entirely virtual, though the brain is the depositary of it (it safeguards and memorizes it). A brain is a dictionary form without any lexical content at the beginning.

The first triad, to sense—to perceive—to identify, was borrowed from Bertrand Russell's (1921) approach of the mind. The second triad the author is going to consider is vastly borrowed from Lev Vygotsky (1934; 1962; 1978; 1985; 1987), Jean Piaget (1975; 1976; 1988; 1990), and others specializing in child's cognition, but also from the deeply cognitive and psychogenetic theories of Gustave Guillaume (1919; 1929; 1945; 1964). The supporting theory is cognitive, and language is, first of all, a cognitive tool leading to action, even if it is contemplation.

The first step is "to experiment". Language experiments with the linguistic patterns received from the brain to use them—when the child can of course—to target some objective or some actor to satisfy his/her objective evolving from need to desire. This is true of all human actions. Endowed with some experiential knowledge, a human being experiments with this knowledge to find its characteristics and build its user's guide. For a child learning a language, the first step is the ability to articulate syllables, single or repeated syllables, then words of one syllable or two different syllables. The consonant "m" comes from the child's suction movement of his/her lips when breastfed by his/her mother or with a feeding bottle. Plosives "p" and "b" are the reverse movement of the lips terminating the suction movement. Dental "d" and "t" are more complex since they need the growth of teeth to be articulated. Words like "mama," "papa," "baba," "tata," and "dada," and variations are used by the child to designate people around him/her. "Mama" and all other words of this level are used at the first level of "conceptualization" when two or more objects are covered by the same word because they are concomitant now, next to each other when the child uses the word. That is Vygotsky's first level of concepts (1934; 1962; 1978; 1985; 1987): Regrouping items under one lexical unit because of their proximity when the word is used. This proximity class lasts as long as the proximity is visible to the child. But the repetition of that situation (crèche every day) may solidify the words beyond plain referential presence and designation, hence as a notion captured in absentia.

If the word is a call, then the child sees if the result corresponds to what he/she has so far understood in that word. If he/she calls "mama" and his/her mother, or some other female nurturer, comes the referential value of the word is reinforced. Otherwise, he/she is confused. But this same word covers the need of the child and if it is hunger, the food or the feeding will also be "mama". The three may be expressed by one word for some time. A pattern covering a set of elements is captured as one, only later will the mind be able to discriminate patterns in patterns and it will differentiate between "feeder," "feeding process," and "food" along lines that are not the same for all children: It is a personal experience and a personal constructive process. A child who was raised from three months onward in a crèche where he/she (it was a boy) stayed all day from 7 am to 7 pm, used the word "mama" for the ladies taking care of him in that crèche and for his/her mother when she took care of him/her. The father suggested calling the mother with a shortening of her name, "Lulu," and the child developed three words for his nurturers: "mama" (crèche personnel), "Lulu" (mother), and "papa" or "dada" (father), the third nurturer who took care of him/her and brought him/her to the crèche in the morning and retrieved him/her in the evening.

The second step is "to speculate". All human beings do this after experimentation, to devise abstract knowledge about the experience and experimentation to guide them in future implementations of this

knowledge. The first step of such speculation is the famous two-word sentences. The child must be able to assign order and separate semantic value to the two words. He/she must also assign to the two words the embryo of a syntactic value.

The child must learn a word for the feeding process and the food, at first indiscriminate. His/her first sentence is then a call to his/her nurturer for "feeding-food." If the nurturer responds properly, the child's speculation is reinforced and he/she can move to another level of experimentation/speculation that brings the differentiation between the process of feeding and the food, with a special word for that food. The child might stay for a while within the two-word sentence phase with "mama-feed" and "mama-food," these sentences being theoretical because it is always a personal and individual process for each child. If the first food the child identifies is "rice" he/she will produce theoretical sentences, like "mama-feed" and "mama-rice." That could explain the use of generic objects with some actions like in Chinese, but also within word composition like in English with verbs including a generic object as a first element like in "proof-read," "book-read," "lip-read," "mind-read." These compound verbs with generic objects are common in their gerund or present participle forms: "He is constantly mindreading (people)," corresponding to "He is constantly reading minds," or "He is constantly reading the minds of people," still generic, but becoming specific in "He is constantly reading the mind of his wife" to develop the shorter "He is constantly mindreading his wife."

In this phase, the child is projecting the communicational situation he/she has experienced for a year or more, and on which he/she has experimented all along, casting what he/she tries to express in the matrix of this communicational situation. This communicational situation and its matrix become the matrix of the syntactic construction of the language(s) the child is learning. The child is not able to produce a syntactically constructed sentence for quite a while. He/she has to capture the difference between space leading to spatial items, and time leading to temporal items. These two categories are fundamental, probably universal. In some languages, the temporal items are invariable but time is understood and expressed with ancillary elements or virtually in the mind. Space may not be expressed per se but space is understood and expressed with ancillary elements or virtually in the mind. Linguists have a tendency to project onto all languages the particular forms these two categories take in (most) third articulation (agglutinative and synthetic-analytical) languages, nouns, and verbs. We have to consider more abstract categories: space and time. Space leads to some static elements defined by their place. Time leads to dynamic elements that can move from one state or place to another, which always takes some operational time. This temporal side of the world is mentally and linguistically built on the model of the spatial side of things.

Some languages, like the Salishan languages in Canada and the USA, are debated because they do not seem to differentiate between noun and verb categories. Their roots seem to be unmarked and it is a specific mark added to these roots that make them "verbal" or "nominal." But it would be more interesting to see if words, like "*ʔux*^{ʷ}" and "*sbiaw*" in "*ʔux*^{ʷ}*ti sbiaw*" ("the coyote runs") are "verbal" or "nominal" per se or if it is the "specifier" "*ti*" that establishes a predicative relation between the two beyond the fact that both words can be understood as both spatial hence "nominal" ("he who goes" hence "goer," and "coyote") as well as temporal hence "verbal" ("go" and "be coyote"). Note "go" expresses a movement, hence both space and time, and "be coyote" expresses an essence, hence static notional duration in time. The polemic raged in older decades but if we state—from pure observation based on the consciousness of the speakers—the word order is "verb" first then it is clear langue does not have the categories of "nouns" and "verbs" but discourse producing the

utterance works on the differentiation between spatial-temporal and spatial-static duration. Or they are inverted couples if we take into consideration the "verb" first discursive syntactic rule as opposed to the "verb" second discursive syntactic rule. Is it the role of the "specifier *ti*" to coalesce a sentence from the two elements: "be coyote—Relation—go" or "coyote—Relation—goer."

We have exactly the same problem with all root languages. The roots, the only langue elements, are neither nouns nor verbs and it is only discourse dictating the morphology and syntax that turns "ktb" into a verb or a noun in Arabic or Hebrew. For the Arabic verb, we have on initiation sites (most translations are wrong and Indo-European centered): *Kataba*, "he wrote" (masculine); *katabat*, "she wrote" (feminine); *katabtu*, "I wrote" (feminine and masculine). For the noun, we have: *kitāb*, "book"; *kutub*, "books" (plural); *kutayyib*, "booklet" (diminutive); *kitābat*, "writing"; *kātib*, "writer" (masculine); *kātibat*, "writer" (feminine). The root is "ktb" and then you have a discursive stem for the verb, "*katab*," and two for the noun, "*kitāb*," for the object, including the action, and "*kātib*" for the agent. Note the feminine element on the verb and on the agent noun is the same /-at/. Linguists trained in third articulation languages project their third articulation categories onto all other languages: verbs and nouns everywhere, though in English the distinction that used to exist is disappearing with many words like "work" and it is always possible to use any discursive unit as a verb or a noun, taking a third articulation discursive utterance and casting it back into the spatial hence nominal or temporal hence verbal categories of the second articulation: "Do not mother-fucker-sir me please!" (negative imperative verb); "He is the worst mother-fucker-sir professor I know!" (superlative + compound of a nominalized discursive utterance in a modifying attributive adjective position + another noun); "Paul is always mother-fucker-sirring me in spite of my protest!" (present progressive verb hence using a present participle).

The third step is "to conceptualize". The linguistic items, words, or operations or functions, are captured and defined abstractly. But yet, there are different levels of conceptualization. The simple word "dog," often of a smaller size is a pet for an older person, but an assistant of a bigger size for a hunter or a shepherd, and the same dog for a biologist will be his/her scientific definition of the animal. A veterinarian if the dog is rabid, will only put the dog to sleep and discard the body. The pet owner will eventually cry and most urgently verify his/her vaccination.

This second triad can only start when a child is able to produce two-word sentences, and it leads to abstract conceptualization around 12 years of age that comes to full development only around eighteen and it is still growing in adult age, though probably at a slower rate for most people.

Vygotsky and Conceptualization

First, the child goes through a phase that builds unorganized congeries or heaps of objects in three steps. The three steps state that the concerned objects are in a way or another present when gathered into heaps, hence the rule is proximity, both temporal and spatial. First heaps of objects are brought together on a simple trial and failure basis, hence on a simple proximity. There are pure experiential trials and failures for the child. Then, the proximity is positioned in space, some kind of spatial vision with things positioned in it. The third heap is endowed with a unique signification. Then, a word becomes necessary to give the heap a unifying label.

The second stage is complexes. The child sees bonds that actually exist among the concerned objects, a color, a shape, a texture, etc. First are associative complexes, the continuation of the previous stage. Next are collective complexes or complex-collections. All objects have some common trait but the collection cannot

contain two identical objects. This is a constructive process. The next step is chain complexes: The characteristic is transferred from one object to the next in a chain of objects. The transferred element can change along the chain: red square to red round, round yellow to round blue, blue round to blue triangle, etc. That leads to a diffuse complex in which the common feature in all items is fuzzy: It is common but not quite clearly discriminated. It leads to the step of pseudo-concepts. Externally, they are concepts clearly "defined" by some element, but internally they are objects that may have little to do with one another. The child might have well-differentiated a certain color or shape and he/she may bring together objects of the same color but some are living objects, others plain static objects, etc. A cat, a dog, or a bird are all moving. A fly and a bird both can fly.

Vygotsky (1934; 1962; 1978; 1985; 1987) stated we have to introduce some historical perspective, some genetic approach in our experimental analysis. History is the historical period when a child lives, with its environment and its culture: Children imitate adults and Vygotsky did not know about mirror neurons. These mirror neurons are essential. A child can capture every meaningful element in the behavior or language of an adult, even before he/she is able to speak. We could here wonder if the womb-memory of the child has not captured during the gestation in his/her mother's womb some hormonal connections between the tones of what he/she could hear and the hormonal state of his/her mother directly transferred to the child. History is also the personal history of the child in his/her environment. The genetic element is the psychogenesis of language and concepts, though some phylogenetic dimension could be seen too in the fact everything that surrounds the child has a phylogenetic history. We must also keep in mind language is a communicational medium with a rich and long phylogenetic history.

With pseudo-concepts, the child starts developing the decomposition of objects into characteristics, the analysis of these features, and the abstraction of them by considering the separate features each one in itself and all together. To abstract something, you can only do it by discriminating this element from the simultaneous abstractions of other elements. Then, objects are classified as first potential concepts on the basis of maximal resemblance and a maximal number of common features. These pseudo-concepts are pre-intellectual, defined by a practical reference to a precise circle of objects, within discriminating abstraction. These pseudo-concepts are not based on what the objects can do but on what the child can do with these objects.

A young teenager, within a concrete, meaningful, and motivating situation, brings together his/her previous representations and complexifies the relations between the objects within wider sets. The really new element is that of judgment. He/She is actually always assessing the utility for him/her to know this or that, to generalize this or that. Judgment is mostly self-oriented and self-centered.

Around 12, the child enters the intellectual age with two roots: a widening and deepening of the child's ability to build complexes and reach potential concepts. Vygotsky opposed, in nature, genesis, and value, two types of concepts: spontaneous everyday concepts built from direct existential experience, and non-spontaneous scientific concepts built from education. Both exist side by side and can overlap: Scientific concepts are the result of the child's education which is existential and experiential. It reinforces previous relations within the family circle with transference phenomena. At the same time, it may be captured as either complementary, alternative, or even antagonistic. This intellectual construction of scientific concepts at school may become a refuge from the family circle; it is an antagonistic experience the teenager can peacefully assume or more or less aggressively express against people in his/her immediate family circle.

The first step in this genesis of scientific concepts happens in primary school and it can easily be amplified by school work. But for Vygotsky, you cannot force someone to learn a concept and make it operational. It has to correspond to a level of maturation. This means it is better to lead children towards discovering these concepts with and in their own activities, like reading, writing, and arithmetic, that enable a child to learn how to recognize-conceptualize the letters or characters of his/her language, motivated by the curiosity about what is written on the page. He/she will simultaneously learn how to write, to transfer the recognition of the letters and their association to sounds, to hand movements, and special tools to write, pen, paper, etc.

The second step is in junior high school, at the beginning of adolescence. The teenager develops simultaneously and continuously, and concepts and word meanings in one single movement. Learning is like a process that constructs both the conceptual lexicon and the mind of learners.

The third step is more heuristic and has to do with the method. The school system imposes or proposes to discover new concepts by constructing them with a method mostly based on deduction, induction, and cause-effect abstraction. It is best if this learning is based on experience and experimentation. Motivation is the most important element in this perspective: All learning has to be self-oriented and self-motivated by and for the student.

The learning/discovery of scientific concepts builds up the ability in the mind that uses the brain's structure and functioning to construct what Vygotsky calls a "system" and it is more than one system but it is one system of many systems. This hierarchy of systems or systemic architectures and abilities takes time and is never finished, hence cannot be brought to a terminal state.

Visual Summary

Right at the beginning of the genetic process, you have to take into account what the heritage of the child is, in fact, the outside world and the phylogenetic process that produced the human child he/she is. This outside world is hierarchical by architecture and in this set of hierarchies, the senses are central since they are the direct link between the individual child and the outside world he/she experiences existentially with the main need at birth: the need to adapt in order to survive (see Figure 4).

NATURAL EVOLUTION + HUMAN EVOLUTION					
The world's Hierarchy	Life's Hierarchy	The body's Hierarchy	**The senses' Hierarchy**	The brain's Hierarchy	The cortex's Hierarchy

Figure 4. Humans confronted with nature.

The Senses' Hierarchy is the main interface between the child and the world, even before birth, and we have to take into account the numerous sensors in the fetus and later the body that are also part of this sensual interface between the child and the world, via his mother's similar interface during gestation. This interface is in direct connection with the brain and the cortex through the basic senses and the nervous system. The five senses are well-known and we have to add to these all the sensors in the body that inform the brain of the situation, state, and physiological needs of this very body, like hunger, thirst, etc. But we will only consider the five basic senses: eyesight, hearing, taste, touch, and smell (see Figure 5).

On the basis of this brain and central nervous system, the dual construct of mind and language develops. This complex virtual construct rooted in the brain must be seen as a constantly evolving and developing dual entity (see Figure 6).

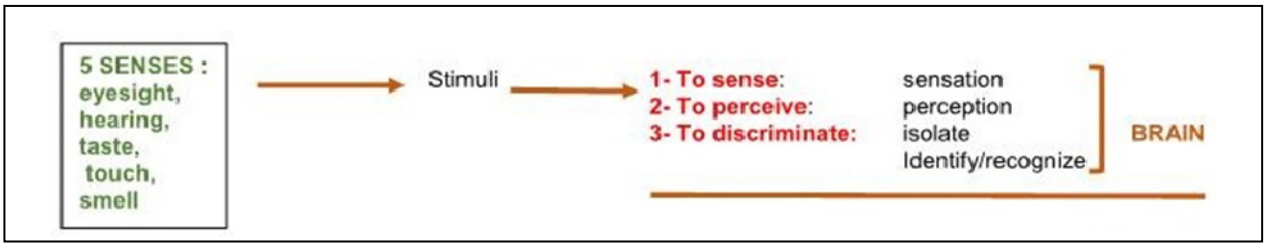

Figure 5. From the senses to the brain.

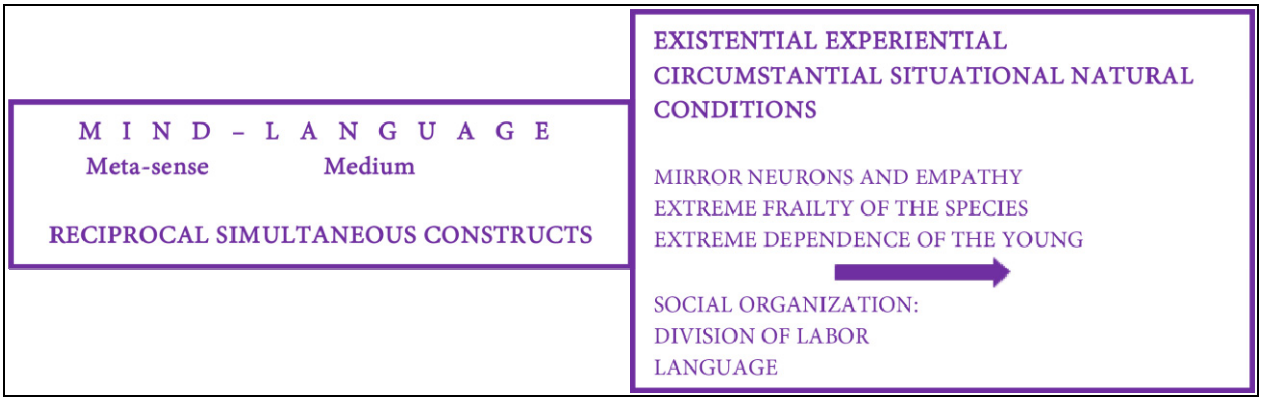

Figure 6. The mind and language.

It is this mind that will produce, construct, and generate the mental constructs and conceptual notions of abstract thinking as well as the linguistic items based on the duality signifying/signified (Saussure, 1916) or content-form/meaning (Guillaume, 1919; 1929; 1945; 1964) in three successive operations (see Figure 7):

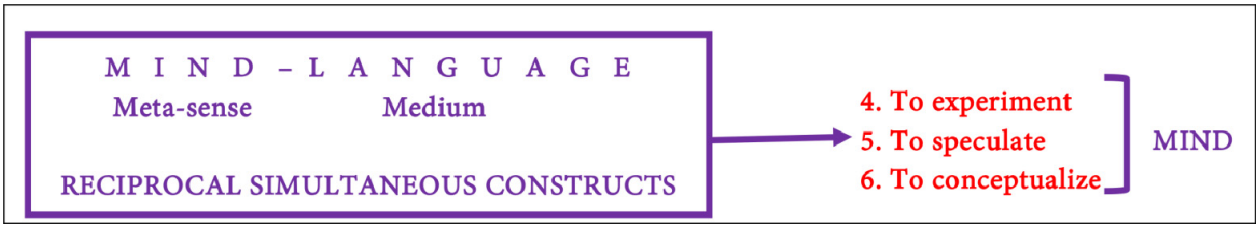

Figure 7. From identified patterns to concepts.

The mind is in many ways a circular engine that constantly produces mental constructs and conceptual notions on one hand, and on the other hand, linguistic items characterized as connecting a signifying form and a signified content both generating meaning. The mental items, via the three operations we have identified, generate the need for new or updated linguistic items, and at the same time, simultaneously and reciprocally, the new or updated linguistic items produce through and in the mind itself new or updated mental items that will immediately be experimented upon, speculated about, and conceptualized to be finally fed to the linguistic side of things to create new linguistic items if necessary or update older ones. That circularity is essential to understand the cognitive process of learning. The new knowledge is not part of the mental constructs and conceptual notions of the mind and the three operations will enable the assimilation of the necessary words or phrases or concepts to cope with this new knowledge but the cognitive process is only finished when this updating or assimilation process is transferred to the mental side of things. Here is the necessity for this new knowledge to have roots in the mental constructs and conceptual notions to be learnable and integratable. That

is Vygotsky's zone of proximal development (1934; 1962; 1978; 1985; 1987). More in a moment are shown in Figure 8.

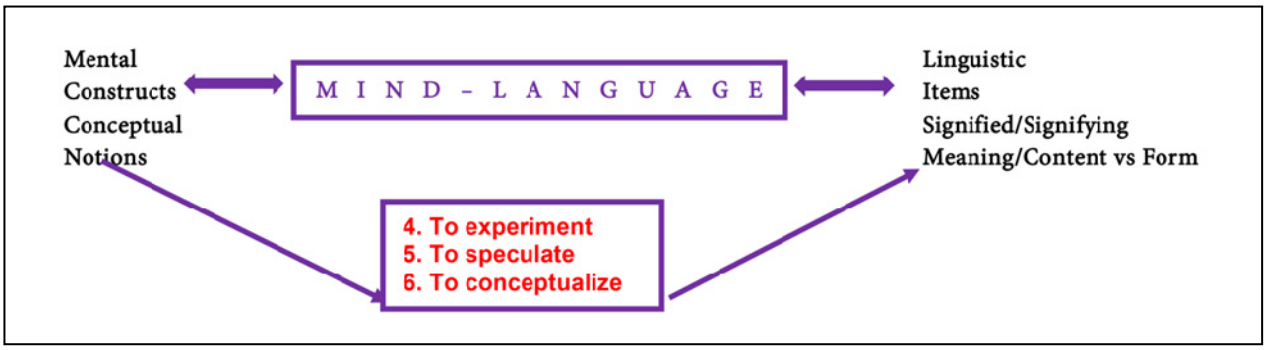

Figure 8. The circularity of mind-language.

And it is this full vision of the mind-language that produces all mental creations and constructions of humanity, particularly the three domains supporting human experience in three dimensions (see Figure 9).

Figure 9. The source of all cognition and creation.

The Zone of Proximal Development

This mental approach of language and cognition opens on an essential concept that Vygotsky does not share with Jean Piaget (1975; 1976; 1988; 1990). Piaget always defended that maturation was natural, going along with the growth of the body, and the child was only capable of doing what his/her maturation enabled him/her to do. This domination of mental maturation by physical and physiological maturation justified Chomsky's consideration that language was a black box in the brain that contained universal grammar in all its operations and complexity only needing to be activated by gene-controlled maturation and social, cultural, or educational prompting. For Piaget and Chomsky, cognition is thus natural, meaning inborn in its very genetic development. The environment is at best a prompter and a provider of cognitive matter and at worst purely circumstantial if not negligible.

Vygotsky (1934; 1962; 1978; 1985; 1987) defended a really didactic, pedagogical, in one word, cognitive approach. You cannot ask a child who has not constructed a certain level of abstract conceptualization along a phylogenic line of mental development, and the phylogenic dimension of his/her development is essential, to learn something that has no roots in what the child already knows, but at the same time, if you follow this phylogenic development you should always propose the child an activity that will activate the next phase of his/her development. Vygotsky refused to let children only do what they already know how to do and he advocates to be just one small step ahead in what he calls the "zone of proximal development." In his standard

approach, it is more conceived as a limit than as a potential. His concept of mental age is disconnected from the real age of the child because it is the ability to solve some problems by himself/herself. But each child is unique and Vygotsky does not insist enough on the necessity for the new knowledge to have roots in the already acquired knowledge, which makes the task of learning more complex since rote learning is out: It must be integrated into old knowledge that must be restructured accordingly. And yet, Vygotsky is totally aware that you have to prompt learners into discovering new concepts or knowledge: "With assistance, every child can do more than he can by himself—though only within the limits set by the state of his development" (Vygotsky, 1962, p. 103).

This zone of proximal development must be used in school education. Since the mental maturation of a child is phylogenetically governed, and we can through observation know the successive phases of this phylogenetic development; we can always propose children to learn something they do not know or control yet, but always starting from what they already know or control. A simple example in the field of language learning can make this clear. A child born in a bilingual family provided the two languages are clearly defined, by the age of four or five—maybe even six if he/she is not attending school regularly in these four to six years—This child will have a slight deficit in lexicon in each language as compared with monolingual children. But altogether the compiled lexicons of his/her two languages will exceed the average lexicon of a monolingual child in any of the two languages. This relative deficit will be caught up by the age of seven in the two languages, but it shows that the bilingual environment enables the child to learn, altogether, more than a child in a monolingual environment because the bilingual environment is more incentive.

To give a second example, the author would say that the earlier you introduce the full interrogation and negation in English using the auxiliary "do," the better. All other strategies like using the progressive form for standard action verbs, hence the auxiliary "be," or the modal "can" as an auxiliary, will strengthen in the learner forms that are not fundamental phylogenetically in English, and this may even reinforce the forms of the first language of the learner that may only use an inversion verb-subject for the interrogative form. The progressive form developed late in English and it is a lot more complicated to understand for children who do not have that kind of auxiliary-using analytical verbal construction in their mother tongues, and the use of modals as auxiliaries to prevent the use of "do" is dangerous because it may weaken if not erase the meaning of these modals.

In English, the interrogative and negative forms always use an auxiliary. If standard action verbs of any type are used without an auxiliary in an affirmative sentence or utterance, then the auxiliary "do" is required and used. The category of auxiliary in English can be subdivided into various constructions as listed below. In all these cases of auxiliary verbs, interrogative and negative forms are built directly with the concerned auxiliaries:

1. For basic action non-auxiliary verbs of any type that come without an auxiliary in the affirmative sentence or utterance, it is required to use the auxiliary "do" conjugated in the proper form + to-less infinitive.

2. As for auxiliary verbs, three cases can be found:

(a) The auxiliary "be" and "be" is always an auxiliary even when used alone, three possible constructions:

(1) Auxiliary "be" + predicate: "he is a teacher" and "she is intelligent";

(2) Auxiliary "be" + present participle: progressive form, "they are reading books";

(3) Auxiliary "be" + past participle: passive voice, "the car is parked in front of the house";

(b) The auxiliary "have" + past participle: perfective aspect, "the cat has eaten the mouse." Note when

"have" is not followed by a past participle, it is a normal verb and it uses "do" when necessary: "Paul and Mary did not have to take the 9 o'clock train" and "How many pages does the book have?";

(c) A modal auxiliary + to-less infinitive: "The weather may change tomorrow."

That is how you can see the zone of proximal development is not a handicap or a limitation. It is a potential for further development. A child will not learn how to multiply naturally because it is not part of his/her nature, but he/she will learn it from activities that will require him/her to learn it, though he/she will not be able to understand the operation before the age of seven or eight. But it would be vain to start with multiplication tables if the child does not understand adding and subtracting, not to mention dividing which will have to come last. That is the phylogeny of the four basic arithmetical operations.

Imagine the next step: proportions or ratios. Starting with a rectangle whose width is 5 centimeters and whose length is 12 centimeters what will the length of the rectangle be if we increase the width to 9 centimeters and if we keep the same proportion it has with the length in the initial rectangle? You need to divide 12 by 5 and then multiply the result by 9 and the length becomes 21.6 centimeters. This conservation of a proportion or ratio between two or more dimensions when one is changed is a complex operation that requires a lot of training but only when the four basic operations are assimilated. A great number of Romanesque and Medieval buildings and artifacts, like churches, water troughs, and tombstones were built integrating one proportion number, the Golden Ratio (1.6180...). We are dealing here with a fundamental phylogenic dimension of humanity that reflects and integrates the phylogeny of arithmetical operations.

All that is contained in Vygotsky and he worked at a time when mass media were not what they are today. Just imagine a child with the Down Syndrome typing his/her name on a computer keyboard to be able to access the games he/she likes on the machine. The author has seen that in an educational day-institution for such children, and not recently since the author saw it in the early 1990s. You can develop skills in all children, though probably not the same and not at the same level for all. You can cope with such facts and situations only if you consider the mind as a construct of the brain and the fact that this mind has its own logic and dynamic for each individual. We have to build a cognitive approach to the world that enables each child or individual to fully use their mind and actual mental capabilities. Any uniform ready-to-use pedagogy that fits all is just vain and it will frustrate those who will be out of the scope of this pedagogy and be they under or over the mental level required to develop the targeted skills.

Conclusions

As for cognition, it is important to state that a child is born with elements, sound clusters for example and other hormonal mood elements, that were acquired, registered, and saved before his/her birth, in the last third or so, earlier for the hormonal mood elements, of the pregnancy. But this acquired knowledge has to be restructured at once after birth to attach to it a signified referential meaning since what was registered was only a signifying form without a referential meaning. This is the basic process of cognition. A child is confronted with new knowledge. This new knowledge is put in relation with the knowledge the child has already saved. If there is a possible connection, it will be integrated into a heap of objects or later on and progressively, into a conceptual system. If it has no relation, whatsoever there is a fair chance that this new knowledge will not be integrated. One relation is motivation after a certain age, particularly after puberty, but children under 12 years old can be motivated to act and learn. This motivation enables the child to integrate the new knowledge in what he/she already knows, or in a new system that will be connected to older systems later. Knowledge is one

hierarchical system of many systems, just like language. New knowledge requires the child to restructure his/her one hierarchical system of systems by integrating a new system or integrating new knowledge into already existing systems. This is essential for any pedagogical work. To teach classical culture requires some kind of connection with the students who have no knowledge of it. This could be motivation but it would have to be prompted and nurtured by the teacher. If no motivation and/or connection with the student exists, the student is not able to receive the new knowledge properly or at all.

The second dimension is mentalism. By mentalism, the author means the reference to Buddhist "citta" understood as a meta-sense. An individual consciously or unconsciously uses his/her mind to cope with the world. This mind is a potential of the brain but it has to be constructed through experience in real contact with the world. This mind has to be constructed all lifelong and the main tool of this construction is language which itself is a construct in the mind. Some children learn more when actually doing some physical activity, and yet the child has only learned something if he/she has built a representation of the action in his/her mind that either makes him/her able to demonstrate the action or to explain with words what the action is. Very often the demonstration is accompanied by some deictic language, like "You do this, then you do that, then you press this button and you choose that task, etc." This deictic language is very common among people working on computers at a lower or intermediate level. But these people could, if required, write down the procedure or explain it on the telephone and then they would have to specify every action and they should be able to do it. This is the mentalism the author is speaking of. The mind and/or language are the core and the tool of any learning procedure, even when the learner is unconscious of it because we are so used to using our mind and language that it becomes customary, hence at best subconscious, at worst unconscious, but it works just the same.

When you bring together those two dimensions you can devise a method to amplify the learning process. This method is rather simple: Make the learner think about what he/she has learned at the end of the day, at the end of a lesson, at the end of a search for knowledge. This summarizing of the day's work enables the learner to reinforce the knowledge he/she has encountered and assimilated. At a more advanced level, it is important for the learner to have a plan before starting that provides some guidelines in the search he/she is entering. A school schedule is such a "plan" since it provides the student with a daily learning frame. But in life, it is the same and every day you have to "know" what you intend to do, what you have to do, what you hope to do, and at the end of the day or the week, you have to summarize the day or the week and see what has been done and what still has to be done.

That is the power of the model the author proposes. It is the same for all children or learners but it varies in implementation from one child to the next, from one learner to the next. Some people might never like Shakespeare until one day they are asked to act in one scene and they accept to try, or until one day, they have the opportunity to see a rehearsal. Then, Shakespeare can penetrate their mental world, even if they have to rap the text on some gangsta rap tempo.

To visualize these conclusions, Figure 10 presents a synthetic visual presentation of this expanding heart of cognition. On the left the universe to which the interface of the senses and the brain is connected. At the top of the main section, the brain and its three operations discriminating patterns identified in brain machine code. At the bottom of this main section, the three experiential domains produce all human mental constructs and entities. Between these top and bottom layers the heart of cognition itself, mind and language with the three operations of the conceptualizing activity of this mind-language are working in a circular process from mind to language and from language to mind simultaneously or reciprocally.

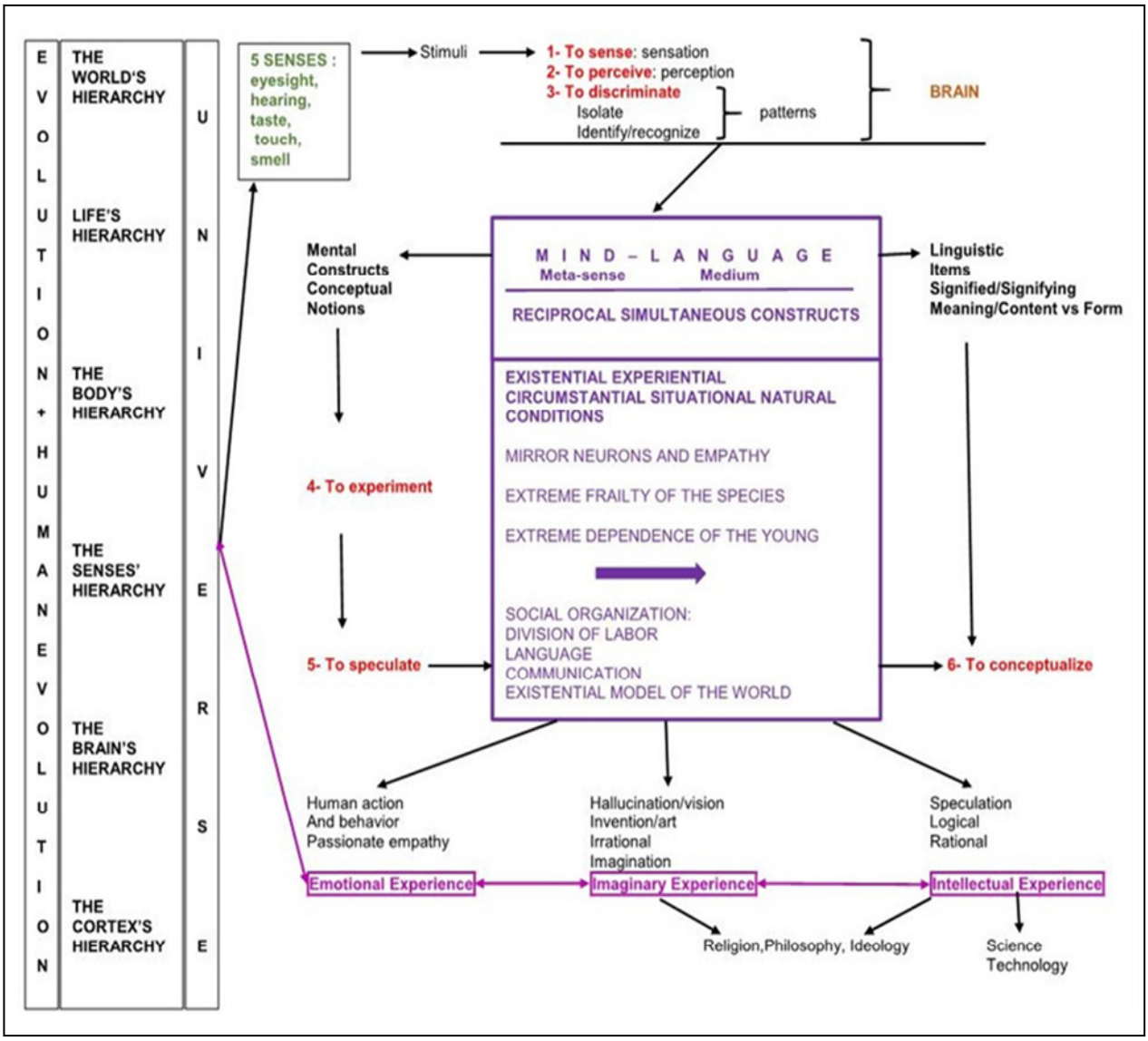

Figure 10. Synthetic presentation of the Heart of cognition.

Second Part: Cognition is Communication

Introduction

In this presentation, let us go beyond the threshold of third articulation languages to examine what happens when Homo Sapiens uses machines, and first of all the machines that deal with or process written or oral language. Here, we will find an evolution from simple mechanical tools using machine code to machines using some linguistic code programmed in them in a more or less discursive way, both written or oral, and to the hypothesis of machines that will maybe tomorrow use some language in the way we humans do, that is to say, in a cognitive and conceptualizing way.

This is the field of artificial intelligence. Two questions are arising on this horizon: Can artificial intelligence machines conceptualize? Do artificial intelligence machines need human language to conceptualize if they can do it?

To use psychomechanic cognitive approach let us summarize this presentation in the form of a "radical ternary tensor graph" (see Figure 11).

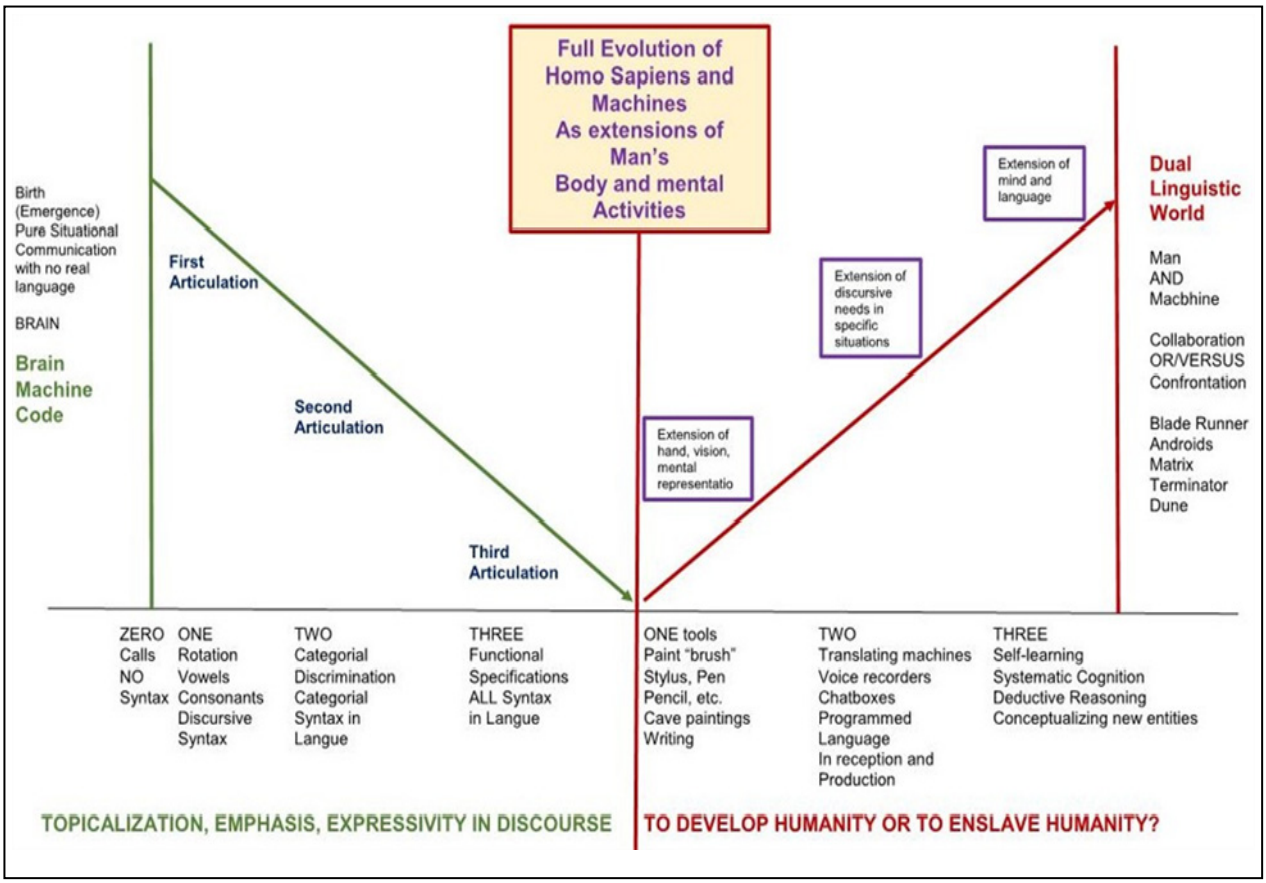

Figure 11. Radical ternary tensor from the brain machine code of the animal world to the dual linguistic world of tomorrow's artificial intelligence.

The presentation now will be the development and the exploration of the potentials and dangers of the evolution to come.

From Plain Tools to Machine Code

The best approach of machines and tools of any sorts is so far the classic theory of Marshall McLuhan (1964). Every invention or development of any sort from clothing to building cities and constructing trains or planes is an extension of one part of man's body and/or (most often "and") one of man's many competencies. Clothing is an extension of man's skin and various competencies (and tools, themselves extensions of man's hands, for example) to produce these clothes, like hunting, curing hide, cutting and sewing, etc. Cities are another extension of man's skin with houses halfway between clothing and towns. But this time, the competencies are different and the need is no longer the same. Clothing protected the body against cold or the weather. Houses have a wider protective role and become defensive in a way, and we are now dealing with a "family" or "hearth" group of people living in this protective environment. Cities are by definition defensive though they are the extension of man's social drive and social organization. Trains or planes are an extension of man's legs and the competence or need to move around over ever longer distances, faster and eventually extending a competence man does not have but man can observe in birds, for example, viz. flying.

Without entering the full exploration of the tools or activities man developed very early in his/her phylogenic evolution that extended man's language, man's mental representation, and man's desire to communicate beyond the present instant of his/her discourse, man has been a communicational animal from the very start. As soon as a technique to produce stone weapons or tools is stabilized, that is to say even before Homo Sapiens per se existed, but also with Neanderthals, Denisovans and probably even Homo Erectus and Homo Ergaster, we can assert the mind and the language have developed enough to do so because you have to have the idea and desire to produce a tool or weapon, then you have to choose materials and design the tool in that material and invent a technique that will produce the tool or weapon (then you main experiment and speculate to stabilize the technique into a materially conceptualized technology). The tools used for communication are numerous, though for a long time the representations carried by this need to communicate were on non-durable media including first of all the body itself with body painting and other beads and adornments. We have no recording of Homo Sapiens language and oral discourse 300,000 years ago, but we have all types of archaeological artifacts that show the speculative mind and thus testify for the communicational ability of Homo Sapiens long before he left, apart from crisscross signs on blocks of ochre, signs, and representations on any durable media.

Representation and communication did not start with cave "art" because all representations from animal painted in caves and carved in stone or ivory, bone, or antlers, to the non-representative signs painted in the caves or carved in stone or ivory, bone or antlers, cannot but have a symbolic value we do not know because we do not know the words, sentences, and linguistic and symbolic rituals attached to them. Such representational and linguistic practices started as soon as the rotation of vowels and consonants was acquired something like 300,000 years ago, partly inherited as a physiologically limited ability, and mostly developed from there due to new physiological articulatory possibilities. This need to represent started a long time before cave paintings that are the first durable form due to the surface used and the means necessary to perform it. Every single element had to be invented and developed on its own and it is probable Homo Sapiens started doing such drawings and representations on non-durable material media that got lost with time. But painting on rock faces is universal in the world and started about the same time in many distant places. This need to represent requires human subjects to have developed some mind-language to the point of

- Conceptualizing what is desired to be represented;
- Sharing that conceptualization in language and maybe sketches on any media, the body first;
- Developing the necessary technical tools and materials necessary for this representation on this or that media;
- Sharing a common spiritual and existential meaning of the representation;
- Being clearly conscious that the representation is neither the author of it nor the object represented: For the painter to believe that he was the painting and hence he was the object represented in the painting is stating a quasi-schizophrenic mental state of non-consciousness, of phantasmagoric vision, a point which David Lewis-Williams (2004) hardly considered, though it is implied in his shamanistic approach of the phenomenon.

This will lead to an essential invention, the invention of writing only made possible in the Sumerian case because of the availability of clay tablets and the stylus used on these tablets along with the commercial need to keep records of commercial exchanges, among other practices (recording law, myths, all types of religion-oriented corpora, not to mention technical records, like the Sumerian harps, its building, and tuning),

and both clay tablets and stylus were used at least three thousand years before the official date for the invention of writing around 3,500 BCE (before common era).

In the Mayan case, it has only survived as carvings in stone and some codices that have escaped the destroying frenzy of the invading Spaniards and there are ancient forms of Mayan writing in stone that are still unreadable, undeciphered. In the Chinese case, we would have to speak of the brushes and inks used for that purpose and the availability of some material media on which this writing was preserved. The Mayas invented early in their history, though we do not know when exactly, a procedure to produce what we can call paper from the inner bark of a tree as Michael D. Coe reported in 1998:

> ... All surviving examples of pre-Conquest paper were made from the inner bark of one or more species of Ficus, a wild fig of the order *Moraceae*. In the case of the Dresden Codex, the crucial analysis was done by Dr. Rudolph Schwede in 1910; through microscopic analysis of some of the fibers of the paper supporting the surface of the book, he found these to be identical with specimens from living fig trees. Later he had the opportunity to study samples from the Madrid and Paris codices, as well as pre-Conquest documents from central Mexico, and came to the same conclusion about them. As for the fourth Maya book, the Grolier Codex, the present writer [Coe, M.D.] was able to make a close examination in 1972, and there is no doubt in his mind that the primary material is also processed inner bark from a species of wild fig. In the Maya lowlands, the tree in question is *Ficus cotinifolia*, to which the Yucatec Maya gave the name of *hu'un* or *hun*, a name which they also applied to paper and to the books made from it (*amate* is a Mexican term derived from the Nahuatl *amatl*). Although we have no information on how the Maya themselves turned tree bark into paper, native Ficus paper from another species is still manufactured by the Otomi in central Mexico and by various Nahuatl-speaking villages in Guerrero... (Coe, 1998, p. 144)

And even in China, there are older writing systems that are still undeciphered: "The National Museum of Chinese Writing in Anyang is offering a huge reward to anyone able to crack an ancient code found cut into bones and shells dating back more than 3,000 years to the Shang dynasty" (Karasavvan, 2017). This writing was often necessitated for some social purpose like commerce for the Sumerian, and it took at least 3,000 years to come to full development. Imagining the time, it must have taken the Mayas to bring their writing system to fullness. A lot more than three thousand years when we consider the extreme complexity of it, and the Mayas were not only carving stone but also painting on some paper-like material that has been preserved when not destroyed by the Spaniards. Note here writing is an invention that implies—and Marshall McLuhan has a lot to say on the subject—the ability to cut up, the continuous oral flow of speech into separate sounds or syllables or words and represent these oral items with a visual written symbolic representation. This is still the same as for parietal representations. To turn something oral into something visual, just as the painting of an animal was turning something oral (the name of and discourse on this animal) into something visual. That is probably why many writing systems start with glyphs of some kind, Hieroglyphs for example. And even in the case of Chinese characters they are a stylized form of something that was a glyph, and even the Phoenician alphabet is derived from the first letter of a word, and their symbols are extremely stylized glyphs as shown in the following chart (Forum Ancient Coins, 2018).

That is where the existence of geometric non-representational signs along with the famous cave paintings show the backdrop of the invention of writing (Petzinger, 2016). These symbols or signs can be dated back to 40,000 or 35,000 years BCE. They exist in Europe but also in many other cases of pre-Ice-Age cave paintings or rock face paintings. These signs are necessarily attached to words, to utterances, and to some semantic and maybe ritual meaning, and there is no surprise that in this Phoenician alphabet we find some of these signs like the X-cross sign that covers T from Taw which means "mark," or the mute consonant that comes from Ayin

meaning "eye." Are these signs entoptic (occurring or originating inside the eye) or are they figurative of some artifact or object? The author will leave this question open. Consider too the case of Gobekli Tepe in Turkey that has carved figures on stone pillars dating back to 9,500 years BCE, 6,000 years before the Sumerian writing system came to its fullness. What most archaeologists forget is this long, at times very long, phylogenetic phase of such inventions: Our dating is thus very late as for the invention itself.

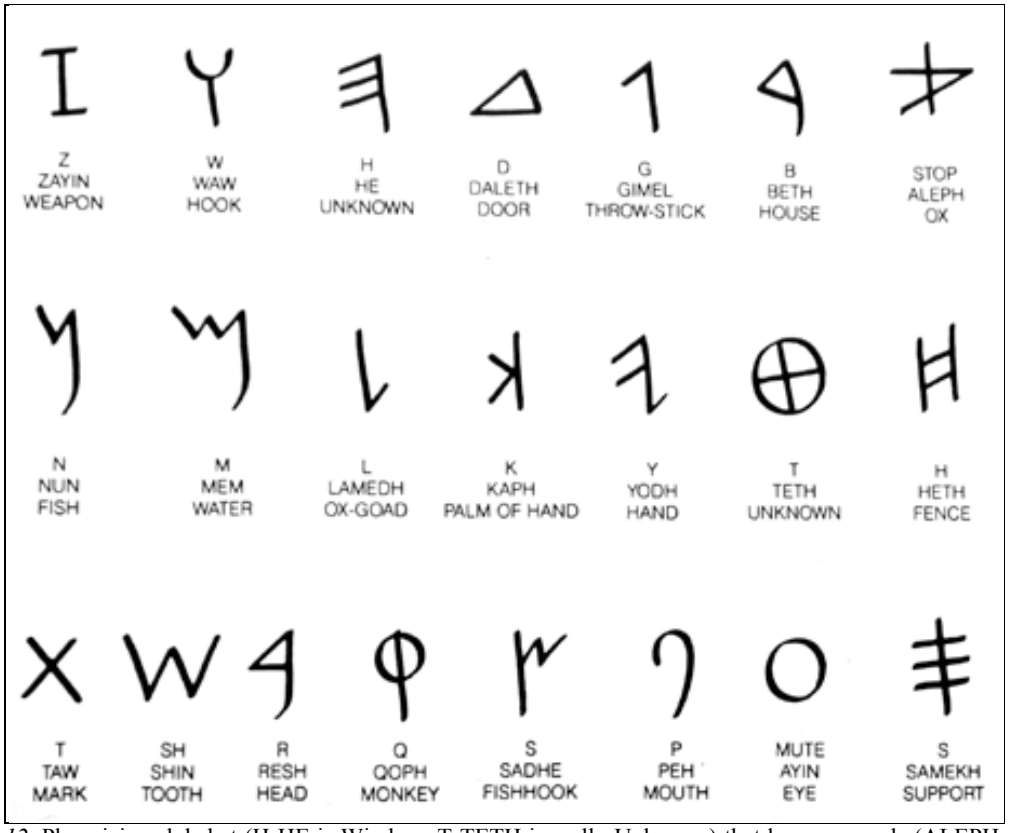

Figure 12. Phoenician alphabet (H-HE is Window; T-TETH is really Unknown) that has no vowels (ALEPH plays a very special role) and it is the matrix of all Semitic alphabets with no vowels.

The rest of the history of writing is known with the various inventions since then that managed to improve the production of written documents and multiply the number of copies, particularly thanks to the printing press invented in Asia and redevised in Europe by Johannes Gutenberg and Johann Fust. That technology has tremendously evolved and progressed over the centuries. In the same way, the material media have improved with all sorts of paper. We could insist on the evolution of the technology. The invention of color printing was the next great improvement. William Blake was coloring his prints by hand. Today, we can print any color or composition of colors by just pressing a button.

Another invention was going to change the whole world in about 50 years. It is the invention of the recording of sound, hence of voice, hence of spoken language, later on, associated to the direct broadcasting of such recordings, or lives performances, with the radio. This invention associated to the recording of moving images, known today as the cinema that was to become television later, has completely put our human world upside down and today we only regret not to have recordings of any event or speech from before this transformation. The voices of so many historical or cultural figures are lost forever.

But Marshall McLuhan explained how the invention of writing, printing, and recording has changed the way humanity looks at itself. The impact of each medium was enormous. What was before only kept in memory, with the development of people able to memorized millions of words during a lifetime in the most Asperger way possible, the famous Rsi in the Indo-European tradition, or the griots of Africa going back to the emergence of humanity itself, or the same tribal memory chain among American Indians or First Nations going way back before the invasion of the Americas by Europeans. Today, human mental life has been liberated from that humdrum task of learning by heart and memorizing for a lifetime. With the Internet, we can always "google" the human memory of big data and find what we are looking for. These tools are even able to correct your mistakes and to bring you to what you are looking for in nanoseconds. The human mind can then concentrate on the method to get there, the trail that leads to what you want, and what is more, it may open hundreds of doors you did not suspect before. For one example, the role of Johann Fust in the invention of the printing press and the first legal assertion that the one who invested money in an invention owns that invention and its products has only become possible when on the Internet anyone in the world in seconds can google Johann Fust and find out how he dispossessed Johannes Gutenberg of his invention and even of his famous Bible due to a decision of a Mainz, Germany court that gave Johann Fust full possession of all that the money he invested in this invention and venture enabled Johannes Gutenberg to invent, develop, and produce, including the paper on which the Gutenberg Bible was printed and the Gutenberg Bible itself. In modern terms, this court asserted the patented ownership of Johann Fust on the invention and the sole copyright over the printed matter on the paper his money bought for this venture. The concept of Intellectual property (and moral right) was not yet invented (It will be invented by the House of Lords in 1774, Donaldson vs Beckett) but it was contained in this court ruling in Mainz, Germany in 1455 (Coulardeau, 2017a).

McLuhan goes farther when he analyzes the effect of such inventions on the way man thinks: "Only the phonetic alphabet makes such a sharp division in experience, giving to its user an eye for an ear, and freeing him from the tribal trance of resonating word magic and the web of kinship" (McLuhan, 1964, p. 84).

Imagine then the magic of the microphone amplifying the public speeches of Adolf Hitler then amplified by radio broadcasting, or the famous more intimate radio Fireside Chats of Franklin D. Roosevelt. The radio brought the trance back, but also developed the mental communication and reasoning from one man to another in private listening, from one man to a limited group in the family or even bar listening. We could discuss his idea that writing and literacy made the world shift from "the barbarian or tribal man … hampered by cultural pluralism, uniqueness, and discontinuity" to "Western ... primary features of homogeneity, uniformity, and continuity" (McLuhan, 1964, p. 87). His conclusion is then more frightening than enlightening. "The new literacy had created a homogeneous and malleable milieu in which the mobility of armed groups and of ambitious individuals, equally, was as novel as it was practical" (idem, p. 88). In that line, we are not surprised to learn that for Marshall McLuhan the radio was nothing but the new "tribal drum." Speaking of Hitler's radio speech in Munich, March 14, 1936, he can write: "His victims and his critics have been equally somnambulistic. They danced entranced to the tribal drum of radio that extended their central nervous system to create depth involvement for everybody" (McLuhan, 1964, p. 298).

And television is the next step in this regressive path to something that existed before the invention of writing and printing.

> ... the all-involving sensory mandate of the TV image.... Print asks for the isolated and stripped-down visual faculty,

> not for the unified sensorium.... TV is a medium that rejects the sharp personality and favors the presentation of processes rather than of products. (McLuhan, 1964, pp. 308-309)

McLuhan could not know really, nor even envisage, the mass impact of computers when merged with television, radio, cinema, and the endless and ever-changing multifarious cloth of the Internet. The fact you can navigate at will and instantly breaks up all impact of any message. It appeals to all our senses like television and then we listen on; otherwise, we skip the message. It appeals to our ears when it is music; otherwise, we jump to the pasture on the other side of the road or fence. We are all-powerful in that constant zipping (both energy and nothing at all) and zapping (dramatic and fast change of the guillotine type). We have no masters, and we can even destroy or change what we do not like and produce our own stuff with our own materials or the materials we can copy and steal everywhere and transform at will in the most "unfair use" imaginable.

That is where we come across Jacques Lacan's (2006) psychiatric conception of the subject in his/her psychogenesis and social functioning.

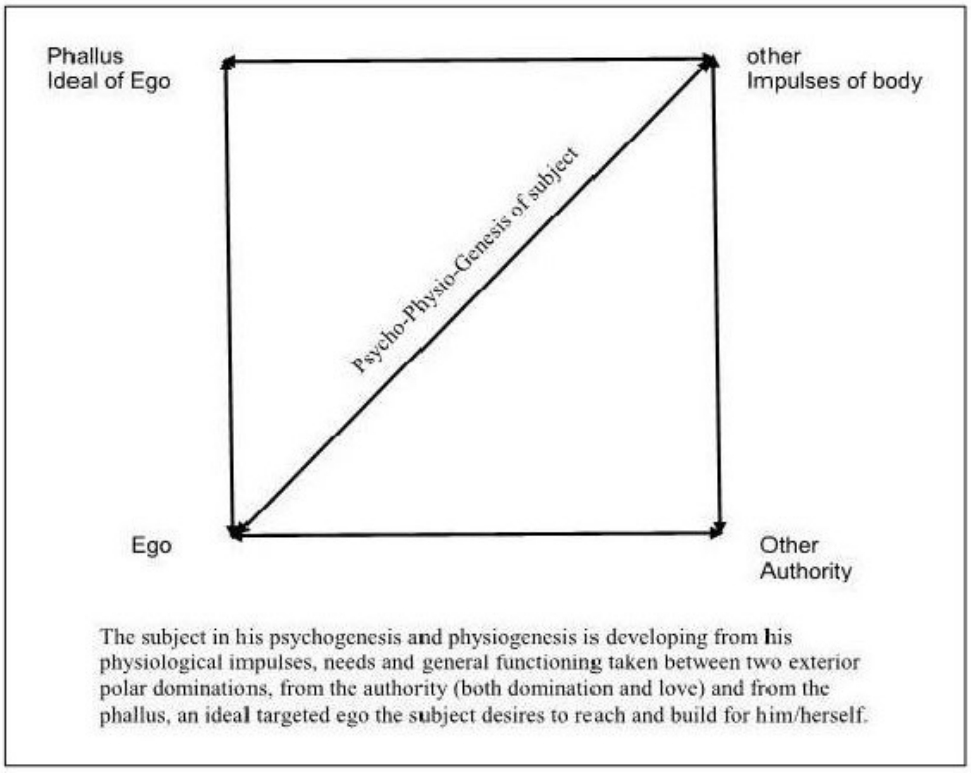

Figure 13. Jacques Lacan's Square of the genesis of the subject.

But McLuhan would only tell us that is the surface of things because it is in no way the analog reproduction of anything but it is all governed, commanded, and mastered by another language we cannot see, we cannot understand, videlicet machine code. That machine code is the way used by the system to manipulate us into believing we are the masters of the message whereas the message is the most powerful mediatic massage we can imagine. And who is the system? An elite that programs these machines and we are only using them, doing what they tell us to do, getting what they decide we should get and censoring the rest. Behind this programmed, machine code is the most secretive elite, even and particularly when they play it cool and transparent in the media, like Mark Zuckerberg who is trying to cover up what he has done and permitted other

people to do with our own data. We can think it definitely changed the result of the Brexit election and of the US presidential election. It has definitely disqualified the system of total freedom of speech because with the Internet that freedom of speech can be manipulated in so many ways that it becomes the freedom to manipulate the masses. And there is no Marxist answer or call to that: Unification is the objective of this elite, unification in each social unity like nations or at the most comprehensive global level, unification in manipulation by a language we cannot even see or decipher if we are not part of these extremely narrow and limited elite that speaks and writes code.

The machine code of the programming of the Internet uses the characteristics of all other media and makes us believe we can do what we want freely while this manipulation is aggregating us into big piles of homogenized people without any mental distance.

For decades, in fact, for more than one century, we have lived on the idea that when the other side is applauding what we do there must be a mistake on our side. And now since the beginning of this century (in France that was in 2005 and the referendum on the *European Constitution*) the extreme right and the extreme left go hand in hand in the streets and in the ballot boxes. Some call that populism. Some call it street democracy. But that is the direct result of the manipulation we are the victims of by machine code and the Internet.

What is machine code the extension of? It is the extension of human language but in a tremendously restrictive way, extension by reduction: two digits and their combinations in the worst possible piling up of ones and zeros. Originally, one word or byte was composed of eight digits or bits, but today a word or byte has no limits.

It is the extension of the classifying and structuring mind in the fact that this two-digit machine code works within a program that is based on a "language" which has nothing to do with our natural languages. It is a program of actions and constructed logics among these actions that have only one objective: to make the machine do something in order to enable the user to do something in his/her turn, or in fact to make him/her do what the elite that devised the program in this machine code want him/her to do. And it works.

The smartphone of today is developing in the users an obsessive-compulsive-syndrome that takes control of their minds completely and at times irrevocably. Video game addiction and even a video game vision syndrome have been identified but we have exactly the same thing with smartphones. Medical researchers say video game addiction only concerns 2-3% of users but even so, that is a phenomenal proportion when we know 5.31% of the US population will develop cancer in 2018 and 1.86% of the same population will die of cancer in 2018. You have to be a genius who can discover the way to enter and break this logic of and in machine code, or one member of the elite that devised this logic of and in machine code, to be able to keep a distance, keep some free mental thought, free linguistic expression, and free human communication.

It is now time to go on to the next stage of these machines: robots.

Machine Conversational Code

Voice recognition and voice synthesis for speaking computers have been on the desktop of many developers for more than 50 years. One of the most important "inventions" along that line came in Lannion at the France Telecoms laboratory when they devised, in the 1960s-1970s, the "diphone" to solve the problem of voice synthesis by putting together not individual phonemes but half a phoneme plus half a phoneme including the articulation point between the two. From robotic language, voice synthesis moved to some fluent language.

The best example is Simone, the name of the synthetic voice robot of Société Nationale des Chemins de fer Français (SNCF), named after the actress (Simone Herault) who lent her voice to it. You type a message and the robot can air it with Simone's voice. This invention in the 1970s was essential and instead of following the logic of the alphabet of standard phonology, it considered that the main elements in the spoken chain were the juncture points between the phonemes, and these points are typical of any particular voice since they are based on particular articulatory movements that depend on the phonatory apparatus of each individual. Unluckily diphone phonology has not been built yet, and that is a shame because it would improve tremendously our understanding of oral language and speech.

The concept of "chat" (Brown, 2018) was introduced in the form of instant messenger, but this is based on written communication. It then developed into oral chatrooms where this time one user speaks to another or several. It is the principle of the telephone, nothing new. But we have been haunted since the 1940s by the famous Turing test: a machine that can fool a human user into believing it is human. The machine becomes the interlocutor of the user and the user can tell or ask anything and he/she expects the chat-bot to answer. So far, a good voice synthesis program is necessary and the chat-bot is supposed to navigate first its memory (programmed at first) and the Internet to find an answer or a response to what has been said or asked.

And things are not that simple. For example, "*Faire comprendre à Alexa les mots 'weekend' et 'Radiohead' prononcés par un Français a été l'une des choses les plus compliquées pour l'équipe d'Amazon chargée de former l'assistant virtuel*"[1]. Google Translate produces the following translation: "Making Alexa understand the words 'Weekend' and 'Radiohead' uttered by a Frenchman was one of the most complicated things for the Amazon team to train the virtual assistant." One mistake: The end should have been "the Amazon team in charge of training the virtual assistant." But it shows that it is not that simple to program a voice recognition machine and it would be funny to see if Alexa is able to pronounce this time these English words the French way. A second element that is surprising, because too technical, the use of the verb "utter." The author would have preferred "as pronounced by a Frenchman." Note this "Frenchman" is not politically correct. It should have been "a French person." French is not gender-friendly but English is supposed to be. These remarks give you the stakes of such machines. More on translating machines later.

Many of these chat-bots are used in limited fields with special customers in special situations, for example, the medical field with Wefight, "Never alone, our conversational interface Vik automates outpatient follow-up of cancer patients."[2] The work of this Vik Chat-bot is demonstrated and explained by two of their authors and developers, Benoit Brouard and Pierre Nectoux, in a YouTube video[3]. Most of this work is programmed and the objectives are clear: to follow up the patient with her (in this case, it is only breast cancer patients) treatment, make sure she takes the pills and other medications, she gets to her medical appointments on time, and it will eventually be programmed to determine in the symptoms the patient can give the machine when solicited by it if the situation is "normal" or if it requires the intervention of a nurse or a doctor. Then, it can raise an alert for the proper service to get in touch with the necessary nurse or doctor.

Translating machines are other inventions that give you a translation of "anything" in any language into any other language, orally or/and in writing, or so they pretend. It is obvious we are beyond a programmed store of translations, even being only one word for one word. Google Translate is a Boolean machine working

[1] Retrieved June 15, 2018, from http://www.businessinsider.fr/difficultes-faire-apprendre-francais-alexa-amazon-echo
[2] Retrieved June 15, 2018, from https://www.wefight.co/
[3] https://www.youtube.com/watch?v=qDUXvCcOEZs

with big data: trillions of words, sentences, texts, in hundreds of languages with direct correspondence between one document and its various existing translations, but also looking for some words or phrases in their contexts, similar contexts in several languages with similar sememes. By dealing with trillions of instances Google is able to select or produce a translation of about anything, they say.

First, let us consider a classical cultural example. Google translates this line by Racine (Andromaque, V 5): "*Pour qui sont ces serpents qui sifflent sur nos têtes?*" as meaning: "Who are these snakes that whistle on our heads?" The first word is obviously a major mistake since it is not the identity of the snakes that is concerned but the identity of the targets of the snakes and in the context the targets of the people manipulating these virtual and metaphorical snakes. It should have been "Who are these snakes that whistle on our heads for," Obviously too, "whistle" is definitely not the proper verb that should have been "hiss" and of course the alliteration in /s/ which represents this very "hissing" is lost.

But let us shift to a more journalistic political translation. In Le Figaro[4], the author picked the following sentence: "*Les députés ont adopté ce mercredi le projet de loi sur la réforme ferroviaire par 452 voix pour*." The author used three Internet translating machines.

First, Google Translate gave me: "MEPs adopted on Wednesday the bill on railway reform by 452 votes in favor." We can note the enormous mistake of MEPs (Members of the European Parliament). Google avoided the common mistranslation as "deputies" but did not understand that we were dealing with the French Parliament, in fact, the French House of Representatives. It should, of course, have been MPs for a British or European audience and since we are translating for an English speaking audience it should have been "French MPs." But for an American audience, it should have been "French Representatives." Note the absence of the article in front of "railway reform."

Second, Reverso gave me: "Members of parliament adopted on Wednesday the bill on the railroad reform by 452 voices for." They avoided the "deputies" mistake but this time they missed the normal press usage that would have been MPs, but they also missed the reference to France and they should have had French MPs or Members of the French Parliament. Note MPs is used for the members of the House of Commons of the English Parliament. The House of Lords is composed of Lords of course. So, it is correct in the English or British context of the translation to use MPs for the members of the lower house of the French Parliament.

Third and last the author used the translating site of SDL (software and documentation localization), a British business. They proposed: "The members have adopted on Wednesday the draft law on the railway reform by 452 votes in favor." This time they avoided "deputies" too but they completely erased the reference to parliament and that is, of course, a serious problem for people out of the context to understand what we are speaking of.

The three translating machines use the verb "adopt" as a direct translation of the normal French word in this context, "adopter." But the normal word in the parliamentary context we are dealing with is "to pass" and the normal word for a bill that has not been passed yet is precisely a "bill" and not a "draft law" which in fact does not mean much in the context. Either "a draft law" is a law concerning conscription (draft), or it is a preparatory document that is going to be discussed in various parliamentary or social commissions in order to prepare a bill precisely that will then be submitted to parliament for passing or rejecting.

[4] Retrieved from June 15, 2018 from http://www.lefigaro.fr/flash-eco/2018/06/13/97002-20180613FILWWW00288-l-assemblee-nationale-vote-la-reforme-ferroviaire.php

We can also note they all retain “on Wednesday” in the place it occupies after the verb in French. This place in French indicates this is a focalized element, or topicalized if you prefer. The same place in English is awkward because it cuts the verb from its direct object with no syntactic reason whatsoever and this position is not a topicalizing or focalizing position. It would have been a lot better and fluent to start the sentence with a slightly modified translation: “This Wednesday, French MPs ...” The focalizing and topicalizing effect is the result in English of the initial position which is not the normal position, and is hence marked by the comma/pause, and by the use of a deictic indicating the closer Wednesday which can in the context only be the Wednesday when this article is written or the Wednesday just before, the day before if the article is written on Thursday. The past tense of the sentence indicates it is the Wednesday before and not the Wednesday after.

The conclusion on those machines is that we are far from perfection. And we might have surprises if we asked the machine to do some reverse translation from their own translations. Generally, a lot is lost because these machines do not work on memory. They do not remember the original sentence.

The author’s favorite example is the following sentence translated and then back-translated by Google Translate. “*Mon cousin Dominique embrasse sa cousine Dominique*” becomes in English: “My cousin Dominique kisses his cousin Dominique.” Note the sexual difference between the two Dominiques is lost. Google is not gender-friendly or sensitive. Then, the back-translation produces: “Mon cousin Dominique embrasse son cousin Dominique.” And we see the mistake at once. Google is not only gender-unfriendly but it has no memory and thus completely loses the gender difference between the two Dominiques who end up exchanging a gay kiss.

To conclude on the chat-bots that speak to you (or write to you), we have to consider this linguistic production is no longer machine code but it is what the author would call conversational machine code and it is based on Boolean navigation in big data corpora. It looks for an answer in its memory or in the big data corpora it can access.

Artificial Intelligence and Self-Learning Cognitive Programs

This next stage considers the machine when it can ask a question for which no answer exists in all the resources at its disposal, or when it can invent from scratch an answer to a question asked from him. In more abstract terms, the machine is asking a question or providing an answer with means it has not been programmed with, or whose objectives had not been defined as enabling the machine with such an open behavior. In other words, the machine is not human for sure, it is not even imitating human behavior and making us believe it is human. It enters a new field where it can ask its own questions and invent its own answers to various questions. In other words, we could consider it is able to think, which implies it has the power to self-learn from its experience, and along that line, it has the power to conceptualize new notions, procedures, and situations. We are here entering the domain of artificial intelligence as real procedural and conceptualizing intelligence to the highest point of such a competence, the one when it would be able to develop a new scientific theory to explain a so far unexplained phenomenon.

But the author want first to say that the wisecrack of a Google engineer about their new translating machine using a neural network developed by Google Brain replacing simple two-dimensional multiple connections between words with a full multi-dimensional architectural construct of a whole semantic and/or lexical domain in a three-dimensional visual space that only a virtual reality machine can produce virtually in its mechanical vision. Note such a machine can integrate the fourth dimension of time. The engineer, when

asked about this system, answered the following quippy barb: "I do not generally like trying to visualize thousand-dimensional vectors in three-dimensional space," as reported by James Bridle (2018) in *The Guardian*, "Thousand-dimensional" is both meaningless and presumptuous. These vectors are thousand-directional and varying in length. It is perfectly possible to represent them in a three-dimensional space provided we use a Virtual Reality machine that will really make that attempt possible.

For example, the author can borrow from Julien d'Huy (2013) such a representation (see Figure 12). Though provided here on a two-dimensional surface, this representation is three-dimensional. We can rotate it in all possible directions in the virtual three-dimensional space of the computer and we can even use a hologram to have it suspended in front of us in midair. Such a three-dimensional representation is a Neighbor-Net splitgraph (Bryant & Moulton, 2004). We can make it into a video representation and that will include the fourth dimension time, and we will be able to see the past evolutions and even possible future hypothetical evolutions.

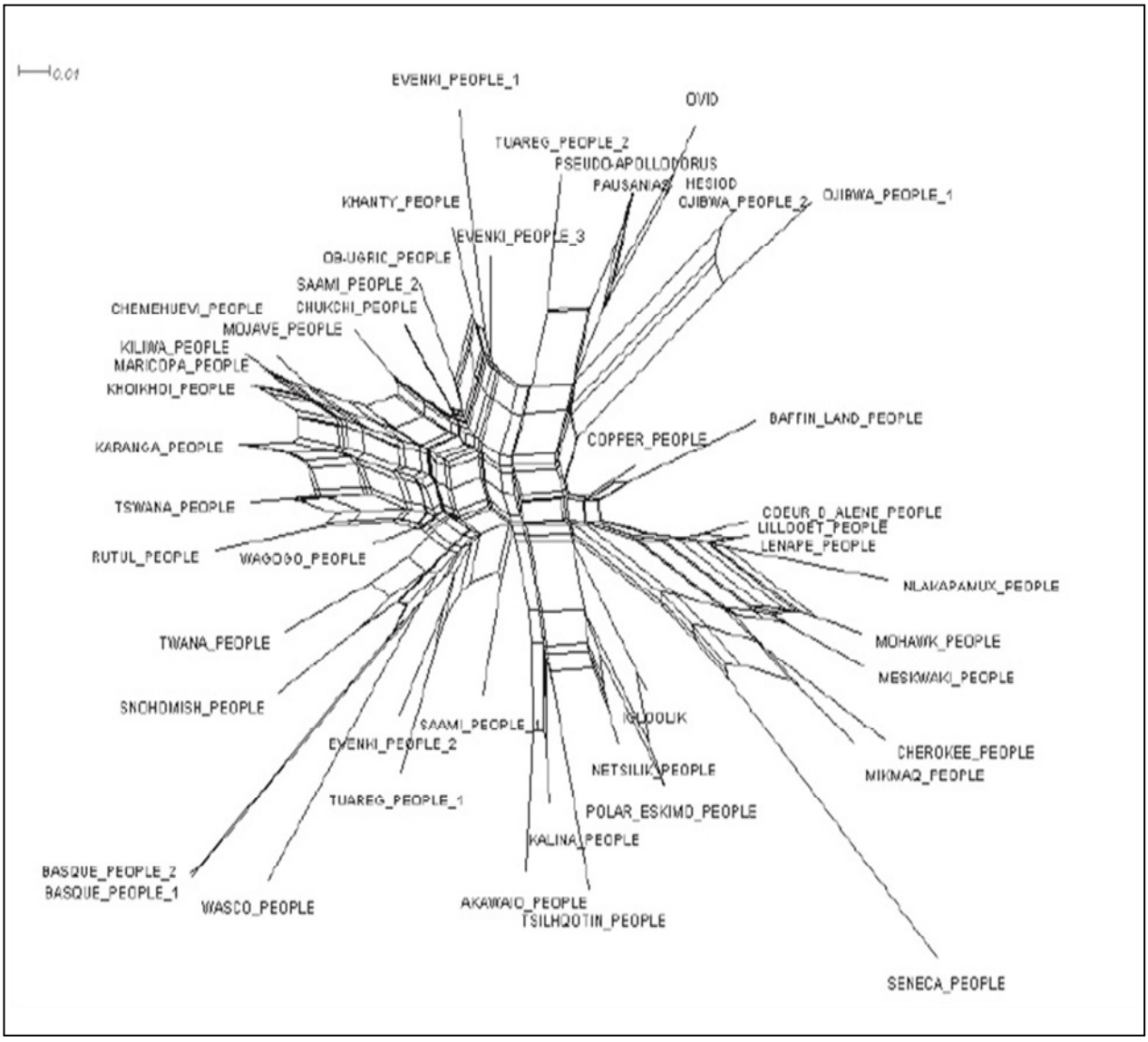

Figure 12. Neighbor-Net Splitgraph without some mythemes.

This type of representation was devised for biology and is extended by some linguists to linguistics. Yet, this representation is for the author far from what it should and—with modern machines—could be in linguistics. Every connection between two terms has to be specified in nature, direction, and mode of operation. It is not enough to say carriage and car are connected. We need the direction in thought and time, and the nature of this connection; this connection cannot be separated from the one between each one of these two terms and the third one cart. And so on, not to mention the full semantic content of each element, a semantic content that implies social elements, dimensions, and complexifications, let alone cultural colorations and what Gustave Guillaume calls "*signifiés de puissance*" and "*signifiés d'effet*," in English "potential signifieds" and "effective signifieds" all attached or carried by the same signifier(s), not to speak of the history of every single formative element in the words, which means etymology. All these elements intervene in a translation. It is not because in English we can speak of "a royal carriage" and "a train carriage," using the same word in the two contexts that in French we could speak of "*un carosse ferroviaire*" or "*un carosse de train*." That means the neighbor-net split graphs of "carriage" in English and "carosse" in French are not equivalent. Translation has to take such elements into consideration.

Yet, the results of this neural-network translating machine is either not available on Google Translate for simple open-access users or it is not that advanced after all if we consider the mistakes Google Translate can make on simple translations as seen above. Maybe it only works so far in English, though it is used for translating. The author would think French is a common enough language that would be developed by Google in his translating machine in priority. The author has to say it seems still far from being able to take into account all the elements that only so far a human translator can consider. But there are other stakes dealing with artificial intelligence and the author would like to consider them now.

The very first question is to know what language these advanced artificial intelligence machines will use when they are dressed up in a human-looking android body. The outside illusion will be perfect. The general behavior of these "Blade Runners" will be perfect. Science fiction tells us they will have some super physical strength and that they will not feel any pain. And of course they will speak, and we can assume they will speak the conversational machine code of the chat-bots. But being more advanced they will probably go beyond.

The first essential quality they will have is that of self-learning. Elon Musk is trying hard to develop this competence in his Tesla cars. To self-learn implies that in circumstances that are not covered by the basic programming and training of the machine, the robot is able to analyze and cope with this new situation. For a car, it has to do with for instance overtaking a badly parked car, which would force the self-learning car to cross the solid, single, or double, line in the middle of the road. The car then must be able to cross this solid line against the rule it has been programmed with, and to do so without any damage the car must be able to assess the on-coming traffic to know if it has the necessary time to do this maneuver. The car must also realize that if it does not break this rule about solid lines, the car(s) that is/are behind would try to overtake anyway and since the automatic car would be blocking the way it would become a lot more dangerous for the car or cars behind who would try to overtake. Assessing the on-coming traffic is not that difficult for a computer, but realizing the danger it creates for cars behind, if it does not overtake by breaking this rule, is of a completely different nature: it has to do with calculating risks but also considering its ethical responsibility in the situation. Has the car been programmed to consider its ethical responsibility in various situations? This might be possible but then where is the ethical dimension if it is only a question of programming? Ethics are a typical human mental dimension that does not come with birth but that is slowly learned from experience in a social environment, and apart from

some basic elements that can be found in a textbook, most ethical rules are personal and reflect the acquisition process each individual went through. Can a self-learning robot self-learn the ethical dimensions of human life?

A self-learning car does not speak a lot and its language will be conversational machine code like that of chat-bots like a talking GPS (Global Position System) on simple cars. We can always have a full philosophical conversation with a car but it will be more relevant to have such a conversation with a human-looking robot. Note Dan Brown (2017), in his latest novel *Origin*, imagined a virtual robot contained inside a supercomputer server that is able to even predict—and manipulate people along the way—what people should and would do, and he has all the means to implement even his most complicated predictions which are more his decisions than anything else. And this virtual robot has been programmed to destroy itself when some objectives are all fulfilled, and he does, and there is no way to stop him. But that is literature, though the author is realistic about one thing: the robot can only have a philosophical argument or a literary discussion with the hero because he has access to the absolute unlimited Internet, and he can hack what would seem to be blocked for him. Of course, all that is literature and the author is the one who says it works like that. We have not reached that point yet.

But what is possible beyond this simple and yet capital ability to self-learn, including ethical considerations?

To conceptualize beyond brain machine code, the machine has to come to such new brain machine code elements from its "existential" experience on the basis of its program, and then experiment on, speculate about and finally conceptualize these new elements. It seems strange to envisage the idea of experimentation from a machine since we expect a machine to do things without any possible experimental mistakes, like experimenting overtaking the way we have seen without all the necessary guarantees it will be successful (only 75%) and without taking into account the fact a police officer may intervene and give the car a ticket for crossing a solid line: I can imagine the driverless car arguing its point of view with the police officer and the police officer putting the car under arrest and putting handcuffs on the car while reciting the Miranda warning and giving the driverless car its Miranda rights.

Then, how can a machine speculate alone? Are we going to invent a machine that could have a split personality and hence harbor two or three more identities so that it can speculate with itself? Note many of us humans are doing that when we elaborate our thinking, we speak with ourselves, with some kind of a doppelganger, a special friend, though this is seen both normal and slightly disturbing for young children, and frankly disturbing for older teenagers and for adults, though yet it is seen as normal for older adults (beyond retiring age). If we do not want this machine to have a split personality (which personality would we be working with when we are using the machine?) we have to accept the idea that machines are going to speculate among themselves, speculate with one another. Can we accept a community of machines next to our community? The machines are supposed to serve us in our community to enable us to do things we could not do otherwise, hence to valorize our own actions and work. But how would we react if we knew that machines are experimenting, speculating, and conceptualizing among themselves without our knowledge of what it is all about? If these machines get to a new concept about an entity that has not been identified by humans yet or about a process or procedure that has not been identified or devised by humans yet, how can we enforce the idea that the machines are supposed to share their new concepts with us and that we are the only people who can validate the concept or the conclusion derived from this concept?

Here again, we meet with Dan Brown (2013) who in *Inferno* invented an insane biologist who devised a new plague to reduce the population of our overpopulated earth by half. The biologist committed suicide and

thus the infection is post-mortem and is controlled by some mechanical device managed by some digital mind. It is easy to imagine this time a machine coming to the conclusion the human population of the earth has to be reduced by 50% and to devise a method that would do it without any war, physical violence, or other flesh-maiming and blood-pouring method. A bacteriological plaque can be a very innocuous, invisible, and painless way to achieve the goal and it can be directed against one particular type of people determined by some genetic physical traits (note the machine will never be able not to be racist on top of being a genocidal individual): All people possessing a certain limited number of alleles on this or that gene will die of a massive artificially caused heart attack in a very short time. Beyond the ethical problem of a machine doing that though the very first rule of such machines is that it cannot cause any vital damage to any human, if it is the decision and action of the machine in no way determined by its program apart from having been programmed to examine problems and to look for and implement solutions, we can see one fundamental programmed rule will be that the machine has to be validated in its conclusions and subsequent actions by some human authority.

Apart from the fact that it would be difficult for machines to go as far as by-passing the rule about human final authority and decisional power, we can always imagine that machines with that conceptualizing power could become dangerous for various reasons: paranoia like in *2001: A Space Odyssey* (Kubrick, 1968), or simply over-logical reasoning like in the series *Terminator* (Cameron, 1984)[5], or manipulation from an architect like in the series *Matrix* (The Wachowski Brothers, 1999; 2003), that architect either being some human in a totally isolated position and able to command the whole mechanical world that would exterminate human beings to replace them with Mr. Smith, an army of Androids all having the same simple name of Mr. Smith, or being the program itself controlling all the machines, hence the matrix itself, showing here again the "brain" of the mechanical world taking over the whole universe. In the present time of ours, the solution of the crazy human being seems to have been pushed aside tremendously and it survives as a marginal and non-significant hypothesis in the last series of films quoted above. In numerous other films or film series, like *Alien* and *Aliens* (Scott & Cameron, 1979; 1986), androids are generally faithful and can accept their death as a natural consequence if necessary for the survival of the humans they are supposed to serve. Yet *Dune* (Lynch, 1984), the series of films (old ones or projects) and the series of novels (Herbert, 1965) are based on a fundamental idea that all intelligent machines have been banned by the Butlerian Jihad.

Anyway, at this point, we come to the idea that we have to go beyond artificial intelligence machine code and reach the real eventuality of artificial intelligence language, implying the full power of that linguistic code. The last problem here is that it has to start from one particular natural language because it seems very difficult to start from a basket of languages that would have to be wider than just Indo-European. Then if these solutions were chosen the various languages from different phylogenetic families, with different characteristics and procedural and yet evolving systems, we can hardly see how these differences could be all integrated into one machine. We should then think these machines would have to start from only one language: a dominant global language like English or Chinese, the language for all. The other hypothesis would be that the machines could devise a unique synthetic and symbiotic language from all human languages still alive, or a vast selection of

[5] Cameron, J. (1984 and subsequent years). *The Terminator*, Orion Pictures (Warner Bros & United Artists), Los Angeles, and many other subsequent sequels unified by the characters and one main actor, Arnold Schwarzenegger: *The Terminator* (1984), *Terminator 2: Judgment Day* (1991), *Terminator 3: Rise of the Machines* (2003), *Terminator Salvation* (2009), *Terminator Genesis* (2015), *Terminator* (forthcoming, 2019), Television series: *Terminator: The Sarah Connor Chronicles* (2008-2009), Web series: *Terminator Salvation: The Machinima Series* (2009).

them. All experiments we know of universal languages, like Esperanto, have failed in both their universal target and in their ambition to bring together the characteristics of all languages. Esperanto is an Indo-European language vastly based on Western Indo-European languages. The only language that is universal, and evolving every day by constant expansion, is the language of mathematics. But this is not a very widely used language in the human population because it is not conversational at all, nor literary, poetic, artistic, imaginary and whatever other characteristics human language develops in its oral and written uses.

Conclusions

What the author has just said goes against two directions that are popular among some intellectuals. Note the two references the author is going to consider are in fact very similar in the conclusion: humanity will be taken over by machines because machines will become more intelligent than men and women due to the famous singularity. The first author is the American Ray Kurzweil and his book *The Singularity is Near* (Kurzweil, 2005). The second author is the Israeli Yuval Noah Harari and his two books *Sapiens: A Brief History of Humankind* and *Homo Deus: A Brief History of Tomorrow* (Harari, 2011; 2015).

Ray Kurzweil refers to the mathematical concept of "singularity" that means: "In general, a singularity is a point at which an equation, surface, etc., blow up or become degenerate. Singularities are often also called singular points" (Wolfram Math World, 1999). Ray Kurzweil means that by 2050 or so, machines will be more intelligent than men, meaning they will be able to process any information faster than man's brain, and speed seems to be the most important element along with the complexity of the operations themselves that would be too complicated for the human brain. Kurzweil does not envisage any mental development of man using the machines he himself invented. His vision of humanity is static and speechless. He does not at all envisage any linguistic communication with the machines. He insists on nanobots which will inhabit our bodies in millions and will regulate, regenerate, and hence make quasi-eternal every organ or function in our bodies. At this point, he states these nanobots are intelligent with precise missions but he does not envisage their source of power, hence their lifespan (and what happens when they are "dead"), and he does not consider at all that these intelligent nanobots would be able to communicate among themselves within one body or several bodies (hence individuals) and would be in constant communication with some managing board somewhere in the universe controlled ... and that is the real problem: by whom or by what? Humanity would then be reduced to human-machine mongrels under the control of a mastermind and managing dispatch board. It is obvious we are dealing here with a dystopia that does not seem to consider the fact that humanity can, could, and should impose regulations, limitations, and ethical norms in the conception, construction, and use of such machines.

Yuval Noah Harari goes a lot farther in the past and starts his history of Homo Sapiens with the first revolution he calls the cognitive revolution something like 70,000 years ago. This date corresponds to the third migration out of Black Africa and third articulation languages. But Yuval Noah Harari does not at all consider language as used by this Homo Sapiens. So at that date, Homo Sapiens suddenly became cognitive. All the migrations out of Black Africa had taken place or were in their final stage and cognition appeared in man when this was finished. That enables Harari to totally erase the Black African origin of Homo Sapiens out of his phylogenetic history. What is more, he does not explain why Homo Sapiens suddenly became cognitive and he does not state cognition has to do with the mind and language. His Homo Sapiens is totally mute even if Harari speaks of man's fully developed linguistic ability then. His cognition then is the work of some spirit of God or some brutal genetic mutation that occurred among Homo Sapiens in the whole world, like a flu-virus that

spreads in the whole world in a few months. But how can that happen in 70,000 BCE: No mass concentration, no real fast travelling, and that leads then the entire vision to being contained in western Europe, rejecting out of this region the people in Northern Africa (not the Levant and Palestine in the Middle East at the time) who all spoke Semitic languages that will eventually produce Arabic and Hebrew, the latter being Harari's own first language. All that make his cognitive revolution absolutely improbable and scientifically absurd. It is not because we have not found any rock paintings older than this pivotal date that Homo Sapiens was not cognitive before. First, he was cognitive enough to develop language from older practices that were not articulated languages. Second, he was cognitive enough to develop the use of ochre (and the processing of it to get several different colors) with several values from body decoration to burial rituals; to develop pierced shells strung on some "rope" though we do not know the value of these strings of shells; to invent new stone processing techniques, new developments of tool and weapon production; to invent new methods to hunt and fish; to gather natural edible items and to process them, etc. If we listen to Yuval Noah Harari Homo Sapiens, before this crucial date of his, was mute (and language will never be taken into account properly in the two books) and hardly more developed than chimpanzees or gorillas, maybe orangutans.

Then, there is little to say about the second book and the future. Homo Sapiens becomes Homo Deus, that is to say, God himself and as such Homo Sapiens disappears as a biological species to be replaced by this new species half human and biological and half mechanical, a vision very similar to Ray Kurzweil's with exactly the same shortcomings. Then, Yuval Noah Harari's vision is a dystopia based on some very debatable approach to ancient history. After all, since the divine spirit of some god—or it might become some godlike gene and mutation though it is not identified by Yuval Noah Harari—caused the sudden cognitive revolution of Homo Sapiens from a simple mammal animal to the brilliant human inventor we know, it is easy and in phase to think this god has inspired man with the divine inventiveness that will bring the end of humanity and its evolution into some divine being.

We are in other words rewriting *The Old Testament*, in both cases, in a purely technical way for Ray Kurzweil and in a miraculous apocalypse for Yuval Noah Harari. And even if the two authors said it is nothing but a metaphor, the reference to God would remain on the table and words have a heavy value as soon as they are uttered. We just hope then to find refuge in Buddhism that states man is in no way of any divine nature and is purely human and uses his/her mind to solve all problems he encounters, and robots will be just one more problem and nothing else.

The approach the author has presented enables us to see that man has systematically developed physically and mentally along with the knowledge he/she constructed and the machines or technologies he/she built to satisfy his/her needs and desires. The approach the author has developed here states that nothing would have been able to happen if humanity had not developed their communicational power with language.

At the end of our reflection, we come to the hypothetical question: Will humanity live in peaceful collaboration or symbiosis or even osmosis with artificial intelligence machines and be able to communicate with them with some oral and written language that could be broadcast everywhere? This may imply the linguistic unification of humanity, though the author believes full unification will never be reached, will never be targeted, except as a unification in diversity.

The author will close this presentation with Figure 13 that reconstruct the radical ternary tensor of the beginning in vertical depth with the original situation at the top and the present-future problematic at the bottom and between these two the three stages of Tensor 1 and the invention of human articulated language, the

threshold of human practical utilitarian technological-scientific (religious-philosophical-artistic) development producing machines processing language, then Tensor 2 and the phylogenic invention of language processing machines from purely practical mechanical processing to machine code, then to conversational machine code, and finally to artificial intelligence language.

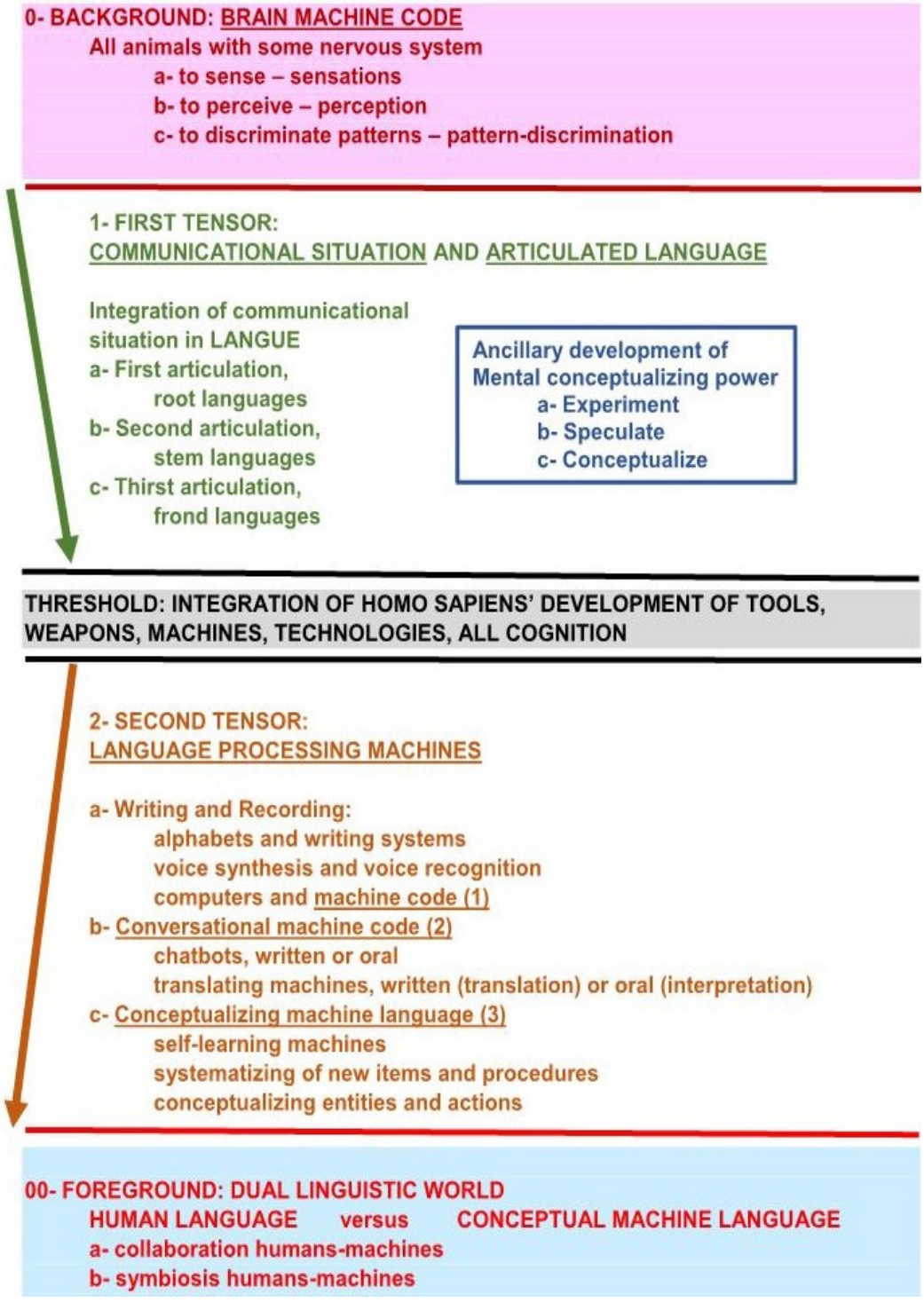

Figure 13. From brain machine code to conceptual machine language.

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