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MAN, MACHINES AND CONSCIENCE?

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Abstract. *This paper presents a summary of the impact that the impetuous development of information science and technology may have, emphasizing the trends and the role of artificial intelligence. It sets out what conscience is, the way in which the information is processed in the system of human thought, which is the relationship between this system and the study of human conscience and the way in which man-to-man, man-to-machine and machine-to-machine intercommunication is made. Then some controversial views on the possibility of the existence of some machines with conscience are presented and it is demonstrated why it is not possible to build such machines in the near future. The conclusion is that, in the near future, machines with a conscience are not consistent with reality and that the best thing would be to state that it will be possible in the future to build machines not with human intelligence, but only machines with algorithmic, binary intelligence.*

Keywords: artificial intelligence, conscience, intercommunication

"Man, know thyself and thou wilt know
the Universe and the Gods"
Inscription from the frontispiece of the Temple of Delphi.

1. Introduction

Information science and technology[2] is one of the rapidly evolving areas with the most spectacular implications on the economic and social life. However, there are some serious reasons to believe that what we have seen so far only its beginning.

Artificial intelligence is an important factor in the evolution of information science and technology. This intelligence makes each element, device, component or

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[2]For the enunciation of the new scientific achievements in the field of automated information processing the Europeans have promoted the term computer science (designed by the French in 1964) and the Americans have oscillated between "Computer Science" for the theoretical aspects and ,,Electronic Data Processing" for the applicative, practical aspects. The term information technology, which has become widely accepted today, is relatively new and marks a maturation of the field which has exceeded the stage of science and craft, entering the industrial phase. As the technology of automated information processing generalized beyond the scope of numerical calculation, the data and the computer are no longer perceived as essential (nowadays, the potential visit to a virtual museum seems to have no connection with the earlier introduction of data with punched tape to calculate wages or prices). In addition, the term information technology shows symmetry with communication technology, offering the possibility of a linguistic integration in the term information and communication technology with the acronym ICT.

system perform these three steps for any given task: to assess its internal conditions and performance; to determine the requirements of any given task and if there is a correlation between the conclusions of the first two stages, to determine what to do: if there is a correspondence it executes it, if not it seeks help.

The interaction between microelectronics and the new "photonic"[1] science and Nanochemistry[2] and biotechnology shows the importance of ISoC (Intelligent Systems on a Chip) technology to human evolution. This technology will create conditions for obtaining intelligent systems built on a single chip (ISoC).

ISoC technology is considered the top innovative process that will allow the integration of the latest technological knowledge, selected from the intelligent computer networks. It will make possible the development of some new circuits and new intelligent systems with extraordinary features relevant to all the economic sectors. Intelligent systems built on a single chip can be applied in areas such as: health monitoring, medical diagnosis, microsurgery, Nano chemistry, environmental monitoring, etc. (Iancu St., 2007).

Recently, the similarity between man and machine has been increasingly debated in the literature, the man being considered a sophisticated machine made of billions of biomoleculars that interact in accordance with the rules derived from science, presumed to be well defined, but which are still incompletely known (Brooks Rodney, 2008). These biomoleculars interactions in our head generate our mind and our intelligence, our feelings and emotions, the consciousness of our existence. Accepting these assumptions would lead to remarkable possibilities. If we work like machines and if we manage to understand and assimilate all these rules that govern our mind, then, in principle, there should be no reason why we should not reproduce, in silicon and steel, machinery to operate under the same rules by which the man himself operates. Supposedly, these machines should be able to demonstrate that they have human intelligence, human emotions and even human consciousness. The problem to be clarified is if we work like machines or not-if it were so-if we can ever identify all the rules by which we operate.

Information and communication technology has begun to be incorporated into the environment and the objects of current use; its use is so man "friendly" that it is no longer seen as an annex, but as a current integral part. In the report "2006 State of the Future" (http://www.acunu.org/millenium/sof2006.html), conducted by over 2000 scientists and futurists, the increasing interest in the man-machine collective intelligence, which is expected to grow significantly in the next 25 years, is signaled.

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[1]**Photonic science**- the science of electronic phenomena based on the propagation of light.

[2]**Nanochemistry** - discipline that deals with the formation of future materials through a better understanding of the unique properties of atom and molecule sets, ranging in size from that of an individual atom to those of some pieces of material.

Understanding the brain, the mind and the human consciousness is considered today the last frontier of science by many scientists. In fact, the sciences of mind and consciousness, besides quantum physics, have reached a common, unique frontier of science (Mihai Draganescu, 2000).

Mind and consciousness cannot be fully explained without quantum physics and the study of the latter will no longer evolve without taking into account the consciousness. What connects the frontiers of quantum physics and consciousness is the phenomenological information[1], the "experience", qualia[2], the active information that generates the quantum world according to David Bohm[3], and generally the phenomenological meanings (Mihai Draganescu, 1999).

2. What is conscience?

The nature of consciousness is not yet understood and therefore, scientifically, there is no conclusive answer to the question what is conscience. There is only a concept that makes connections between individuals and their knowledge on their own existence.

Conscience is extremely difficult to define scientifically because it is entirely subjective. For this reason, its study has long belonged to philosophy and religion. Recently, the biologists, especially the neurobiologists, have entered the debate. Some of them hoped that the image of the brain and the electrical reading of brain signals will reveal "the neural correlation of consciousness" and actually there has been made significant progress in this field. But what exactly in our brain activity

[1]**Phenomenologically** - on phenomenology (1.-descriptive study of a set of phenomena as they manifest in time and space; 2. - description / in Fichte and Hegel /of the spiritual history of conscience that grows from sensorial certainty to "absolute science"; 3.-idealist philosophical current-established by E. Husserl, which reduces the "object" to "phenomenon", seen as spiritual essence and as a final and direct result of consciousness, regardless of the objective existence and the sensorial experience.)

[2]**Qualia** come from Latin and it is the plural form, meaning qualities. The singular form quale means "a certain type" or "a certain way". In the philosophy of mind, the term qualia was used for the first time in 1929 by Clarence I. Lewis (philosopher, 1883 - 1964) in the paper "Mind and the World Order" to describe the recognizable qualitative characteristics of a given fact that should not be confused with the objective properties of the objects in the external world. The term qualia has been established after 1982 with the publication of Frank Jackson's article (Australian philosopher b.1943) "Epiphenomenal Qualia", where it receives the meaning of certain features of the bodily sensations and of certain perceptual experiences which cannot be reduced to what is included in the pure physical information. Qualia can also be defined as introspective phenomenal aspect of mental states that arise as a result of perception, in a certain appropriate manner, of the sensations in an environment. Qualia refer, therefore, to the way in which things appear to us, the way in which they reach the consciousness through the reception of the senses.

[3]**David Joseph Bohm** (20 December 1917-27 October 1992) was a scientist with real contributions in theoretical physics, philosophy and neuropsychology, as well as in the Manhattan Project;

makes us be conscious is still unknown. Certainly, there is no area in the brain that is active only when we are conscious and that is passive when we no longer realize that we are conscious. Even if we accept (and not everyone does) that it comes from the brain, there are still some problems. The situation was called "the hard problem" of consciousness, some people trying to explain it by calling it "the emergent property of the active neuronal networks" - something that is born of the interaction between neurons, but not found in them.

Conscience is the most advanced man specific form of objective psychological reflection of reality by means of sensations, perceptions and thoughts in the form of representations, concepts, judgments, and reasoning, including emotional and volitional processes. Consciousness is a superior process of the human mind, developed through social activity and enculturation[1], by means of communication, based on an internal and internal-external (verbal and written) communication model consisting of reflection codified by knowledge, self-organization with emerging effects and self-adjustment at the level of the mind that link the information received over the time to the experienced feelings, giving rise to often new thoughts and feelings. In terms of cognitive sciences, consciousness is the faculty of understanding all internal and external phenomena that relate to us.

According to some, conscience is not a moral instance that tells you what is right and what is wrong, it is not a human attribute but an attribute of the intelligence in our mind (Dennett C. Daniel, 1991). Conscience is related to *thought* as a specific human feature. The subject of human thought is the entire world surrounding the man and the man himself, his place in this world, all these leading to the purpose of his life, whether he realizes it or not. A second characteristic of consciousness is *judgment*, i.e. the ability to distinguish well from evil. A third feature of consciousness is that it triggers man's *will*. By will, the man produces facts: thoughts, words and works (gestures). Without its will, the man cannot act consciously. These three characteristics of consciousness - thought, judgment and will – but also the emotive states determine entirely man's attitude towards himself, towards his fellowmen, towards society. That is way man's actions show the quality of his consciousness. His consciousness dictates his behavior, his attitude towards himself, towards his fellowmen, towards his society.

We should make a clear distinction between conscience and consciousness[2]. Being conscious is understood to have a distinct meaning than having a conscience, i.e. to "hear" that inner voice, which always shows us what is right and what is true. Free will gives us, unfortunately, the right to override the advice of conscience.

[1]**Enculturation** - process of assimilation of a certain form of culture, by training and education throughout the life.

[2]**Consciousness -** the fact of being aware of the surrounding reality, of people's own possibilities, the obligations that people have in society to achieve the goals set previously.

Consciousness is a process of cognitive reflection over the world and the man himself. We speak, thus, about world consciousness and self-consciousness. While world consciousness is coercive, showing the real dimension of things, the unrelenting, objective necessity, self-consciousness is the key condition of the self-adjusting activism, of selectivity and creative intervention in the environment. The world consciousness is based on models or images of the objective reality, while self-consciousness is based on the model of the self and on personal traits.

Consciousness must be considered in the first place, in unity with the social human activity of transforming the world, of adapting. It forms in time, under the influence of society, of its principles; through family, schools, books, by verbal exchanges between the individual and those around him, through his thoughts formed in contact with the evolution environment. Of all the species of the earth, the man is the only one who becomes just like the others provided that he develops, evolves in the human society. Man does not become man if he is kept in isolation[1] from human society (Dulea Gabriel, 2005).

The issue of consciousness will lead to an important frontier for mankind as well. A science of consciousness begins to develop and the nature of the consciousness could have significant implications for the society. Man and human consciousness, with all the scientific and cultural developments and the religions that preach what is right and not what is wrong, have failed to create a true civilization, the social and human civilization[2]. Man might not be able to create a true civilization because of its genes that prevail over its culture. Thierry de Montbrial noted: “don’t we have reasons to think that it, the consciousness, continues to grow if not progress? This is the message of great religions. This is also the message of science because it makes us revise continuously our image about the universe and our place in the universe ...". (Thierry de Montbrial, 1999).

A long debated question in philosophy is whether consciousness exists as a brain specific phenomenon or it is inherent in all matter (principle known as the principle according to which “everything has a conscience”, which can be found in ancient philosophies).

[1]From the literature it is known the case of the twins, one of which was stolen by the monkeys (known cases). The other one grew in the city and became a mature man: he graduated a college, he got a job, he knew to browse the internet etc. The one grew by the monkeys became an animal: he couldn’t talk, he couldn’t admire a landscape, he couldn’t walk on two feet and used "all fours" instead (actual cases are known).

[2]**M. Draganescu** claimed in August 2000 within the exhibition of “The inevitability of globalization and the Information Society” that “By social civilization we must understand the quality of the relations between people, between groups, nations, states, ethnic groups, institutions, and their relations with the natural and artificial-technical environment, all considered in connection with human, ethical and aesthetic criteria of the manifestation of a certain point of man’s life in its existence”.

H.S. Green[1] relates the functioning of the brain to quantum processes that produce unpredictable effects. (Green H.S., 2000). A very interesting point of Green's thinking is that intelligence cannot be connected to consciousness. This argument was confirmed by the artificial intelligence that showed that there can be intelligence, in a primary, unconsciously form.

Our problem, of all of us, is the simple fact that, our consciousness is always subject to thoughts and judgment. We continuously perfect ourselves by simply understanding that, in the order established by the reason that created us, the consciousness is superior to thoughts and we have an obligation to live rationally and therefore responsibly. And the society, to the formation of which each of us contributes, will become, in its turn, more responsible, giving, thus, finality to its becoming.

3. Information processing in the human thinking system

The tenth decade of the twentieth century was the brain decade; a period in which the knowledge acquired about the brain exceeded the knowledge acquired in seven or eight decades earlier. New discoveries have led to the establishment of connections between human performance, failures and diseases, not only with brain biochemistry but also with genetic factors. One can say without any exaggeration, that 60% of the mental functions are genetically determined. In other words, genes determine the limits of our capacities and the environment determines how completely this potential is achieved.

The idea of a neural network emerged in the '60s of the twentieth century and it was put into practice in the 90s of the same century once the neural scanners appeared. But how can the attention mood are "caught"? The only option available to the researchers was to catch the precise moment of “becoming conscious”, i.e. when we understand a joke or solve a mystery like finding the difference between two almost identical pictures. Studies on these phenomena have led to a model, widely accepted today, namely that of “the conscious working space”. According to this model, our neurons are organized into two distinct areas: on the one hand small brain circuits, a kind of “processors” that generate unconscious mental representations and on the other hand, “a working space” responsible for the conscious representations. This, “working space” can support only one image at a time, and therefore each processor that composes it is in competition with the others to impose its own information. There are several factors that make a representation to prevail over another. This happens, for example, when we are focused on a painting but we react instantly if we hear our name pronounced. The same principle governs the “déjà vu” states. This is the most accepted model, but

[1] **H.S. Green** Professor of Physics at the Univ. of Adelaide, Australia;

it is far from explaining everything, for instance we do not know, the "language" through which neurons communicate with each other, neurologists barely perceive a vague background “noise”.

In 2000, Arvid Carlson, Paul Greengard and Eric R. Kandel received the Nobel Prize for medicine for their crucial discoveries in understanding the normal functioning of the human brain[1]. The study of the functional connection between brain and mind has been done by similarity to computer connection - program, although it is known that a computer is not a brain, but because computer programs are designed by people with brain, it has been considered that a computer for which these programs are written could represent, based on a comparison, a model in the analysis of the connection brain / mind, and the distinction among brain, mind and human reason has been considered to be similar to the distinction between machine (hardware), inferior or soft programs (for example operating systems) and superior or hard programs[2]. The similarity between the two distinctions has been based solely on the fact that human reason and the high level programs are both higher forms of organization.

I, personally, believe that, because the nature of human reason as a superior form of organization of the functional connection between brain and mind is yet

[1] The human brain has about 1500 cmc, being about 5 times more massive than the one of the primates of the same weight, it represents about 2% of body mass, consumes 20% of the total oxygen pumped through the heart arteries and is composed of 1,000 billion nerve cells, each nerve cell forming thousands of contact points, the so-called synapses (the contact area between two neurons), and the communication among nerve cells is made through chemicals called neurotransmitters. When a neurotransmitter substance stimulates a nerve cell, its signal is transmitted through a process called slow synaptic transmission, a process involving an essential chemical reaction, protein phosphorylation which changes the functioning of nerve cells. The resulted changes may last from seconds to hours. The slow synaptic transmission is the one that controls both our movements and processes of the brain, involved in emotions and reactions to substances that cause addiction. Human brain reacts to what we see or hear due to the neurotransmitter substances carrying signals in nerve cells and because memory functions are achieved through changes in the forms and functions of the synapses.

[2] Currently, in the literature (M Voicu, 2006) there are two levels of artificial intelligence:

- *inferior or soft level* - ensures the development of non-biological processes that require a smart management such as the management of some production processes, making analysis, the game of chess, processing, understanding and natural language synthesis. This level, considered inferior, in fact, provides a more accurate and faster memory than the human one, it has a greater storage capacity than the human one and it can acquire and provide instant knowledge;
- *superior or hard level* - can give the possibility to the machine to have smart reactions similar to the human ones if two conditions are met: a computing capacity of at least 10^{16} operations per second and an artificial intelligence software similar to the human one. In 2005, IBM Blue Gene/L PC already achieved 10^{14} operations per second and if estimates are made according to Moore’s law, confirmed by the microelectronics industry, it might reach, in constant prices, 10^{16} operations per second in 2020.

unknown, the comparative study of the brain / mind relationship using similar rules to computer/ computer program may be only the beginning of the study which could be beneficial only to computer science development. As research carried out revealed that there was no apparent connection between the functions of the neural networks that constitute the brain and the functions of a computer system, there should be a thorough concern to identify the real nature of the structure of human reason as a result of a superior form of organization of the functional connection between brain and mind.

Although in the past 10-15 years very important steps have made in the study of information processing, it still cannot be said with respect to human thought that it has been deciphered or that the mechanism of thought generating new knowledge is known. In an article published in 1998 in "The Economic Tribune" (Iancu. St, 1998), I stated that a computing machine that thinks could not be devised because the mechanism of human thinking was not known yet.

If a computer is able to handle a large number of "0" and "1", it is very hard for it to recognize an object or to read a manuscript, tasks that the brain makes easily. The efficacy of human brain, according to an American-Swiss team from the Institute of neuro-science in Zurich, is the result of its hybrid character both binary and analog. There are claims according to which the problem of designing artificial intelligence software to obtain similar reactions to the human ones can be solved. The temporal and spatial resolution of scanning the human brain progresses exponentially, so that observations in real-time of human neural networks[1] are already possible. Mathematical models and validated simulations of several tens of brain regions, including regions of the cerebellum, where is the majority of brain neurons, have been developed. Although the co-operation in interaction of all these models has not been simulated yet, at present, it is considered that the conditions necessary to provide solutions for hard intelligence will be created in approximately two decades.

Compared with the human brain, the computer presents several advantages in the sense that if it has the correct software, it does not forget and does not do any mistakes. The human brain has reached a high degree of perfection due to its continuous evolution and adaptation, but it forgets and does errors. Consequently, the similarity between brain/mind and computer/program is inconsistent. If thinking is a non-algorithmic process operating primarily with images, the computer is a rigorously logic algorithmic machine, even when it has to process erroneous data. If the rules of logic are rules of correct reasoning, thought

[1]In the "Wired" from March 2009 it has been stated that "The center of human memory considered, not long ago, too chaotic to be decoded, might be deciphered soon." Through some research conducted at the University College from London the researchers succeeded, using the cerebral activity of four subjects in a virtual room, to identify the exact place where they were.

processes, emotions and human feelings are not governed only by rules of logic. Studies have shown that there is no global relationship between brain and mind. It has been found that several distinct parts of the brain may generate separate or parallel effects in the mental process. Human mind is capable of identifying a piece of information and a structure known in various forms of presentation. For example, a driver with experience identifies if the engine works properly or not by the noise it makes. A new sound, which he has not heard before, may make him understand that the engine is not working properly (Karl Pribram, 2007).

Let's see what happens today. Deciphering the human genome (information that can be stored on 80,000 compact discs) and elucidating the relationships between genes and their effects may, in the next 10 years, lead to the domination of the society and hopefully of the socio-human consciousness, of the whole human biological foundation. Its change, not only for medical purposes, due to a controlled evolution, a self-controlled evolution actually, that could lead to characteristics that determine favorable features for a superior conscience and socio-human civilization.

4. Man-to-man, man-to-machine and machine-to-machine intercommunication

The main means of man-to-man intercommunication[1] is spoken language. Any human communication has both a desirable and an unpredictable and sometimes even unwanted effect by the speaker. In interpersonal communication, the mood and desire of the receiver to communicate may have a key role in an efficient exchange of ideas and information.

The context of the communicative act, its duration and the level of knowledge and intercommunication between speakers, the level of knowledge in the area to which the subject of the conversation belongs to, etc. play a significant role in the person-to-person communication. In current human language we use a large number of metaphors (e.g. "time flies like an arrow") and the problem of understanding metaphors is related to the problem of living, the central problem in understanding the concept of consciousness as well (GH von Wright, 1995). A familiar neighborhood can make us understand and control complex phenomena, living a phenomenon (a situation) being fundamental to its understanding.

It has not been possible so far to create a computer program that allows man-to-machine or machine-to-machine intercommunication in human spoken language, perfectly identical to human dialogue. The problems encountered in a verbal dialogue with a machine are generated especially by the idiomatic language[2],

[1] **Intercommunication** - the mutual conversation between several discussion partners.
[2] **Idiomatic** - all the characteristics of a language; relevant to an idiom (a generic term for concepts

which, according to some authors are insurmountable in understanding the meanings of sentences.

Currently, one of the contextual problems found in the dialogue with a machine, in human language, is the sequence of the replies. This issue is treated in Austin[1] and J.R. Searle[2]'s theory of speech acts which places each line from a dialogue in a well-specified category: information, demand, offer, etc.

Any man-to-machine communication involves an interface made of all the real physical elements (keyboard, screen, mouse, etc.) or the virtual ones (windows, menus, other ways of display and interaction displayed on the screen) and the software involved in the dialogue between a man and a computer or computer network. The human factor is decisive in designing and operating such interfaces (Trausan-Matu Stefan, 2000).

In man-to-machine dialogue, the key effect is given by the information interaction, the physical interaction between man and machine having only a secondary role, directed towards the facilitation of the information interaction (pressing some keys, moving the mouse, etc.). Both man and machine (the electronic computer from the control system) have different representations of the information (the computer - memory bits; in programming languages - symbolic structures; and the man - symbolic structures and images from the memory). The machine provides information to the human discussion partner in a certain form (alphanumeric, graphic, imaging, auditory, tactile, etc. form) and the latter takes them, makes certain judgments and as a result, it selects a particular processing variant and gives certain orders. All these interactions, subject to some possible disturbances are intermediated by signs and signals, which turn into ways of man-to-machine communication carried out through a communication channel according to a certain code.

People will interact with the computer making it able to respond and give evidence of understanding. Such technology is already experienced in the laboratory. Verbal communication technology increased by natural language

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of language, dialect, subdialect or speech).

[1] **John Langshaw Austin** (28 March 1911-8 February 1960) a philosopher of the language, who contributed to the birth of this field. He held a very important place in the English philosophy of the language alongside Wittgenstein (**Ludwig Josef Johann Wittgenstein**-b. 26 April 1889, Vienna - d. 29 April 1951 - was an Austrian philosopher, author of some fundamental contributions in the development of modern logic and the philosophy of the language) for the way in which they looked at the way words are used (use) and to elucidate the sense (meaning).

[2] **John Rogers Searle** (born 31 July 1932) Professor of Philosophy at the University of California, Berkeley, known for his contributions to the philosophy of language, the philosophy of mind and consciousness, over the characteristics of social reality constructed in opposition to the physical reality and over the practical reason;

understanding makes a computer to understand and participate in the interaction. Let us imagine that in the near future it will be possible to ask a computer to make all the arrangements necessary for a trip to Sinaia for the weekends. The computer should understand from "his knowledge base" that "we" means our entire family that our family has certain preferences regarding the means of transport, and it should automatically make reservations on the date and time requested, that the family has certain accommodation preferences to satisfy by booking early seats, etc. The computer should contact several travel agents and negotiate, select and demand a particular journey in preferential conditions to the agency which ensures the highest performance/cost ratio. Thus, it will take several seconds to launch the request to the computer and half a day needed to negotiate with travel agencies will be spared.

"Intelligence" implies the possibility of connecting autonomous devices in a network that will then work together. Let us imagine that a company which runs the operation of 800 blocks of housing for rent from a distance could understand the behavior of the tenants based on the pheromones[1] of the occupants. Let us imagine a piece of furniture that could respond to the wishes of its user or to systems that could control the operation of a vehicle and could drive it on the highway[2].

The researchers from IBM Israel started in 2008 the "Hermes" program that will create a device to help the elderly have a computer-assisted memory. The elderly will be equipped with microphones and miniature video equipment to record, at their command, what they have said, what they have done, where there have been at a certain time. All this information will be stored and processed to provide, upon request, electronic "memories" to those with memory slips. The computer will free man from its daily tasks, giving it the necessary time for creative activities, for personal, family concerns, etc. What is fiction today will become reality in the next decade of the 21st century. Will we entrust the logic, daily, algorithmically activity to the computer as it happened at the beginning of the first industrial revolution, when muscular strength was replaced by the strong arm of machines?

As of 2000, according to the literature, the research direction with the greatest potential for the development of information technology is represented by

[1]**Pheromones** - chemical, biologically active substance secreted by the individuals belonging to different species that influence the process of development and the behavior of other individuals of that species or of other species.

[2]The future belongs to the intelligent automobiles with reflexes that are faster than the human ones. In 2008 the license of the only road safety system, called Mobileye, was sold in Europe by two teachers from Israel. It integrates the alarm for danger of collision with the one signaling leaving the road and with the dangerous proximity alarm. The traffic security system is already installed on luxury cars like BMW, Volvo, Buick and Cadillac.

computers operating autonomously, i.e. computers able to solve their own operation problems, able to self-repair and become functional again. The term, "autonomous computer" may sound esoteric but it will have practical implications, reducing the total cost of operation (the cost of installation, operation maintenance, current and periodic maintenance of the system) and eliminating hazards generated by viruses.

Currently, the evolutionist artificial intelligence systems, inspired by biology, as well as those on artificial life, are increasingly powerful. If most of the previous approaches of the artificial intelligence sought to imitate intelligent human behavior, the solutions provided by the artificial life sub-domain aim to summarize some artificial life forms to model it as it might be or become, to try to understand the life we are living. The distinction between machine and live nature has not been determined by the nature of the existing machinery. On the contrary, the concepts of mind and machine depend one on the other, being in a continuous dialectics.

The problems with the industrial robots and the current automated production sectors are simpler than those of the human-type robot, but they are much more complex than those of the mechanical duck[1] or those of the means of production without electronic control and adjustment. Only after the man had had the electronic means to build the artificial intelligence did it become a characteristic of the automated means of production. The law of the complementarily between the mechanical motion and the electronic intelligence marked the technological development in the second half of the twentieth century, leading to the evolution of production machinery and machinery in general. The evolution from the simple tool to the tool with artificial intelligence made the world familiar to quantitative growths, but also important qualitative leaps.

Currently, practical information and communication technology applications, even wireless, operate separately, independent of one another. Machine-to-machine communication, although in incipient development phase is in a continuous expansion. At present, there is no infrastructure designed to allow a general intercommunication between telecommunication devices, integrated in machines equipped with artificial intelligence.

In literature (Kallio Johanna, 2009) it has been estimated that in 2010 the number of the communication devices, integrated in machines equipped with artificial

[1] In the winter of 1738-1739, Jacques de Vaucanson (1709-1782, French engineer) built and made a demonstration in Paris with a mechanical duck, considered to be the first robot that was able to peck grains that after a reasonable time, necessary for “digestion”, were eliminated. Besides this mechanical duck, during the same demonstration two other mechanical constructions representing a flutist and a tambourine drummer and whistle singer were presented. In addition to the commercial, philosophical, popular and professional success, the three presented automatic devices impressed Voltaire, who called Vaucanson, “a rival to Prometheus”.

intelligence will be 1,000 times larger than the number of the mobile phones, which currently exceeds one billion. When all the existing communication devices will be interconnected to the Internet, new opportunities for machine-to-machine intercommunication will appear. Usenet project (Ubiquitous M2M Service Network[1]) launched by Eureka/ITEA 2, in 2008 aimed to solve this interoperability problem within three years, providing information collection, transmission and processing services and creating an interactive system with machines equipped with telecommunication devices.

Ubiquitous M2M Service Network will provide opportunities and benefits that are essential for the activities of various companies, in particular if the systems that control their key processes are able to use real-time information, generated by the machine-to-machine (M2M) intercommunication. The main result of the M2M system operation will be that all the interconnected companies will be able to increase their service quality, to reduce cost prices and increase customer satisfaction.

5. Can machines have a conscience?

Currently there are many machines, whose "behavior" suggests that they are endowed with mental processes. For example, the aircrafts equipped with autopilot can fly by themselves on air routes: they respond to external "sensorial" information; they "take decisions" on the flight; they communicate with other aircrafts; they "know" when they "need" fuel; they "feel" a potential danger, etc. The way in which an autopilot functions restores the following question: Are humans the only ones who make decisions, who communicate? Machines do not? And, yet, the problem is not really that simple. For a number of cognitive researchers, strong artificial intelligence is not just a tool for formulating and testing hypotheses concerning the human world, but also – if it is well-planned – a mind that seems to understand and have other cognitive processes as well, in brief, a conscious mind. John Rogers Searle thought that it was impossible for machines (even with strong artificial intelligence) to have a consciousness. He considered that there is only one "machine" made of flesh and blood or neuroproteins that may be conscious, the phenomenon of consciousness being inaccessible to silicon and metal.

In the SF literature, the existence of robots with self-consciousness and decision-making capacity as a result of their own judgments in accordance with the social requirements[2] has been imagined since the first decades of the twentieth century.

[1]M2M - machine/two/to machine.

[2]In 1921 Karel Capek's "Rossum's Universal Robots" was published. It is about the construction by people of better robots that were sent to fight in wars. Robots decide that fighting in a war is madness and they conquer the world to dominate peace.

If we consider the elements of intelligence based on a more or less developed nervous system, of so many creatures inferior to man, all machines with all their automated perfection, including with microelectronic or nanoelectronic structures of control and adjustment, seem primitive to us compared with the simplest creatures and with the latest machines equipped with artificial intelligence. "The simplest living cell is so complex that supercomputer models may never simulate its behavior" (Wayt Gibbs W., 2001).

Some say that mankind will never build a machine with a conscience. It is indeed difficult to imagine how a brain-robot could be the support of a conscience. But at the same time it is difficult to imagine the way in which our organic brain may be the seat of a conscience. And yet we accept it easily even though we do not imagine how it could be possible. The genetic revolution of the ’60s of the last century has made the hopes of building a conscious machine revive. It is argued in the literature (Vinge Vernor, 2008) that mankind became efficient enough to be considered a superhuman being through its computer networks and the created databases. Globalization, increased today by the Internet, is accompanied by the creation of a global network which is assumed to become a network of artificial intelligence and in the future with conscious nodes of artificial intelligence. What kind of conscience will such a network have? Green thinks that there will be a symbiosis of human conscience with this conscience of the Internet by creating an ecological system that will lead to a great intelligence[1] and wisdom (Green H.S., 2000).

The artificial intelligence[2] is a discipline that provides methods, techniques and information tools, based on specific ways of information processing, which mimics different facets of complex problem solving, which could not be satisfactorily resolved only by using numerical methods. Artificial intelligence is the result of combining computer science, physiology and philosophy (logic), cognitive psychology and management science, biology. Research in automatic

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In 1950, Isaac Asimov published the work “I, Robot” in which he set out the three fundamental laws of robotics:

a. - A robot may not injure a human being, or, through inaction, allow a human being to come to harm.

b. - A robot must obey the orders given it by human beings, except where such orders would conflict with the First Law.

c. - A robot must protect its own existence, except where such protection would conflict with the First or Second Law.

[1]**Intelligence** - the capacity of the individual to adapt to new circumstances, to determine the essential relations and to find a way out of a given situation, to solve new problems.

[2]**Artificial intelligence** - the capacity of advanced technical systems to achieve performance that could be identical to those of humans. The term indicates a concept (in the wide sense advocated by Turing’s test), an area (a branch of information technology that deals with intelligent behavior automation) and an instrument (for the development of applications, objects and intelligent technologies).

learning, automatic processing of natural language, sensorial perception, made it possible for scientists to build machines that perceive and understand, leaving the impression that they reason.

Perhaps the best way to assess whether a machine has intelligence is the one shown by Alan Turing[1]. He said that "a computer deserves to be considered intelligent if it makes the man to believe that its actions with such a computer are its actions with another man" - (http://library.thinkquest.org/2705/basics.html). The issue of artificial intelligence has been defined on the one hand, in comparison with the ability to reason, and on the other hand, in relation to behavior skills. Basically, artificial intelligence involves both a better understanding of human thinking and a rational way of action. "Rationalism and the human factor define the four major categories of definitions: systems that think like humans, systems that think rationally, systems that act like humans, systems that act rationally. The rational-human dichotomy does not imply that people are irrational, but that people often make (sometimes explainable) mistakes "(Elena Solunca Moise, 2002).

Artificial intelligence involves the storage and the logic processing of a very large volume of data and symbols with very high speeds. Therefore its support is the static electronic memories of high capacity in small physical volume and the logical drives that have taken the form of microprocessors. The evolution of the artificial intelligence is closely linked to micro and nanotechnology developments in general and the development of computer science in particular, significant results being achieved in recent decades, both in the conceptual and the applied plans, as a result of introducing the electronic circuits in the structure of devices, machines, facilities and development of operating systems in real time (Iancu St., 2003).

Human brain has been considered a supercomputer, which might interact with ordinary computers. It is also thought that, in the future, the print of a man's consciousness could be stored on a computing support, ensuring thus the immortality of the individual. According to the literature (Koch Christof, 2008) in the next 25 years it will be possible for a person to "transfer" its mind, memory, intelligence, its entire personality to a machine and thus this machine could acquire consciousness[2].

[1] **Alan Turing** (1912 - 1954), English mathematician, a pioneer in the development of computer logic, as it is known at present.

[2] According to the literature, clinical studies have shown certain neural activities that offered the possibility of some rudimentary understanding of billions of processes that might constitute the basis of forming a conscience. At the same time it was found that many processes in the brain have nothing in common with the conscience. Extensive destruction of cerebellum (the small brain, part of the encephalon located in the rear and bottom of the head) does not affect a person's conscience,

If a person's mind, memory, intelligence could be reduced to the level of a structure of electrons, it will become possible for this structure to be copied and multiplied, sold, pirated and/or, "deleted" from the memory of the machine. Such a structure could also be unified with another electronic structure with artificial intelligence, improving the operating parameters of the latter. For the moment, such statements are and will be only some SF scenarios because as long as no one knows how the human brain works, it is impossible to know what a conscience is.

Hans Moravec[1] thinks that the intelligence of robots, even before 2050, will exceed by far the intelligence of people (Hans Moravec, 1999). Follower of the principle "Structural science is sufficient to explain the whole nature, including life, mind and conscience", although he has some doubts on this principle, Moravec believes that the mere increase in the computing power and memory of computers will lead to consciousness without any special precautions in order to produce qualia. This is however excluded by the principle "Structural science is insufficient and incomplete to explain the whole existence, including life, mind and conscience", (Draganescu Mihai, 1997 A), principle that also states the need for the recognition of some new physical and information ingredients, of a new physics, of some new scientific principles. However, Moravec's following statement is very interesting: "In that case, mass-produced, fully educated robot scientists working diligently, cheaply, rapidly and increasingly effectively will ensure that most of what science knows in 2050 will have been discovered by our artificial progeny!" (Hans Moravec, 1999). It is possible that such robots, let's call them quantico-phenomenological ingredients, will appear. Will they be socio-human? Or will they take on their own the evolution of the conscience on the Earth and in the Universe? Green believes that the development of quantum computers with conscience and that will reproduce themselves will be the next step in evolution.

All the optimistic forecasts do not state the strict requirements for a machine to have a conscience. We assume that a machine with conscience does not need anything more than what humans have. But which are the essential properties of human conscience, without which it could not exist? The answer to this question may refer to the amount of integrated information that a human being or a machine could generate. The man and the machine perceive and become conscious of an existing state separately. For example, a man and a photoelectric cell[2] can signal if a nearby screen is bright or dark. But while the man by looking at the light or dark screen perceives a lot of information the photodiode does not

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although there are more neurons in the cerebellum than in any other part of the brain.

[1]**Hans Moravec** - Professor at Carnegie Mellon University, USA, who has been working for 45 years in the field of Robotics.

[2]**Photoelectric cell** – diode whose operation depends on the intensity of light flow that falls on it.

see anything, but it only responds to the presence of the luminous flow. The way in which the man and the photoelectric cell react to the existence of light is distinguished by the amount of generated information[1]. When the photoelectric cell receives the luminous signal it enters one of two possible states, while the man when he sees the dark screen enters a large number of possible states. If he sees black it means he does not see blue, red, green, etc. For the man, the black screen does not signify only the absence of light, but also it could mean the lack of some previously seen and appreciated images. Therefore being conscious implies being an entity with a huge repertoire of states and the level of conscience is given by the quantity of integrated information which may be generated. Therefore humans have a much bigger level of consciousness than any machine. The integrated information theory (IIT) established in science and mathematics can determine the amount of information generated by the integrated systems consisting of several integral parts.

IIT suggests a way of assessing the conscience of a machine through a kind of Turing test for consciousness, and in this sense, Koch Christof and Giulio Tononi (Koch Christof, 2008) have proposed a version of the Turing test in which a certain scene is presented to the computer and it has to deduct the "joke", the essence of the scene, which is perfectly possible for the human judgment (Vinge Vernor, 2008).

Other attempts to measure the consciousness or the intelligence of a machine failed. Conversations in natural language or participating in strategic games, considered human attributes have been performed by computers. Deep Blue super-computer that defeated Garry Kasparov at chess in 1997, discussions with the computer in natural language on different areas or participating in strategic games have shown that machines may exceed human performance in narrow areas, but none of these experiences did not reveal the existence of a conscience in a machine.

According to IIT, consciousness implies a large glossary of states for a single integrated system. To be useful, these internal states should be able to provide much information about the world in general. A test used to prove that a machine has a conscience is whether it can or cannot describe a scene seen for the first time and which is different from the huge number of scenes stored in its database. A man, for example, can describe successfully and in a different manner what happens in a scene from a photograph, a painting or a scene from a film, seen for the first time. For a machine equipped with artificial intelligence to understand a picture that it has not seen before or an image that includes elements which do not

[1]**The amount of information** is measured by reducing the uncertainty that appears when you have to choose between several possible occurrences.

exist in its database it is still impossible. It will be possible to write a computer program which will identify the objects from a new image based on the multitude of objects from its database, but this program does not imply the existence of a conscience. As long as it will not have a huge storage capacity and the computer program will not be designed to conclude from a multitude of possible combinations in action the items or all the items of any potential future image in different contexts (the picture of a child in a garden with a toy gun in his hand is completely different than a young man with a gun in his hand at the door of a bank) it will be impossible to speak about the conscience of a machine.

In 1986 researchers tried to design the model of an artificial brain[1] with 6,000 synapses, using an electronic microscope. Two decades later, they were still working at the functional model of this minimal nervous system. Giorgio Buttazo showed that G.S. Paul and E. Cox (1996), Ray Kurzweil (1999), Hans Moravec (1999, 2000) had estimated how complex the human brain was based on the enormous number of synapses (10^{12} neurons, each on average with 10^3 synaptic connections with other neurons, so a total of 10^{15} synapses). Simulating the human brain with artificial neural networks taking into account that each synapse requires 4 bytes of memory in a computer it results that it would be necessary a memory of 4 million Gbytes. Giorgio Buttazo, based on the developments and trends in the evolution of computers, believes that such a memory can be obtained in 2029 (Buttazo Giorgio, 2001). Note, however, that such a memory is only one of the conditions necessary for a simulation of a giant neural model and assuming that we will have determined how consciousness forms with the huge number of parameters whose values are only vaguely suspected, and therefore, I, personally, consider that such a simulation is very unlikely to happen in the foreseeable future.

In the literature (Wada Yasuo, 2001) it is stated that the development of nanotechnologies based on molecular nanoelectronics and quantum devices will enable the replacement of the silicon MOS technology in 2015. The issue of brain knowledge cannot be solved only by improving computer technology while a theory of the mind and consciousness based only on structures and structural fundamental forces of nature is not possible. The phenomenological processes and the phenomenological reality are equally important for obtaining such a theory (Drăgănescu Mihai, 2007).

If the structure and the operating mode of the human brain are understood then we might understand the way in which human consciousness is formed. But this issue

[1] Research carried out revealed that there is a category of rules which coordinate the activity of the classic systems (e.g. the electronic computer) that can be described in Euclidian and/or Newtonian terms or drafted in Cartesian space/time coordinates and another class of rules for the coordination of the classes of systems with fine-grain structure (e.g. the brain), knowing that in the latter may occur radical changes within the creation process through successive transformations.

is unlikely to be solved in the 21st century. If in the literature (Drăgănescu Mihai, 2007) it is stated that the current biological man cannot build a society of the consciousness but only a society of predicting the society of consciousness, how can we hope to build a machine with a conscience? Firstly, it would be necessary for the current biological man and the existing social consciousness to evolve.

Humanity was not able to ensure the management of the natural environment of our planet. While many natural species are destroyed, different biotechnologies multiply transgenic plants and animals. How far will this process go? Will everything that has been designed over millions of years in the natural environment disappear and will we be surrounded only by robots?

Research and the practical implementation of the new scientific discoveries and new technologies should not be fighting against the created natural world, but only against the motions and the energies of the powers of the world which are unnatural and hostile to the natural environment.

6. Conclusions

(1) The consciousness that we have today is the result of the ongoing interaction between tool (i.e. the hand), thought (i.e. the brain/mind), communication (i.e. the society) and the increasing cultural development of the individual over millions of years, so it is clearly different from the self-consciousness of some animals endowed with some form of intelligence. It is clear that the human consciousness is part of the natural world and that it has contributed to reducing human progress in favor of the human cultural evolution.

(2) Nowadays there are machines which have the ability to understand human language in a particular domain, to read texts written in human language, to recognize shapes and to process images, there are machines which communicate among themselves, changing and enriching their databases. However, it is not known if there are programs that make a machine self-conscious. There are programs that allow a machine to identify the space in which it is placed and which route to follow to get to another spatial location. It has not been created the program that could ensure the auto-orientation of a machine so that it could move in a totally unknown space or in a known and easily modified space.

(3) The developments in science and information technology are taken into account in the understanding of the way in which our brain and mind work. Many conclusions on the possible functioning of the brain were drawn by similarity based on what is known on the functioning of the electronic computer. The possibility of higher levels of structural organization of quantum information processing in the brain, levels that are to be identified by future research, should be taken into account as well.

(4) Currently, it is not known whether human consciousness depends only on the scientific laws, still imperfectly known, or if it has been formed as a result of the action of the still unknown energy fields. Only after having understood the entire system of quantum information processing in the brain will it be possible to say if machines can be endowed with a conscience or not. These facts lead us to the conclusion that at present there is no premise to make us believe that the construction of conscious machines, similar to the human one would be possible in the near future.

(5) What distinguishes humans from the other species is the fact that it is the only one who affected the natural environment. Human intelligence has completely deciphered the genome of its species. Cloning is already possible, a scenario of a supposed Bing Bang moment has been created, the solar system is being explored, but man fails to explore and know its own planet, to reveal its genesis and destiny in the universe. In this context, claiming that the creation of a machine with a conscience is a certainty is not consistent with reality. Perhaps the best answer is that it will NOT be possible to build machines with human intelligence in the future, but only machines with an algorithmic, binary intelligence.

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