Academicianul Mihai Drăgănescu la 80 de ani

Talk at CRIFST
October 15th, 2008

WHAT IS SCIENCE TODAY

Acad. Mihai DRĂGĂNESCU,
President of the Romanian Committee for the History and Philosophy of Science, Member of the Presidium of the Romanian Academy

Introduction

The first time I have directly addressed what does *Science* mean nowadays was in a public conference organized by the "Cuvântul" (The Word) journal and its senior editor, Prof. Mircea Martin, from the University of Bucharest, in March 2006. On that occasion, I have delivered the talk "The Creative Equilibrium of Culture in the Knowledge Society" at the Eugen Preda Press Center of the Radio Romanian Society, based on a text with complete bibliographical references written in November 2005.

A shorter version without bibliography was published in "Cuvântul" of 15 May – 14 June 2006, pp. 12–14. I was very happy with the invitation to make this presentation and with the publication of its shorter version. However, the main reference text is the November 2005 version which is available from the author.

The 2005 version stated:

"The lack of appropriate attention to science, knowledge and innovation, at the cultural, political, state level, has created a disequilibrium ... the constitution of Romania does not even mention the word science, with ill-fated consequences on science,

knowledge and professionalism, resulting in clear deficiencies. ... On the other hand, *the current technology has reached a high scientific and intellectual level*, *creativity and vision*, *as in the most advanced science*, *covering a wide range of levels from routine to creative.*

A novel aspect is the importance of the process of innovation for the Knowledge Society. Although the *Innovation Process* is not new, it has now achieved *an equally exceptional importance for society with that of Science and Technology*. … My own and others' interest in the Knowledge Society have emphasized the role of *Science*, *understood in the broadest possible manner*. It is therefore necessary for Science to become a coordinate of the thinking of every citizen. ... We need a generalized thinking on Science. Who would have thought, years ago, that in the Knowledge Society „*the Science would have such a wide meaning*, *encompassing technology*, *research*, *development*, *design*, *innovation*, *research institutions*, *academies of sciences*, *scientific societies*, *state forums dealing with the problems of science*, *international forums*, *global forums etc.?*"

The above thoughts are the starting points for this paper.

The Science of our times proves to be a vital component in the human life and society despite all the acute problems of its basis resulting from the classical and modern thought on Science. We will state our opinion, but we will also refer to the remarkable ideas and papers of contemporary scientists, emphasizing our agreement or disagreement with them.

Science as arch of knowledge

The view on Science depends, to the largest extent possible, on the relationship between Science and Consciousness.

On one hand, with respect to Science, I have emphasized the idea that it has to be understood in the broadest possible manner.

On the other hand, the studies on a Consciousness Society underline the problems of consciousness and the fact that the most

dangerous thing is the exclusion of the consciousness from the equation of the human life and of the existence.

For that reason, I have mentioned:

"The Science and the Consciousness should not be broken from one another, absent such an equilibrium we will not achieve the great equilibrium of culture ... This equilibrium is not and will never be static, but in a continuous dynamic search, with stages of disequilibrium, produced by new poly-cultures, generated by the novelties that will continuously appear."

We can therefore regard the Science as an arch of knowledge that extends over all the elements of the broader meaning of science, meaning defined above. The substance of Science is *knowledge*, its production, use, involved organizations, innovation, practice and the day to day involvement of everyone, and also of the artificial intelligence agents etc.

A qualified worker applies knowledge, no matter where it comes from, no matter how it was learned, knowledge from his own experience. But he also innovates, produces knowledge, in other words, he is in the middle of Science in its broad interpretation.

In my papers on the Consciousness Society I have sketched a new theory (philosophy) of knowledge. In the preface of my paper published in Revista de Filosofie, January-April 2002, I have mentioned:

"In the last decade of the 20th Century and the beginning of the 21st Century, knowledge has received new meaning and significance with respect to the classical and modern philosophies of knowledge. The knowledge is no longer only a human mental process, but also one of the animals, of the artificial intelligence systems, of the industrial, economic and social organizations, of the organizations where humans collaborate with software agents, intelligent robots and the Internet, of the intelligent conscious artifacts (in the future) that act with or without human supervision. Knowledge has become an important economic factor and has become subject to the management processes. The technological

and organizational knowledge becomes as important as the fundamental scientific knowledge of truth."

Although it is not possible to detail here all the elements of this study, we will underline an essential idea: knowledge is information. Knowledge is information with meaning, by itself, through its internal processes. It may be mental (which means structural-phenomenological), self-aware or not, or structural (the case of intelligent agents). There is also information that acts by itself, without own meaning, such as the regular software systems, or the organizational information. However, a regular software system without artificial intelligence acts based on the knowledge defined by the programmer. Therefore such a program represents an active dynamic knowledge, is a form of knowledge. Similarly, the organizational information is a form of knowledge. The knowledge is a much more subtle substance for a theory of knowledge in the 21st century.

The Science, however, is more than knowledge because it is more than information. The Science contains equipment, institutions, organizations, people. All these are contained in the knowledge arch of Science..

But what is Knowledge? Is Astrology knowledge? Is Chiromancy knowledge? The essence of knowledge is not due to being information, but it depends on a specific life domain, on the discipline learned in school or otherwise, on the imaginary created in a domain. There is always knowledge which is part of the arch of knowledge. Knowing that something is false, partially or entirely, this is also knowledge. Astrology interprets the influence of the planets and the stars on the destinies of individuals, groups or nations (The New Encyclopedia Britannica, 1994 edition). But is there such an influence? Nobody knows because it is not a science, but a pseudo-science, although during the Middle Ages there were departments of astrology in the universities of Bologna, Florence, Padua and Paris. Even today Astrology and astrologists have credibility with millions of people and even society leaders, by using

a mixture obscurantism and true knowledge. But Astrology is not part of the arch of knowledge of Science.

Chiromancy (the forecasting of future and destiny based of the hand's lines) is in a similar situation with Astrology. Chiromancy is not part of the arch of knowledge of Science.

The fact that sometimes predictions are confirmed may either be coincidences or an ability to penetrate, without science, without knowledge, in the phenomenological regions of existence.

The arch of knowledge of science encompasses the information, as an universal ontological factor and the age of information which is defined through the Information Society, the Knowledge Society and the Consciousness Society.

After the Newton and Einstein moments, the two giants of Science, as well as Faraday, Maxwell and other great scientists and pioneers, and great discoverers and inventors (such as Edison), *the third gigantic moment will be the insertion of information into science*, *not only through its structural and semiotic structural aspects*, *but especially through the phenomenological realities of the information.*

The notion of information should be among the most profound notions of science because the existence is structural-phenomenological and energetical-informational.

Many years ago I have formulated the principle of the insufficiency and incompleteness of the structural science to explain the reality in its entirety (the entire existence, including life, mind and consciousness).

To be precise, what is the meaning of "phenomenological" in the "structural-phenomenological" syntagm? For the answer we refer to a synthesis of this problem, developed jointly with Menas Kafatos, and published in our volume titled "*Principles of Integrative Science*".

In essence, H. Stapp (1993) defines the phenomenological as the domain that investigates the experience (the experiential). Mihai Drăgănescu (2000) extends this definitions to: *the phenomenological is the domain of the investigation*, *knowledge and practice of*

experience (the experiential) and of the phenomenological senses, in general.

The phenomenological and the structural cannot be understood independently of one another, but only in the structural-phenomenological ensemble. The question "What is structural?" has received a simplistic answer when it was stated that the structural refers to particles, fields and structures. The answer is much more refined in the structural-phenomenological context. What is phenomenological? The above definition of the phenomenological points to the core of the problem, but the answer is much more refined in the structural-phenomenological context.

As we have noticed, "an electron is structural as long as we do not consider its phenomenological content, because it is not relevant for its behavior in most cases. This is how Physics treats reality as being non-phenomenological, non-self-aware, non-living".

Jointly with Menas Kafatos we have introduced the notion of integrative mathematics to model the structural-phenomenological.

The need for science and knowledge to recognize the phenomenological in the structural-phenomenological context discussed above will soon be proven. A step in this direction, although still in a strictly structural view with certain subterfuges toward the phenomenological, is made by Stuart A. Kaufmann in his 2008 volume with the resonant title: *Reinventing the Sacred. A New View of Science, Reason and Religion: Finding God in Complexity*.

Stuart A. Kauffman is an important contemporary scientist in the complexity theory and its application to live organisms. He is the founding director of the Institute for Biocomplexity and Informatics at the University of Calgary, Canada, and has joint appointments in the Departments of Biology, Physics and Astronomy. He is also Professor of Philosophy. In the 90s he had a prominent role at the Santa Fe Institute, USA, where he was a researcher and professor and published important papers.

S.K. (as we will thereafter refer to Stuart A. Kaufmann), in his 2008 volume, states his opposition to Reductionism which reduces

everything to Physics, atoms and particles. S.K. (p.18) refers to the evolution of organisms, to values, meaning, and history, which cannot be reduced to Physics, but are realities of the universe.

But reduction to structural physics is different from reduction to a structural-phenomenological physics or to a structural-phenomenological science which may become prominent. What is important to S.K. is that he wishes and envisions such a science with his intuition. However, being limited by a structural view that he cannot abandon, uses various subterfuges to actually support such a possibility. S.K. shows mastery in the use of subterfuge as a method, which is to be appreciated.

He proposes *emergence* as a new scientific view of the world, to replace *reductionism*. For S.K. the emergence expresses the fact (book preface, p. x) that while no law of (structural) physics is violated, the life in the biosphere, the evolution of the biosphere, the humankind history are realities that cannot be reduced to (structural) physics, nor explained through physics, despite their centrality for our life. Would the same be true for a structural-phenomenological physics?

The principle of emergence is to be retained, as is that of reductionism, and, without doubt, the biosphere, the human economy, the human culture and the human action (p.3) are emergent entities in the universe. For S.K. 'the new scientific vision on emergence' brings with it a *place* for meaning, action, and values (p. 4). What is emergent is radically unpredictable. We cannot predict what possibilities may appear, neither probabilistically predict their appearance (p. 5). While this is indeed an important feature of emergence, it should not be made absolute.

Concerning consciousness, S.K. states (p.4, 231) that whatever its source, it is emergent and a real characteristic of the universe. The emergence of consciousness is considered in the universe as an astonishing enigma (p. 195), suspected to appear only in very specific physical systems (p. 204). If there is a reality more profound than the universe (or universes) then one may also

raise the problem of the emergence of consciousness there. Or maybe the consciousness is somewhat fundamental.

Chapter 6, "Agency, value, and meaning" includes the subterfuges mentioned above. Agency, besides its meaning as organization, has also the meaning of active operation or personified action. Due to agency ultimately appear values, goals, and meaning. S.K. made use of this operator in the absence of the recognition of the role of the phenomenological information in the human affairs. S.K. emphasizes that agency exists not only at humans, but also at animals, and also on the biological scale, up to the simplest live organisms, and maybe even to a live autonomous molecule that reproduces itself. Through agency the values have emerged in the universe, states S.K. (p. 74). But the agency is not explained, it is only provided as a subterfuge to support further reasoning. However, this is not how one can make science today. Only an explained agency will have scientific value. Everything is now gravitating around *Information*.

S.K.'s position on information is strange, but it also contains some interesting points of view. He criticizes the structural view on information, but he cannot come out from it. S.K. asks (p. 94) *What of the much-heard concept of information?* Remaking how much biologists like to talk about informational rich molecules and consider biology as an information processing science, he notices that no single concept of information may satisfy all the requirements of biology. Therefore he reviews several concepts or theories of information, starting with the theory of Shannon (p. 93–95, 192–193). As a telecommunications engineer, Shannon was not at all interested in clarifying what the information is, emphasizing that the semantic aspects of communication are irrelevant for the engineering problem. The communication process assumes the meaning, has a semantic character, and may include a communication system.

S.K. notices (p. 95) how Shannon never defines the information, being only interested in how much information is

carried through a channel with noise, without being concerned with the meaning of the message. Therefore, the purely syntactic information theory of Shannon is actually not a general theory of information, and cannot be used for biology and biosphere.

S.K. also reviews the algorithmic information, concept developed by the renowned mathematician Andrei Kolmogorov, noticing that it is entirely void of any semantic content. S.K. thus criticizes the structural view on information, which is an accomplishment. However, he cannot find a solution, because he cannot renounce the structural view, and the above mentioned subterfuges have no use for the notion of information, *which they cannot include*. The main weakness of the Stuart A. Kufmann's book is therefore in the problem of information.

We think that Information is the third giant of Science, after Newton and Einstein, without being able to predict what name or label will receive in the history of science.

Acknowledgement

For the translation in English, and for convincing the author to agree and to publish it, I am grateful to my colleague and friend, George Tecuci, professor at George Mason University and member of the Romanian Academy.