DEEP REALITY,CONSCIOUS UNIVERSE AND COMPLEMENTARITY

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1.Introduction.

Among the many ideas and problems presented by Menas Kafatos and Robert Nadeau in an inciting book[1] there are three which seems to be of utmost interest:

- a. A generalization of Bohr's complementarity principle.
- b.The problem of a conscious universe.
- c. The existence of a deep underlying reality.

A fourth theme elaborated by the mentioned authors in their book concerns the methodology of science, namely the necessity to extend the present day scientific method in order to cope with such problems as those cited above.

In this paper some commentaries on the first three items only are presented, the question of methodology deserving a special attention and a separate discussion.

2.The Generalization of Bohr's Complementarity Principle.

After he launched ,at Como(Italy) in 1927,his principle of complementarity in quantum mechanics,Niels Bohr tried in many papers to generalize it to biology, psychology,neuroscience,human culture etc.In 1957,in an exposition entitled "Physical science and the problem of life" he mentioned that ,in general, "...the notion of complementarity refers directly to our position as observers in a domain of experience where unambiguous application of the concepts used in the description of phenomena depends essentially on the conditions of observation"[2].Bohr thought that the principle of complementarity is a general principle as a logical framework in all conscious constructions of reality.For Bohr,indeed,as mentioned by Kafatos and Nadeau,"complementarity was a fundamental logical principle in constructions of reality base on the symbol system of ordinary language"[3].

After Clifford A.Hooker (1972) who criticized scientists and philosophers of science saying that "Bohr's unique views are almost universally either overlooked completely or distorted beyond recognition"[4],a new look into the principle of complementarity ,as a general principle,is presented by Kafatos and Nadeau.They support the view that "complementarity is the most fundamental dynamic in our conscious construction of reality in both ordinary and mathematical language systems"[5].They brought many arguments in favor of this point of view.Their examination of the relation between part and whole ,under the generalized principle of complementarity,is very useful not only for the principle in itself,but also for its relation with the deep underlying existence in which wholeness seems to play a major role.This deep existence is

not only a subquantum level,but an underlying reality which encompasses specific properties which may be related to mental processes,consciousness and others.

But accepting the generalized principle of complementarity as a logical principle,one still faces great problems.If at various levels of reality we have to use the principle of complementarity in order to obtain a construct of reality for every level,and if we have,or if we want to apply this principle for the last (ultimate) level of reality,then it may be asked if complementarity is not in the nature of the deep reality.And if so,it might seem normal to think that complementarity as a logical principle reflects a deeper complementarity which is, inherent in the nature of things themselves.The fundamental ingredients of existence may be complementary.If there is only one fundamental ingredient for all(mind, matter, void etc), then it might have complementary properties.If there are two fundamental ingredients they may be complementary to each other.For instance,if the deep reality is not characterized by space and time,it might still posses energy and information as its most fundamental principles.Energy may be not exactly the energy known in our universe,but the source of the latter.Information may be not exactly the discrete information,so widespread today in our universe,but of another type that might eventually be also or not in our universe[6].

The resuscitation of Bohr's complementary principle,in a generalized form,by Kafatos and Nadeau ,may have a tremendous importance for the foundation of science and perhaps for a new ontology.

Recently Menas Kafatos(1996) was asking[7] if "is complementarity a hallmark of the universe" and "is complementarity fundamental "? These questions are indicating that he is ready to think that the complementarity principle is much more than a logical framework,that it might be a fundamental reality of existence.

Complementarity may become an ontological category[8].

3.The conscious universe.

For Kafatos and Nadeau the entire universe is a quantum system[9],and at the same time may be taken as conscious[10].

Are these points of view complementary or/and reconcilable?

The consciousness of the universe may be understood in different ways:

- a.In a strong sense,considering that it is (or has) a conscious mind independently of living conscious organisms;
- b.In a mild sense,considering that only through the human(or similar) consciousness an universe can be discerned as possesing consciousness;
- c.In some intermediate senses:
    - -the universe has always an infraconsciousness,which does not mean full conscious awareness,but only a certain type of sensibility;

- -the universe has a bakground mind neccessary for full consciousness to be discerned through humans;
- -the universe has a background mind and may have bursts of full consciousness,from itself,independently of humans,such bursts being very rare phenomena at the human scale;
- -etc.

Kafatos and Nadeau do not consider that the consciousness of the universe "is in any sense antropomorphic,or that embodies or it reflects the conscious content of human consciousness"[11].They write : "Since the universe evinces on the most fundamental level an undivided wholeness,and since this wholeness in modern physical theory must be associated with a principle of cosmic order ,this whole manifests order in a self-reflexive fashion.It must,in other words,be self-reflectively aware of itself as reality-in-itself to manifest the order that the prior condition for all manifestatios of being.Since consciousness in its most narrow formulation for human beings can be defined as self-reflective awareness founded upon a sense of internal consistency or order,we can safely argue that the universe is,in this sense,conscious"[12].

Therefore ,following their suggestion,the universe is conscious in a strong sense.For this, the universe must have something special in its ingredients in order to be so.And this something special has to be related to the structure of the universe.

When they think that the consciousness of the universe is related to the wholeness which exists under the quantum realm,then this consciousness is located in the whole of the universe,namely in its root,that is in the deep reality.And in such a case the universe is conscious through its wholeness.

The universe ,which is a quantum system,is not only a quantum system but something more.It has complementary properties.It is quantic and conscious.This is a conclusion to be retained from the work of Kafatos and Nadeau ,independently of the mode in which the "strong" consciousness of the universe is realized.And this complementarity quantum/conscious may be considered valid for any type of the consciousnesses mentioned in the beginning of this paragraph.It is perhaps too early ta say exactly what type of consciousness has the universe.But the fact that it has forms of consciousness may be taken seriously into consideration.

It may be thought that the deep reality is the source not only of our universe,but of many others,everyone with its own space and time.The universes have a common substratum and the "consciousness" of the substratum (of the deep reality) is essential for the consciousness of every universe.This "deep consciousness" may be responsible for the birth of an universe,and to the becoming of the universe.This consciousness is not antropomorphic,it is sooner of a very specific type,perhaps like a physical proceess and at hte same time having an informational content (of mental,or phenomenological type).

In any case,Kafatos and Nadeau are poynting towards a neglected reality which probably exists.A specific type of "consciousness" may be found also in the ontology mentioned in the note 6.Here,it is sooner a sensibility,a feeling about its own existence and about tendencies of becoming.These are considered informations ,quite different of the digital or discret type of

information ,and were named phenomenological informations which can be generated in the deep reality by physical specific processes.

The problem of the consciousness of the universe is not a false problem.It has something to do with reality and it may become an object of science under a coherent ontological model of the entire reality,provided an extension of the methodology of science is undertaken.

4.The deep reality.

Perhaps the most convincing argumentation of Kafatos and Nadeau refers to the existence of a deep reality.This reality is conceived as a wholeness being outside of space and time.

The arguments brought out by them are based on a series of facts[13]:

- -Bell theorem and Aspect's experiments proving that non-locality and non-separability are facts of nature;
- -wave and particle aspects of reality in quantum physics ;
- -Godel's incompletness theorem;
- -Big Bang theory;
- -David Bohm's theories of implicate order,wholeness and holomovement;
- -arguments from the history of philosophy;
- -their own philosophical and scientific insights;

All these arguments ,together,point to the deep underlying reality. Concerning this deep reality,Kafatos and Nadeau consider that it might be a "thing in itself",lying outside scientific knowledge.This may be indeed the case if the only or the main argument of its existence is given by Bell theorem and Aspect's experiments.But this is a very ,perhaps,unilateral interpretation, because if in the deep reality there is also some form of consciousness,and this one is a source for life and alive consciousness in the universe,then there is another link between the deep reality and the universe,besides the link indicated by Bell-Aspect processes.Therefore it is too early to say that the deep reality is a thing in itself in a kantian sense.Before stating this,it is necessary to explore also the other link,not only the physical link put in evidence by Bell and Aspect, without saying that the other link is non-physical.

Because the deep reality may have two "connections" with the universe,there is a possibility to know more about it.Or,to imagine more about it,that is to try to build models of it.

It is interesting that Bernard d'Espagnat[14] considers that the deep reality (named by him "independent reality",which is different from the "empirical reality" constituted by phenomena and their description) is a "réalité voilée"(veiled reality),a matrix on which physics can give only some "lueurs" (glimpses) but not a complete description.For him,in this deep and independent reality "pensée et réalité empirique s'engendrerait l'une l'autre,en quelque sorte reciproquement"[15].He considers that this deep reality "le Réel ,bien que structuré,ne peut en aucune manière etre conçu comme <<separable>> et comme <<local>> ,c'est -à-dire comme formé d'objets au sens empirique du mot"[16].And further he writes :"Un dévoilement partiel,par la science,de certaines structures rationelles du réel ne me paraît pas à exclure ..."[17], although

the deep reality (le réel) is not in space and time[18].These points of view which surpass the thing in itself ,even if not in totality, do not eliminate completely the problem of the thing in itself.But the deep reality is under the scrutiny of science and philosophy.

The notion of deep reality may become one of the most important concepts. The contribution of Kafatos and Nadeau to justify the existence of this level of reality has to be recognized.

5.Some considerations.

I will take the liberty to expose some further considerations on the above themes.The form of consciousness of the deep underlying existence(deep reality,deep matter),in its most fundamental form,cannot be of the structural type,and although it is a form of information,this information is not of the digital type.This other type of information has to be a fundamental process of nature,necessary to be recognized also for mental phenomena,for the human mind and for any living object.If human consciousness can be recognized,by a phenomenological recognition ,if not by a proof using the classical methodology of science,then it is necessary to incorporate the phenomenological recognition in the frame of the methods of science.The consciousness of the Universe cannot be phenomenologically recognized (we exclude the mystical recognition ,which is a long way of the scientific method),but the existence of the mental sense as a phenomenological phenomenon can be phenomenologically recognized.Not only by introspection,but also by reason.It is generally recognized that mental phenomena and consciousness cannot be reduced only to the play of atoms and structural molecules,and therefore any superabundance of interconnections of structural molecules is in the same situation.The structural science is fundamentally incomplete [19]. It is necessary to add a new principle to take into account something more than structural ingredients.Many scientists in this century have thought in this manner as, for instance,Niels Bohr and C.H.Waddington[20],for whom our fundamental scientific concepts contain no element to make the difference between the living and the non-living,and also to have a similarity with consciousness.

The connection between the phenomena of life and cousciousness of the living may indicate that the same fundamental principle could explain both of them :"Mais ce <<nouveau>> principe fondamental pourrait etre utilisé par la matière non-vivante et seulement de différences d'organisation,de ce principe, négligé jusqu'à present,avec les autres principes déjà connus,pourraient expliquer le vivant et le non-vivant"[21].

This principle is beyond the structural and it cannot be understood by the structural science (which is common today for physics and biology),otherwise it could have been discovered by this science.

This new fundamental principle which is necessary and has to be recognized as a phenomenon of reality,because in an indirect manner there is a proof of it,perhaps a weak proof for the time being,but still a proof by a phenomenological recognition (implying introspection and inferences based also on the structural science),we named it "phenomenological sense".The mental sense is a phenomenological sense.

The phenomenological sense cannot be a phantom.It must have some type of physical substrate.And this substrate,that we called informatter,has to be coupled with the structure of a cell,and of the brain,although this cannot be, perhaps,detected by measuring the forces among the structures of molecules.

This substrate may be in the deep reality and still present in living objects. The consciousness of the underlying deep reality may be constituted by the phenomenological senses from this primary reality,some of which are eternal and the source of becoming.

Revising this paper,I tried to explain in this paragraph my interest in the problem of the "conscious universe".Between our consciousness and consciousness of the universe there is a connection.The consciousness of the universe is connected also with all reality in the universe,even with matter, the phenomenological laws of becoming being translated in physical laws of the universe.But the phenomenological laws of becoming are still acting through the mental phenomena and especially through the human consciousness.

Some recent review papers[22] are presenting the points of view of the last years concerning the human consciousness.But without a new model of existence it will not be possible to obtain a model of mind which could help to understand consciousness.That's why the problem of the Conscious Universe seems to be important.

6.Final remarks.

The aim of this paper was not to present a book,but only to explore some ideas from the book of Kafatos and Nadeau that seem to be relevant for constructing an adequate ontological model of existence to be used not only for the philosophy of science but also for science.If I presented some of my own ideas,this was done because of their possible connection with those of Kafatos and Nadeau.

The considerations of Kafatos and Nadeau are framed in a "metaphysical and epistemological realism" with the intention to suggest an extension of today methodology of science in order to cope with the deep reality and its implications,and also with the "consciousness" of the universe.

References and notes.

1.Menas Kafatos,Robert Nadeau, The Conscious Universe-Part and Whole in Modern Physical Theory,Springer-Verlag,New York,1990.

2.Niels Bohr,Atomic Physics and Human Knowledge,Science Edition,New York,1961,p.99.

3.Menas Kafatos,Robert Nadeau,op.cit., p.92.

4.Clifford A. Hooker ,apud M.Kafatos and R.Nadeau,op.cit.,p.37.

5.Menas Kafatos ,Robert Nadeau,op.cit.,p.11.

6.In a romanian ontology (Mihai Draganescu,Depths of the Existence, Bucharest, 1979 and Orthophysics,Bucharest,1985) it is considered that in the depths of matter(existence)-the deep reality-there are two complementary ingredients,an "energomatter" and an "informatter",which are,the first a source of energy without form,that is without dimension,the second a source of information which perhaps is sooner of the type of mental phenomenological senses.Both ingredients being complementary and not contradictory contribute to the dynamics of the entire reality.

7.Menas Kafatos,Foundational Principles and Consciousness,Krasnow Institute for Advanced Studies,GMU,Fairfax,April 1,1996(exposition and discussions).

8.This is an acceptable position for the ontology mentioned in the above note 6.

9.Menas Kafatos,Robert Nadeau,op.cit.,p.146;147;158-160;16-17.

10.Idem,p.10;170-171;178-180.

11.Ibid.,p.178.

12.Ibid.,p.178-179.

13.Ibid.,p.61-73;112-115;147-172;174-175.

14.Bernard d'Espagnat,Etienne Klein,Regards sur la matière-Des quanta et des choses,Fayard,Paris,1993.

15.Idem,p.261.

16.Ibid.,p.268.

17.Ibid.,p.287.

18.Ibidem.

19.Among the principles of a future structural-phenomenological science [Draganescu 1990] the first is "the principle of the insufficiency of the structural science".See M.Draganescu,Principes d'une science structurale-phénoménologique (Principles of a structural-phenomenological science),Bulletin de la Classe des Lettres et des Sciences Morales et Politiques,Academie Royale de Belgique, 6e série,Tome IV,7-12,p.255-311,1993.See also,L'Universalité ontologique de l'information (Ontological Universality of Information),Préface et notes par Yves Kodratoff,prof.,Université de Paris-Sud, Directeur de recherche au CNRS,-Bucharest,Editura Academiei,1996(also on the INTERNET, http://www.racai.ro/books/draganescu).

20.M.Draganescu,Sur la notion et le domaine de la Vie Artificielle (On the notion and the domain of artificial life),Bulletin de la Classe des Sciences,Academie Royale de Belgique,6e serie ,Tome VI,No.7-12,1995,13 pages.

21.Idem.

22.John R.Searle,Deux biologistes et un physicien en quete de l'âme,La Recherche,No.287,mai 1996,p.62-77; David J.Chalmers,The Puzzle of Conscious Experience,Scientific American,December 1995,p.62-68; John Horgan,Can Science Explain Consciousness?,Scientific American,July 1994,p.72 -78.

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