

CONTINUITIES AND DISCONTINUITIES IN THE REALMS OF LIFE AND MIND

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1. Introduction.

Two of the great problems that persist to defy science are the passage from inanimate matter to life and from life to consciousness. Harold J. Morowitz in two books[1][2] is dealing, in an interesting manner, with these two questions.

In his "Beginnings of Cellular Life(1992)" he considers that :

- -life is emerging in a structural way(there is no <<ghost in the machine>>, where ghost means anything that can eventually explain some delicate properties of life);
- -life is prepared inside a prebiotic vesicle, in an aqueous world;
- -from a protocell to the universal ancestor and the first prokaryotic cell, up to the today bacteria, there are only chemical structural processes, and thus all these organisms are structural machines.

In the other book, "Cosmic Joy and Local Pain(1987)", he is looking at life from another point of view, drawn from the philosophy of Teilhard de Chardin. Thus, he recognizes the presence of an alfa-mind (God or an underlying deep reality as a mind) in any superior organism. It is considered that this new ingredient "seems almost coexistent with life"[3], perhaps even in a motile bacteria.

It may appear that the two books are contradictory, but it is not quite so. Looking down-up, that is from the emerging of life to the first organisms, y compris, bacteria, it is normal for a scientist to see only structural events and only structural organizations. But looking up-down, that is from the man to inferior organisms, it is also normal to think that if some special ingredient, not known today, is taking part in the constitution of man, to have mind and consciousness, then any living being ought to have the same ingredient, although not quite a conscious mind.

The two books are raising the important problem of the frontier between the non-living and living. The mentioned books take into account what seems evident at the two ends of a string : the inanimate matter and its organization towards life, the first, and the human being, the second. What happens between these ends is not so sure.

The same "dichotomy" may be found in a recent book of Christian de Duve[4], about which he declares himself:

"Je suis surtout à l'aise dans la première moitié de mon livre,ou je defends une vision très déterministe de l'origine de la vie,et des premières étapes de l'évolution.(.....)Mais plus j'avance vers la deuxième partie de mon livre,plus je marche sur des oeufs"[5].

And indeed,de Duve in the end of his mentioned book,after a very structural conception of life developed in this work, he considers that the conscious thought is not an epiphenomenon of the biosphere, but a fundamental manifestation of matter[6].He considers that the Universe has a sense,being a significant universe,which can think of itself and discover its own structure and understand immanent entities like truth,beauty,good,love[7].

After Cosmic Joy & Local Pain ,Harold.J.Morowitz is nearer Teilhard de Chardin,but after Beginning of Cellular Life he is nearer the structural biology,especially molecular.

In fact,both de Duve and Morowitz are somewhere between a structural and a structural-phenomenological vision of reality[8],but in different places on this line.De Duve has mainly a structural vision,but he is confronted with the reality of mind and consciousness,which cannot be explained by today known structures.Morowitz is placing the border between structural and structural-phenomenological not at the frontier of non-living and living matter,but in a region between bacteria and superior organisms,although even motile bacteria for him could be structural-phenomenological.

2.Life and structural biology.

The demonstration of Harold J.Morowitz concerning the beginning of life with a chain of chemical events leading in time to the formation of vesicles,then to the protocell followed by the universal ancestor seems plausible.

A vesicle is formed by certain classes of amphiphilic molecules, which are at the origin of an universal membrane structure used in all biological "systems".Of course,such a vesicle is not yet alive.

A protocell,without a genetic apparatus,is a vesicle with many types of molecules inside it,achieving a chemical memory without macromolecules.It has properties of self-reproduction[9].Although it is a self-reproducible object,this does not mean that it is a living object (organism).The structural and non-living phenomenon of self-reproduction is known today in the computer studies of Artificial Life[10] [11].It may be a more general phenomenon both for inanimate structures(physical and/or informational),under specific conditions and circumstances,and for living objects.The self-reproduction is not only a property of living objects,on the contrary,even in organisms it is mainly a structural event.

A protocell is not yet alive,but it represents an important structural step for preparing the living cell.By physico-chemical evolution the protocell becomes the universal ancestor of all biological cells,a primordial prokaryote, containing macromolecules of nucleic acids and proteins.Morowitz considers that these macromolecules evolved inside the protocell and not so much outside it.

There is also another model of the chain of events leading to the universal ancestor. De Duve considers that the life began without a membrane and only lately the membrane appeared[12].

But independently of the chain of events leading to life, either proposed by Morowitz, or by de Duve, fundamentally the situation is the same, that is, life is preceded only by structural processes.

Therefore, it may be inferred that ,

- (I) Life on earth was prepared by structural phenomena , although life may prove to be not quite only structural.

In the process of evolution of matter, with increasing complexity life may use something more than structures, but perhaps only some types of structures are able to accept what is needed to become alive.

The fact that life may appear outside or inside a vesicle is due it seems more to the nucleic acids. For Morowitz, the development of the genetic system is a fundamental discontinuity in the history of life[13]. Life, being conceived especially in connection with the nucleic acids, and if these may participate, after de Duve, at the constitution of life even outside the cell, and in any case inside the cell, then something special might happen with DNA and RNA. These acids may be living molecules[14].

3. More than structures?

In a cell, in comparison with vesicles and protocells, after Morowitz's description, the new elements are the macromolecules of proteins and nucleic acids (DNA and RNA). If all these are only structural, then no frontier is possible between vesicles and biological cells concerning the property of life. Prof. Morowitz accepts the idea of the emergence of mental processes (consciousness, thought, mind) at very complex organisms provided with nervous systems. Mind is understood by him as a complexity of mental processes with the property of reflective thought. This is a very good definition.

Why not to accept the mental process as a fundamental phenomenon which might be present in very simple form in every living entity? We observe that the structural science, as it is the science today, was not able to understand the mind because it cannot be derived only from molecular structures. The structural science, in general and in principle is insufficient for explaining the entire reality[15].

The mind is a reality, and very elementary mental processes have to be recognized as realities in any living object. The mental process may have under-rudimentary and rudimentary forms, unconscious and subconscious forms. It is very difficult not to admit that there is something unique present in all forms of life, from the living molecule to the brain with mind. This is the same thing having a very special property, a fundamental ingredient not discovered until now. It should have been discovered if it was of a structural type. But it cannot be discovered by the methods of structural science, because it is not structural.

The only phenomenon which has to be taken into consideration is the mental process, because he is a reality to be recognized in connection with the human mind, and therefore with life in general. If this general process is recognized, then it follows the necessity to recognize a substratum for this process, which cannot be purely structural.

On the scale from vesicles to protocells, universal ancestor, prokaryotes, eukaryotes, multicellular organisms, man, there are two possible discontinuities. One is between the non-living and the living, which is placed between protocells and the universal ancestor, the other is between prokaryotes and eukaryotes.

Because the multicellular organisms are built from eukaryotic cells, it is convenient to think that the same type of life is present in all these living objects. Can we accept then the presence of mental processes only to these organisms, and not to prokaryotes? Could be the prokaryotes and all the world of bacteria simple machines, like the dogs of Descartes?

If we take into consideration the nucleic acids, present both in eukaryotes and prokaryotes, the difference in the organization of these acids being not extremely fundamental, there is no discontinuity in the major sense of life, but only an important change inside the life.

It seems that prokaryotes may have mental senses, even if these are not of the same order as for eukaryotes. Therefore it may be inferred as being very possible that

- (II) Life is mainly characterized by the presence of mental processes.

Because a mental process must be a natural process, implicating a structure and something more, a special feeling (sense) that I called phenomenological sense [16], it seems necessary to find a fundamental material ingredient that can manifest this property.

4. The coupling problem.

Morowitz observes "this strange property of being alive" [17] and that "we are at present unable to infer the necessity of life from the properties of atoms and molecules" [18]. He also observes that a "group of scientists seeks defining relations to envision life deep within the laws of physics and the nature of cosmos" [19].

We cannot but agree with all these remarks. Something new in the laws of physics has to be discovered in order to explain the connection of life with the cosmos. The question of connection of some structures of molecules and atoms with a fundamental property or ingredient of the cosmos, to become alive, we call it "the coupling problem".

It seems that we return at the idea of Descartes who thought, it is true, only for humans but not for other organisms, of a coupling between the body and a separate mind (soul) through a central gland in the brain (the pineal gland).

The coupling must be general, for any living entity, and, perhaps it is very simple, although hidden for the structural science. This may be the most hidden secret of life. Because at the molecular and

atomic level alone it was not possible to find the nature of life ,it follows that something might happen at the quantum level,perhaps at the level of the elementary particles,but in the frame of the structure of the living object.

In order to find the possible cosmic participant to life,it is perhaps necessary to take into account an idea that seems to gain a certain importance,namely of a "deep underlying reality"[20][21]. This is a reality under the quantum level.The arguments for the existence of the deep reality are based on a series of facts:

- -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 incompleteness theorem;
- -Big Bang theory;
- -David Bohm's theories of implicate order,wholeness and holomovement;
- -arguments from the history of philosophy;
- -philosophical and scientific insights;

The deep reality is conceived as a wholeness being outside of space and time, it is the source of the universe,of the physical universe,and it may participate again in the universe,in a specific way,with some of its properties,to give birth to living organizations.The organization of a living object must comprise an ingredient of the deep reality which cannot manifest in an open way in a nonliving object.

The coupling problem is a question of organization of molecular structures with an ingredient of the deep reality,which is in the sub-quantum realm.How this is realized it remains an open question,and it may be said that,

- (III) The most deep secret of life lies in the coupling between a biological structure and a physical ingredient of the deep reality which has the property of manifesting phenomenological senses.

I sustained since many years that for explaining life,a new physical ingredient has to be taken into account,an ingredient which at the same time has informational properties of the type of mental senses[22].I named this new ingredient informatter and the specific informations in this informatter I named them phenomenological senses.

Recognizing mental senses as a reality,one recognizes the phenomenological sense,in general,as a fundamental process of nature.Because such senses must have a physical substratum,it is necessary to recognize also the existence of informatter.

But all these are open questions.The direct proof of these ideas,or of such a model,may be impossible.Informatter by its very nature is not interacting with a type of force with the structures of the usual physical world,and all the methodology of science has to be re-examined.The coupling of informatter with some structures may have other reasons than

force, may be topological, may be others. It might be a phenomenon of coupling among macroscopic, quantum and subquantum levels.

5. Final remarks.

The point of departure of the above comments from this paper was the position of Harold J. Morowitz as himself presented in his two mentioned books. It was not my intention to present these books which are remarkably written and in which many other valuable ideas, scientific and philosophical, may be met.

In *Cosmic Joy & Local Pain* he declares himself a mystic scientist. Is he really a mystic? No, that's not true. He has a cosmic sentiment: "Each of us is a small part of a living whole existing in a vast universe whose design is wondrously oriented toward stars, planets, life, thought, and perhaps something more"[23]. He accepts religion with this cosmic sentiment and not with mysticism. He sees also the local pain and suffering being "inherent in design"[24], but he considers that with the reflective thought the human mind is not totally enslaved to them. Men can alleviate the bad in a tendency towards the good, becoming partner of nature (or to god) "to move the local world toward more cosmic joy and less local pain"[25]. The cosmic sentiment, which is a response to the inherent philosophical tension of man[26], may be, indeed, a sentiment of cosmic joy.

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