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MICHEL BOUNIAS AND HIS ROLE IN DEVELOPING A DEEPER KNOWLEDGE ABOUT REAL SPACE

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A brief story about late Professor Michel Bounias, a member of Advisory Board of *Spacetime & Substance*, is stated in the present note. His remarkable studies aimed at the understanding the constitution of the real space allow us to consider his findings as an actual breakthrough in the fundamental science. Bounias' studies shed light on the organization of space arranged as a mathematical lattice of topological balls – founding elements of the real space. He investigated the space structure and the substructure of balls, fractality of the real space derived from first (submicroscopic!) principles and specified origins of matter, charge and fields and disclosed the way of their manifestation in the space tessellattice.

Michel Bounias, a board member of *Spacetime & Substance*, passed away on 23 March 2003. Professor Bounias was very interested in developing of our journal, because he called it an actual forum presenting new progressive ideas and concepts in the fundamental science. He fairly believed that it is this subject that is under taboo in the mainstream physical journals; hence *Spacetime & Substance* is able to give free rein to any scientist who wishes to state one's ideas, concepts and theories, especially regarding the constitution of the universe.

French Professor Michel Bounias was a high-level scientist whose researches were wide known among many mathematicians all over the words. He published hundreds of papers in about a hundred of different journals, e.g. *Comptes-Rendus de l'Academy des Sciences* (Paris), *J. of Mathemat. Analysis and Appl.* (USA), *Nature* (UK), *Int. J. Comput. Anticipatory Systems* (Liege, Belgiue), *Indian J. Theor. Phys.* (Calcutta), *Ultra Scientist of Physical Sciences* (India), *Physics Essays* (Canada), *Spacetime & Substance* (Kharkiv, Ukraine), *Chimie Analitique* (Paris), *Biochemistry Journal* (USA), *Biochemistry Intern.* (Australia), *Canadian J. of Forest Research*, *Brazilian J. of Medical and Biological Research*, *Science of the Total Environment* (Italy), *Zeitschrift fuer Naturforschung* (Germany), and etc. He published about ten books at such Publishers as Springer-Verlag (Berlin), Masson (Paris) and others.

Michel Bounias was married, had a son. Though later he lived along in proper houses, initially in Avignon, then in the countryside in the South of France at distances 2 to 3.5 hours by car from the Avignon University where he taught mathematics. As a teacher, he delivered lectures also in other places, for instance, the Belgrade University. As a researcher, he visited and worked in many scientific centers and was the research director at the Alexandria Institute, New York. In 2001 he in collaboration with other scientists initiated a manifesto entitled "Science Responsibility and Scientists Concerns for Evolution of Planet Earth: A Manifesto on Action for World's Peace and Harmony." Here is the abstract:

During the last centuries, human technologies have grown to such an extent that their power has reached a level and a range comparable to that of natural forces. The Earth is witnessing an ever-increasing human technological intervention, in almost all areas of human life and Nature in general, with unfortunately a deficit in philosophical and humanistic approach, whatever the consequences this may imply for the present and future of humankind and Planet. An increasing load of damage has resulted from the consequences of human population growth and development, with poverty, stress and violence still spreading in every part of the world. While political and industrial lobbies argue against the capability of science to give them lessons of objectivity and wisdom, religions have also failed to provide adequate guidelines for the way humanity should behave in harmony with the whole of the living community, and religious wars still rage worldwide. The three parts of the present appeal successively deal with the following parts of the

tragedy: (i) the technological and economical aspects; (ii) the social and philosophical implications; (iii) the moral and spiritual messages.

A new way of thinking about identification of correct behavior and management that would allow the living community to evolve towards a optimum future is sketched and the whole of the scientific community is invited to contribute out of conflicts of interest to fill the appeal with the wisdom that Science should be able to bestow to humanity, in conjunction with Arts and Philosophy whose contribution is emphasized.

Bounias' scientific interests were exceptionally wide. After the graduation in the mid 1960s, he started as a researcher in the nuclear weapon program of France and worked in this area for 7 years. Then he was teaching the math and conducted researches in many branches of pure and applied mathematics, biomedicine, analytical chemistry, environmental protection, UFOlogy, theoretical physics, etc. During his last years he was keenly interested in the study of negative influence of herbicides on the quality of foodstuff and the health of bees that pollinate cultivated plants.

Bounias did not have a TV set, but a switched receiver was constantly on his writing-table. He could receive a fax from an Australian broadcast company somewhere at the mid night, another correspondent wished to interview him twenty minutes before a New Year. He could suddenly receive an invitation to visit a camp of researchers somewhere in a desert in Mexico for a couple of weeks or so, etc. The same as many thinkers, Bounias negatively perceived top politicians considering them as people who only purposed their corporate economic objects. He very critically expressed his opinion about the war against Yugoslavia. He was in depression looking at what was going on the Mediterranean coast in France: all buildings were constructing directly near the shore without taking into account any directions of conservancies.

For about thirty years the major subject of Bounias' study was the investigation and understanding the phenomenon of life. Bounias' Global Project concentrated on the following questions [1]: (i) does a physical universe exist? (ii) if so, on which conditions could it exist? (iii) what life really represents, and why as a part of the whole universe, does it seem to apparently not follow some of the so-called "laws of physics". In the frame of the Project he could complete clarify points (i) and (ii), and the main contribution to solving point (iii) was made in last years.

Those studies have imperishable meaning not only for biologists and mathematicians whose work directly touches the phenomenon of life. His investigations are paramount important also for those physicists who investigate space as such. Indeed, he could show that a physical space can exist as a collection of closed topologies in the intersections of abstract topological subspaces provided with non-equal dimensions. In particular, the Project allowed him to raise and then to solve (rather finally!) what was considered as 'time' in human perception.

After publishing his remarkable book on the creation of live in 1990 [2], he concentrated on the understanding the constitution of space. Those studies were mostly carried out jointly with his friend Dr. Andre Bonaly from the University of Paris X. Namely, they published such works as "A topological model for fundamental structures" [3], "On mathematical links between physical existence, observability and information: towards a "theorem of something" [4], "Timeless space is provided by the empty set" [5], "The trace of time in Poincaré sections of a topological space" [6], "On metrics and scaling: physical coordinates in topological spaces" [7], "Some theorems on the empty set as necessary and sufficient for the primary topological axioms of physical existence" [8], "The theory of something: a theorem supporting the conditions for existence of a physical universe, from the empty set to the biological self" [9]. In particular, he was proud by work "On spacetime differential elements and the distribution of bio-Hamiltonian components" [10] published in *Space-time & Substance*. In this paper it has been discussed how various Hamiltonian models are derived for chemical structures belonging to living organisms while the Hamiltonian concept has not been applied to life as a whole. For the first time paper [10] has identified differential elements of space-time, from which it delimits a probabilistic fuzzy-like invariance standing for conservativity of biological Hamiltonian. In 2002 he also contributed to a book of American Dr. Ilonka Harezi writing a long mathematical part entitled "A Scientific Trip from Nothingness to Something. Mathematics Generating Physics up to Life".

Let us now examine what is space-time in the Bounias' approach. What he proposed initially was the founding element. Namely, it is generally recognized that in mathematics some set does exist. A weaker form can be reduced to the existence of the empty set. If one provides the empty set $(\emptyset)$ with the combination rules $(\in, \subset)$ and the property of complementary $(\complement)$, a magma can be defined. Those preliminaries allowed Bounias to fortunate the following theorem.

The magma $\emptyset^{\emptyset} = \{\emptyset, \complement\}$ constructed with the empty hyperset and the axiom of availability is a fractal lattice.

Writing $(\emptyset)$ denotes that the magma reflects the set of all self-mappings of $\emptyset$. It has been shown that the space constructed with the empty set cells of the magma $\emptyset^{\emptyset}$ is a Boolean Lattice and this lattice $S(\emptyset)$ is provided with a topology of discrete space. A lattice of tessellation balls then has been called the "tessellattice" and the magma of empty hyperset becomes a fractal tessellattice.

The introduced lattice of empty sets has ensured ex-

istence to a physical-like space. Indeed, looking at the inferring spaces (W^n), (W^m), ... formed as parts of the empty set $\emptyset$, Bounias has proved that the intersections of such spaces having non-equal dimensions give raise to spaces containing all their accumulating points forming closed sets. Therefore, our space-time becomes one of the mathematically optimum ones. And time is an emergent parameter indexed on non-linear topological structures guaranteed by discrete sets. In other words, the foundation of the concept of time is the existence of order relations in the sets of functions available in intersect sections.

The symmetric difference between sets and its norm can be treated as a new, more general, non-metric "distance". The generalized set distance as the extended symmetric difference of a family of closed spaces

$$\Delta(\mathrm{A_i})_{\mathrm{i}\in\mathrm{N}} = \underset{\cup\{\mathrm{Ai}\}}{\complement} \underset{\mathrm{i}\neq\mathrm{j}}{\cup} (\mathrm{A_i}\cap\mathrm{A_j}).$$

The complementary of Δ, i.e. $\cup_{i\neq j}(A_i \cap A_j)$, in a closed space is closed. As distances Δ are the complementaries of objects, the system stands as a manifold of open and closed subparts. Mapping of these manifolds from one to another section, which preserve the topology represent a reference frame in which the "analysis situ" - the original name for "topology" given by Poincaré - has allowed one to specify the changes in the configuration of main components: if morphisms are observed, then this enables the interpretation as a motion-like phenomenon, when one compares the state of a section with the state of mapped section. The research came him to the theorem: A space-time-like sequence of Poincaré sections is a non-linear convolution of morphisms.

Thus time is not a primary parameter. And the physical universe has no more beginning: time is just related to ordered perceptions of existence, not to existence itself. The topological space does not require any fundamental difference between reversible and steady-state phenomena, nor between reversible and irreversible process. Rather relation orders simply hold on non-linearity distributed topologies, and from rough to finest topologies.

One of the remarkable achievements of Bounias is the determination of relative scales in the empty-set lattice, i.e. the tessellattice. This allowed him to introduce intervals constructed from mappings $\mathcal{G} : \mathrm{N}^{\mathrm{D}} \mapsto \mathrm{Q}$ of $(\mathrm{N}\times\mathrm{N}\times\mathrm{N}\times ...)$ in Q. It has been found that the size of structures is a function of iterations (n). At each step (ν_j) the ration of size in dimension D will be: $(\prod\nu_\mathrm{j})^{\mathrm{D}}$, so that the maximal will be

$$\rho \propto \left\{(\prod\nu_\mathrm{j})^{\mathrm{D}}(\prod\nu_\mathrm{j}-1)^{\mathrm{D}}\right\}_{\mathrm{j}=1\to\mathrm{n}}.$$

The manifold $(\prod\nu_\mathrm{j})^{\mathrm{D}}$ is a Bourbaki-multipliable indexed on the integer section $\mathrm{I} = [1, \mathrm{n}]$. Predictable orders of size, from the Planck scale (the size of an elementary cell of the tessellattice, which can be estimated as 10^{-30} m), roughly comply with quark-like size (clusters with 10^{10} of elementary cells), atoms size (clusters embracing down to 10^{17} cells), human size (clusters including about 10^{28} cells) and then clusters that represent higher scale universes: stars and solar systems (10^{40-42}), etc. So, we can see that the universe suggests a quite different organization of matter at different scales.

It should be particularly emphasized that Bounias was very prejudiced against general relativity. Indeed, the geometry employed in the relativity, which does not involve the notion of mass in its mathematical formalism, is very far from those transparent ideas that were established by Poincaré for the comprehensive study of space, namely, topology that is based on such fundamental notions as point, distance and similitude. They were those elements which Bounias used in his sophisticated analysis of the constitution of space. He had planes to reconsider the phenomenon of gravitation starting from first (submicroscopic) principles, which would bring us to a new theory with a radically new postulates. The theory should describe all the phenomena predicted by general relativity, such as the motion of Mercury perihelion, the deviation of light ray by the sun, and the red shift. In this theory the major role will play the inner structure of space, i.e. its presentation in the form of the tessellattice with its proper cell structure. The conventional metrics of general relativity, as a phenomenological formal characteristic, is substituted for the set-distance and therefore the theory will deal with the distribution of the deformations of balls in the tessellattice. The first stage is the deriving of Newton's potential $1/r$ basing on the principles of motion of particles and field particles in the tessellattice. Next stages will deal with the interaction of objects in the tessellattice, which should result in the corrections to Newton's law formally revealed by general relativity... This is a short scheme of further studies designated by Bounias. Anyone can join to this intriguing line of research.

I am honored that I could work tightly with Michel Bounias in the area of the foundations of the fundamentals. Starting from topology, set theory and fractal geometry we have shown how the physical space generates particles (i.e., matter) and fields (matter field, called the inerton field, and the electromagnetic filed). Proceeding from first submicroscopic principles we could determine such basic notions as a particle, mass, distance, spin, charge, the reduction of mass and distance, etc. We introduced the notion of mass [12] and introduced the fractal decomposition principle. In other words, a local deformation of a cell of the tessellattice is able to allocate itself by a huge number of surrounding cells, which means the migration and so-called dispersion of the local deformation. Thus the exchange of structures revealed in the tessellattice exactly corresponds to the motion of "inertons", elementary ex-

citations of the matter waves and carriers of the gravitational interaction previously introduced by the author in a series of works dedicated to the foundations of quantum mechanics.

We also examined the phenomenon of the electric and magnetic charges in the tessellattice [13]. It was argued that the phenomenon of charge is associated with the shape of a cell: protuberances on the cell surface corresponds to the positive charge and concavities are characterized the negative charge. The magnetic charge appears due to the motion of the electric charge and hence the motion of elements of its surface.

At last, our final conjecture that allows the solution of the Hubble expansion of the universe: cells in the tessellattice exhibit increasing volumes from the center to the periphery of a 3D stacking.

Bounias' last researches [10-14] clear the way to a deeper understanding the inner links dominating in the nature. He has introduced a radically new approach that for the first time allows us to look at the submicroscopic construction of the real space. This automatically redefines basic directions in the fundamental science and starts a radically new trend for those who travel on the path for the truth.

Bounias' scientific archive consists of files, journals, papers and books whose total weight reached 10 tons. He contributed much of his own resources in scientific literature and communicated with a huge number of scientists all over the worlds, which allowed him to hold his highest-level position in the fundamental science.

Michel Bounias had a big heart. Let he be remembered forever. It will be great if Bounias' rich scientific heritage inspires new generations of researchers paving the way to new productive discoveries in Science.

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