Book Review

Review of Amrit Sorli's Book: The Physics of Now – The Eternity Is NOW

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ABSTRACT

Amrit Sorli's book, The Physics of Now, can be considered as a very appealing intellectual attempt to suggest a powerful starting point towards an ultimate "theory of everything" that, with opportune refinements from the mathematical point of view, could solve important foundational questions of theoretical physics and contribute to the development of a new holistic science in which matter and consciousness emerge as different aspects of the same fundamental reality. You can find this book at Amazon.

Key Words: physics of now, theory of everything, holistic science, consciousness, fundamental reality.

The whole development of theoretical physics can be seen as a continuous improvement of the models of space and time. No physical law can be formulated without being collocated in an opportune space-temporal background. This fact stimulated many times in the history of physics the idea of a tight connection between the physical processes and the global arena in which they take place.

In the 20th century three fundamental theories have changed the understanding and explanation of the phenomena occurring in the universe: special relativity, general relativity and quantum theory. Special relativity modified the notion of the three-dimensional Euclidean space characteristic of Newton's physics in such a way to incorporate time in a smooth four-dimensional continuum (the Minkowski space-time). In the picture of special relativity, the Minkowskian four-dimensional space-time is the fundamental stage which serves as the medium for all of physics. Later on, general relativity generalized the Minkowski space-time to describe gravitational phenomena. The central discovery of general relativity was the acknowledgment that Newton's space-time and the gravitational field are the same thing and that the dynamics of the gravitational field and of any other dynamical object is fully relational, in the Aristotelian-Cartesian sense.

However, the most radical and relevant scientific revolution happened probably with quantum theory. Indeed quantum theory introduces much more spread scenarios and problems than those offered by every previous physical theory. Fundamental and intriguing perspectives determined by the quantum formalism as regards the arena of the physical processes are for example the following: the existence of non-local correlations and the fact that subatomic particles can be in

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entangled states, the wave-corpuscle duality as well as the special role that seems to be ascribed to the conscious observer in the measurement processes.
Now, despite over a span of few years theoretical physics has opened important perspectives in the exploration of new territories (such as the meaning of matter at the Planck scale and the role of the quantum information), certain conceptual confusions in different physical theories and significant foundational problems as regards what must be considered as the "real" arena of physical processes are evident. The fundamental fact which subtends these problems is that Einstein's general theory of relativity and quantum theory are mutually incompatible. One clearly needs a new consistent unitary theory describing the so-called "quantum gravity domain" which incorporates the principles of both quantum mechanics and general relativity, and reduces to them in appropriate limits. Finding a new synthesis and an unitary picture of the universe represents therefore the most important challenge in today's fundamental physics.

On the basis of the current research, in order to achieve a coherent unification of general relativity and quantum physics a solution could be obtained by a precise redefinition of the background of physical processes and thus by a deep reinterpretation of the meaning of space and time. In this regard, for example Macìas and Camacho recently emphasized that what is needed is either a theory of gravity with a non-dynamical Newtonian time, or a quantum theory with a dynamical time in its construction [1].

Today, significant current research are based on the denial of the existence of space or time as fundamental physical entities (think, for example, of Chiou's timeless path integral approach for relativistic quantum mechanics, Palmer's view of a fundamental level of physical reality based on an Invariant Set Postulate, Elze's approach of time, Girelli's, Liberati's and Sindoni's toy model of a non-dynamical timeless space as fundamental background of physical events, Caticha's approach of entropic time, Prati's model of physical clock time, as well as a more radical approach, proposed by Verlinde, according to which, not only time but also space–time as a whole is emergent through an holographic principle [2-8]).

On the other hand, in the second half of the 20th century, the concept of a physical vacuum as fundamental medium that subtends the three-dimensional space as well as time emerged. In the "grand unified theories" (GUTs) the physical vacuum constitutes the medium that carries the so-called zero-point field, where energies turn out to be present even when all classical forms of energy vanish (namely at the absolute zero of temperature). On the basis of the quantum field theories which describe the known particles and their interactions, the unified physical vacuum is not only a theoretical mathematical entity but really as a physical reality, which turns out to be characterized by different levels or domains, in other words there are various contributions to the energy density of the unified vacuum.

The realistic concept of the vacuum completes and complements Einstein's theory of relativity (although it places in doubt one of its pillars, the constancy of the speed of light). Relativity theory views space-time as relative and dynamic, interacting with matter and energy. It is the "background" against which the events of the manifest world unfold. But the origins of this background are not accounted for in relativity theory: space-time is simply "given," together with matter and energy. This is much the same in the currently elaborated theories of everything (TOEs). TOEs would be truly theories of everything only if they were "background

independent"; that is, if they did not merely assume the presence of space-time, but showed how it arose in the universe. The TOEs developed to date, based for the most part on string and super-string theories, cannot do this. The majority of the versions of strings works, just like Quantum Field Theory, which is its closest relative (and thus like also the Standard Model of particle physics), with a flat Minkowski space-time, while a correct, authentically relativistic (in the sense of general relativity) theory should be independent on the background, or not presuppose any metric signature.

The current impasse of theoretical physics points towards the necessity to recognize a deeper – and non-local – floor of the universe which is able to achieve a coherent unification between quantum physics and general relativity. "If we are ever going to find an element in nature that explains space and time," Princeton physicist John Wheeler asserted, "we surely have to find something that is deeper than space or time – something that itself has no location in space or time" [9]. On the other hand, in his 1930 paper *The Concept of Space,* already Einstein himself noted, "We have now come to the conclusion that space is the primary thing and matter only secondary; we may say that space, in revenge for its former inferior position, is now eating up matter" [10]. A few years following the publication of Einstein's thought, Erwin Schrödinger restated this basic insight: "What we observe as material bodies and forces" he remarked, "are nothing but shapes and variations in the structure of space." [11].

More and more current theories ascribe physical properties to space, more exactly, to the field or medium that subtends space. In particular, Amrit Sorli and the author of this review have introduced a research line according to which the stage of natural phenomena is an a-temporal physical space, universe is an a-temporal phenomenon, and the Planck-length quanta of space are its elementary constituents. The exploration of the different physical phenomena (from relativity to quantum theory) in the attempt to arrive at an unitary picture in physics and to find a new role of the observer and to define a new notion of consciousness are the main themes of Amrit Sorli's new book, The Physics of Now [12].

In this book [12], Amrit Sorli suggests a new interesting way in order to face the problem of finding a unitary synthesis in physics, according to which the fundamental arena of processes is a granular three-dimensional space, composed by a network of interconnecting elementary Planck volumes, and where time exists only as a mathematical quantity measuring the numerical order of material changes. In this picture, the primary physical reality is represented by the elementary three-dimensional grains of the Planck scale and by their energy density whose behaviours determine NOWS that exist in a timeless universe. In this framework gravity and inertia naturally arise as variations of vacuum energy density whose gradients should determine the relative velocity of material changes in the Universe.

One of the intriguing aspects of Sorli's approach [12] lies in the possibility to explain, in a very simple fashion, striking quantum phenomena such as the non-locality, the quantum entanglement or the double-slit experiment. Universal space where time is just a mathematical sequence of motion can explain in a simple way the non-local correlations of two subatomic particles in EPR-type experiments.

In the approach suggested in Sorli's book [12], the "mathematical universe", by simply knowing about the spin of the first particle and so it instantly informs the other particle how to rotate, is the direct medium of the information between the particles under consideration and shows that the universe has a tendency toward developing symmetry and harmony as the opposite spin of the particles is determined by the laws of symmetry.

In the final part of his book [12], Amrit Sorli introduces in a new way a relevant holistic picture that has the merit to see space, matter, life and consciousness as elements of a one universal process and thus to create a deep link between the natural sciences and the cognitive sciences. In Sorli's view the structure of the universe is determined by three elements: consciousness, the mathematical universe and the physical (material) universe (which should not be viewed in a hierarchical manner or in a vertical sense, but rather as one fabric, coexisting in an indivisible and intermingling manifestation).

Sorli shows in [12] that a profound experiential consciousness research leads to the acknowledgement that the evolution of life is an integral part of cosmic dynamics, of the greater cyclical phases of the universe in which matter evolves towards consciousness. One can so construct a real "cosmic anthropology" which allows a deep connection between natural sciences and social sciences in a single unitary approach in which consciousness emerges as the fundamental entity and implies that a timeless experience of oneness is the real goal of both science and society.

In summary, Amrit Sorli's book, The Physics of Now [12], can be considered as a very appealing intellectual attempt to suggest a powerful starting point towards an ultimate "theory of everything" that, with opportune refinements from the mathematical point of view, could solve important foundational questions of theoretical physics and contribute to the development of a new holistic science in which matter and consciousness emerge as different aspects of the same fundamental reality.

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