Sergio Serapioni's “Mechanics of Time”

Comments by Prof. Giandomenico Sassi

These comments do not serve a commemorative purpose but have the objective of being useful for whoever wishes to read the series of books on the subject written by Sergio Serapioni.

I shall proceed in a schematic manner with successive points in order to avoid losing track of the logic that links the various parts. I shall start by describing the more aesthetic (and perhaps more fascinating) inspirations which are at the root of his studies and then proceed in detail to describe the methods and the results.

1) The name given to the theory, "Mechanics of Time ", is eminently appropriate because time is the fundamental element of the whole development. It is so fundamental that in essence it can be said that it is the only real existing quantity. This is a real fundamental point, even though there is no definition of time in the theory, as indeed there is no definition of time in Physics. In summary, it is assumed that all physical quantities are a power of time, and that time therefore acquires the nature of a fundamental module. For example, energy is a measure of time to the power of twenty, length is a measure of time to the power of four, and so on. Starting with T1, which is time in the strict sense of the word, and going up to T28, all the physical quantities can be expressed.

From a certain point of view, this particularly surprising hypothesis is very fascinating, as I believe there are no previous attempts to geometrize all of physical reality in such an ambitious manner. There is a unique fundamental module and each physical quantity is expressed through this module raised to an appropriate power. This is different from the possibility, which is well known in Physics, to use a single unit of measurement to express various quantities, because in that case, the result is obtained by assuming some fundamental constants to be unitary and anyway such cases do not use increasing powers of such unit of measurement for each different physical quantity. There is, however, a formal, non-negligible difficulty in this hypothesis. For example, length is a T4, velocity is T3 because it is length divided by time, and likewise acceleration is T2. Essentially, time which acts as a fundamental module for all physical

quantities is also the time we use as a parameter to define motion. In Physics however, it is precisely motion, which requires the concept of length, which enables us to introduce the concept of time, because time cannot be conceived without motion. In this theory on the other hand, it is necessary to establish time as an a priori entity which, by defining length, leads to motion. The whole setup is totally inextricable. One possible escape route could be to define the fundamental module as something that is not time, but equivalent to time. However, I do not think that this is possible, neither from a logical point of view nor to properly accommodate the theory, because otherwise it would not be possible to express all the physical quantities using the fundamental module raised to 28 different powers.

I think that the attempt to geometrize physics in such an extreme manner is certainly exciting, but a formalization of the theory that satisfies the customary scientific rigour of Physics is definitely beyond the current state of development of the theory. The theory makes an *a priori* assumption that is only justified by the results that are obtained which we will see later.

2) The second fundamental aspect of Serapioni's Mechanics of Time is the 5-dimensional nature of physical space. Relativity uses four dimensions because time is treated as a dimension. In this theory on the other hand, we deal with five "spatial" dimensions because, as we have seen, the nature of time is totally different.

There are two **reasons** for this five-dimensional choice. The first reason is essentially mathematical: through iterative processes of a specific function, you obtain curves that intersect only up to the fifth dimension. Assuming that a parallelism can be drawn between these curves and physical trajectories, then the fact that in nature particles have to interact with each other implies that a space with more than five dimensions is meaningless. Of course, there could be only three dimensions, but on the one hand, such extension to 5 dimensions offers a very useful and elastic means of expression, and on the other hand there is a precedent in Mathematical-Physics suggesting 5 dimensions.

The reference is to Fantappiè's space-time model. Fantappiè's work, which dates back to the middle of the twentieth century, was not very successful. It was all about a perfectly legitimate mathematical model that represents an extension of Minkowski's space-time, which in turn is an extension of Newton's space-time.

The latter gives rise to the so-called Galilean Invariance Group, while the former generates the Lorentz Invariance Group. By adding the Radius R of the chronotope, Fantappiè obtained a new Group of ten parameters, where R assumed finite values. Essentially, this Group is an extension of the preceding groups with five dimensions.

The assumption in Serapioni's Mechanics of Time is therefore that physical space, excluding time, is expressed in five dimensions: three dimensions are the usual ordinary space dimensions, while the other two space dimensions are outside of the sphere of our sensory and instrumental perception. These two hidden dimensions influence the microscopic motion of particles and bodies. It must be stated that at various points in the development of the theory the concept of a physically undefinable immaterial body is introduced to which orbits and velocities are attributed. Quite honestly, for physicists it is very difficult to remedy this weak point. In any case, these two hidden dimensions are surprisingly correlated with the age of the Universe, in the sense that their correlation changes as the Universe evolves. Even this is an *ad hoc* hypothesis, without a formally implied connection (at least I did not perceive it) which is quite fascinating. After all, from Dirac onwards there have been hypotheses in Physics regarding the variability of physical constants related to the evolution of the Universe.

However, there is a further complication. The five dimensions in question are dimensions in the strict sense of the word, which are measurable in terms of length. Each length however, as we have seen in point 1), is time raised to the power of four, that is to say a hypercube of the fundamental time module. Therefore, the five macroscopic dimensions (three visible and two invisible) are the result of a space that is defined as an "underlying" space that is the set whose elements are the fundamental time module raised to various powers.

It is easy to appreciate the difficulty involved in handling these structures and substructures because they are not always bound by the rigorous notions of consequence and they are characterized by a significant hypothetical component.

3) The third element of Serapioni's Mechanics of Time consists of a system of parameters that is the basis of each derivation. Each formula that is presented in this theory is a product of these parameters, each raised to an appropriate positive or negative power. Some of these parameters are the result of a rather intuitive

choice; there are the first three prime numbers (2, 3, 5), with the latter justified above all by the number of dimensions, and the exponential constant “e” (Napier's number) used in the exponential form. There is a rather complex justification for the need of this exponential form. There are also three original parameters denoted as ε, γ, and θ. The first one represents a very small number and the second a number that is slightly greater than one. The reason for introducing these parameters is detailed in the theory. The third parameter is particularly significant both because it is connected to the reciprocal relation of the two hidden dimensions (which are part of the five dimensions), and because it represents a measure of the phase of evolution of the Universe from the Big Bang to the present time. It is not possible here to specify more clearly all these aspects. They are explained several times in the various volumes that Sergio has published in succession, (and which, in truth, are somewhat cryptic even when examined in detail).

Apart from the motivations justifying the introduction of these parameters, the fundamental point is that each one of the theory’s derived results is an appropriate combination of these parameters.

4) The fourth fundamental element that must be taken into account is the underlying kinetics in each part of the theory. There are descriptions almost in every page of particles and bodies performing microscopic circular or elliptical orbits (the shape of which is justified by Fantappiè's model), typically, but not always, at the speed of light. Notwithstanding the fact that these descriptions are explained with the help of many diagrams, they are very difficult to understand.

Up to this point, I have described the indispensable aspects to approach all of Sergio's work. It is not possible to relinquish any one of these aspects as otherwise the whole structure will not hold together because they are all linked with each other. Let us now look at the last two points to identify, uniquely from my point of view, the achievements and the limitations of this model.

5) Thanks to the parameters shown in point 3 and with the motion described in point 4 (obviously taking into account the interspatial geometry of point 2 and the fundamental module of point 1) the theory puts forward formulas that enable the calculation of the fundamental physical constants, including the mass and charge of some elementary particles. In general, the accuracy obtained is of 4-5 significant figures, which is good even though sometimes it is less than the

accuracy of the experimentally determined value.

It is certainly a surprising result, above all in the light of the fact that in Physics these values are only determined experimentally and that they do not have an intrinsic justification. It is precisely because of this fact that the author of all this work insists in affirming that the validity of the four fundamental hypotheses set forth above is justified *a posteriori* by the fact that values that have never been derived before are determined by this theory.

In addition to the value of the fundamental constants, the theory presents a model of the electron that is the basis of many of the above derivations and also of the description of other particles and the fine structure. There is also a calculation of the age of the universe.

6) The sore point of the whole model, which I, as well as other physicists who have analysed it, have not hidden from Sergio, is the fact that many of the exposed derivations are incomprehensible inasmuch as they are not characterized by the usual deducibility to which we are accustomed. This modular and dimensional complexity, with motion that envelops in successive and orthogonal dimensions, all based on non-familiar parameters, is such that the overall logic remains concealed in Sergio's head, and I know that he is tormented by the fact that he cannot express it as he wishes. In all honesty, I also have to say that Sergio’s mathematical formalism is rather weak and that does not help.

In conclusion, dear Sergio, I do not know what degree of truth there is in your theory, but it is certainly an admirable work and I hope that in future somebody will continue to examine it, as indeed it deserves.