TIME AS A MEASURE OF DURATION OF MOTION

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March, 2010 (Russian edition)

October, 2010 (English version)

Time and Space in physics and in the Secret Doctrine, past and future, time travel; Spiral of time, psychological and evolutional time, acceleration and deceleration of time; Hubble sphere, scannable Universe; dark matter, dark energy and subtle planes; big bang; artefacts: Yin and Yang, swastika, Mayan calendar and symbol G; stone labyrinths

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INTRODUCTION

> … it is well to know that no secret was so well preserved and so sacred with the ancients, as that of their cycles and computations. From the Egyptians down to the Jews it was held as the highest sin to divulge anything pertaining to the correct measure of time. It was for divulging the secrets of the Gods, that Tantalus was plunged into the infernal regions; the keepers of the sacred Sibylline Books were threatened with the death penalty for revealing a word from them. [SD2 – 396]

A distinct comprehension of the phenomenon of Time, or proper treating this concept is only possible when one deals with its definition. In other words, only by having defined the *concept* of time we may discuss its properties which are traditionally associated with this concept, such as simultaneity, past and future, existence of some absolute time scale, etc. However, the concept of Time, as that of Space, is still related to those fundamental primary notions which, as axioms, are accepted without universal definitions; instead, specific definitions are used for particular applications.

Philosophy, as a science (learning, or study) recognized by the current European civilization, is still unable to solve this contradiction in spite of the efforts of the human beings of great intellect. And this is naturally, since the formal logic, in the upshot, grounds its considerations on a system of basic concepts which, in the long run, are taken from physics. And as far as the physics, in itself, is developing, a philosophy remains a hostage of the former physical theories and therefore must change with development of newly adopted physical theories. This situation is especially dramatic when the concept of Time is studied, the concept an understanding of which has changed drastically during the preceding century. But whether physics provides us with the required concept at the moment?

Physics, in itself, also cannot solve this problem since it goes in a constructive way by using the operational definitions: in physics, Time, as a primary (or universal) concept, is neither defined nor analyzed. It is assumed that a parameter, called time, in a form of some scale exists at each point of the Space; but this parameter is not attributed with any property until we introduce some model explicitly which would define the measure and properties of time. Namely, for measuring the time an ***operational definition*** is introduced in which, within the adopted model ***M*** of the considered process ***P*** that develops under the fixed physical conditions ***C***, definite parameter ***T*** is considered which reflects general understanding of time as bringing of the sequential states of the process ***P*** into correlation with the chosen numerical scale (time scale) ***R***. This scale may present both a value of time, and a specified unit of time. In the former case the time is numerically defined for each state of the considered process; for instance, by the angle of gnomon in a sun-dial. In the latter case the unit of time is defined by the duration of oscillatory process between the specified states (or phases) of the process; as a rule, these states present the same specific physical situations; for instance – the maximal deviation of a pendulum.

In these circumstances the properties of time are defined both by the process itself (***P, C***), and by the properties of the adopted model (***M, T***) for this process. Therefore, physics defines the Time not as the universal (or general) concept, but in a sense of defining some ***Time Count System*** (TCS). Thus, if the classical physics deals with a singular universal time, the Special Relativity deals with an infinite set of inertial systems in which the clocks of the same type tick at different rates; moreover, in General Relativity the clock may tick faster or slowly depending on the gravity, etc.

For these reasons in physics and civil applications different Time count systems are used our days, where the base physical processes vary from Earth's motions to oscillation of atom. The base periods of the former processes are less stable [28], or even change monotonously, but they are more convenient for the respective applications; those of the latter – are more stable, but they may be inconvenient for practical purposes (e.g. there is no need in use GPS time in an alarm clock). For practical use that TCS is used which corresponds to the respective application by its cost, accuracy, stability and other properties; at that, in general, no problem arises with correlation of these 'times' due to the existence of the converting rules. For example, the Ephemeris time is convenient for astronomy, atomic time – for GPS, etc.

So, as far as apart from the process we must specify a model of time for a TCS to be defined, a series of Time Count Systems is currently in use [Supplement 1].

To a significant extent an uncertainty of the physical concept of time is stipulated by that, that in physical models ***Time*** presents a ***local parameter*** of ***Space-Time*** continuum. This means that though time *reflects* a universal property of the world, it is not invariant in its manifestations in a sense that in each point of physical Space it ticks in its own way depending on the speed, gravity, and other properties of that continuum at this point, and today may tick in other way than yesterday.

Besides, the relativity effects, including the relativity of simultaneity, and expansion of the Universe certify that Time, already on the level of physical world, manifests itself in a significantly broad spectrum of effects than intuitive perception of time suggests.

Therefore, in spite of the great successes of physics in *describing* the natural phenomena, which benefit to our understanding of the properties of physical time, ***we cannot identify*** these ***phenomena*** with their ***descriptions*** presented by mathematical models the adequacy and general completeness of which cannot be tested, as this is testified by the evolution of physical theories, in which the following one corrects and includes the previous. For these reasons such models cannot be used for defining a general concept.

Nevertheless, by taking into account the known physical *attributes* of time, that is the properties which we assign to Time with respect to one or another of the adopted physical models, we may consider physical time as a ***collective notion*** – as a parameter of mathematical models of physical processes (viz. those ***phenomena*** that can ***be observed*** and ***measured*** with the use of ***existing instruments***) which ***reflects Time*** (in general sense) ***in ordering*** the considered ***events*** (states) in the chosen ***numerical scale***.

Hence, within the methodology of instrumentalism being used in physics, the ***concept*** of ***physical time*** (or rather a ***Time count system***) may be defined as follows:

> Physical time ***T*** – is a ***parameter*** of ***mathematical model M*** of ***physical process P*** developing under the fixed physical ***conditions C*** the ***values*** of which are defined in the ***scale R*** with respect to the ***states S*** of this process.
>
> For obtaining the numerical values of this parameter a Clock is used – a physical instrument or method that allow us to ***measure time*** with respect to its ***operational definition***, or model $\Im = \{M, P, C, R, S\}$.

Making use of this definition and physical models allows us to obtain ***general properties*** of ***physical time***.

1. Time – is a numerical parameter of the ***adopted model*** $\Im$, which takes the ***values*** in the scale ***R***. Namely, it is a function *f(s)* that maps the states $s \in S$ to the scale $r \in R$.

2. Property 1 presumes that the scale presents a number space, but it does not state whether it is a continuous, or discrete set.

From operational (viz. mathematical) point of view this space may be either continuous, or discrete – depending on what model is more convenient for *calculations and/or measurements*. But physics, as the esotery, is more resolute: there are no physical *theories* which deny the continuity of time. For these reasons we should set up that the time scale is actually a continuous ***number space***.

However, from a practical point of view a continuous time scale is unachievable since absolutely exact measurements are not possible. For this reason a timekeeping is possible but just with some error Δ pertaining to the adopted model $\Im$.

Therefore, in any measurement a time scale presents, de facto, a discreet number space. In other words, any time scale used in timekeeping presents a ***discrete analogue,*** or ***Δ-approximation*** of the respective continuous time scale.

3. Further on, for a function *f(s)* to be defined correctly, it must present a ***one-to-one correspondence*** $\boldsymbol{S \leftrightarrow R}$; this means that for each state $s \in S$ there exists a unique value $r \in R$, where $r = f(s)$, and vice versa. This means that the set of states ***S*** must also be a continuous number space, and discreet – if a discreet approximation of time scale is used.

4. Moreover, the ***time scale does not arises by itself*** **:**

In theoretical models the ***scale R*** is considered as a numerical axis $E_1 = (-\infty, \infty)$ (it is also called the arrow of time) although *it is* ***not this axis*** *itself,* ***but*** the ***adopted model*** *describes the* ***properties of time***, that is the mathematical properties of the function *f(s)* which reflects the correspondence ***S→ R*** in accordance with the adopted model.

In practice, a ***one-to-one*** function for a ***numerical axis*** $E_1 = (-\infty, \infty)$ ***cannot be defined*** correctly for any ***of timekeeping*** system – simply because we are not provided with any suitable infinite process.

Therefore, ***for the purpose of timekeeping*** a scale is principally defined on the basis of the most stable but ***actual periodic processes*** which, at the current historical epoch, may be efficiently reproduced. In this case a scale is defined as a finite segment ***R = [0, T]*** where ***T*** is called a unit ***of time*** (pertaining to the model $\Im$) if we fix that ***T = 1***, or period ***of the process P*** if we fix the length of this process to be equal to ***T*** (in this case the unit of time makes 1/T). For example, a revolution of the Earth around the Sun makes a time unit of 1 year, or a period of 365 days.

For convenience, the fractional units are also considered (hours, etc.), but this, as a choice of value ***T*** differing from ***1***, ***changes*** but the scale factor, ***not the scale*** itself.

What is ***important*** – a ***function*** *f(s)* ***can be defined in a variety of ways*** for the same set of states ***S***; an example is the ***mean*** and ***true solar times*** which give different values for the same Earth's orientation.

For the purpose of timekeeping of longer durations *we* ***choose a*** process being quite stable in its reiterations *and the* Origin – a state of the chosen process, which is ***optionally*** taken ***for the beginning*** of the ***first cycle*** of the adopted process. After then, the correspondence ***S → R*** is specified by the following function

$$r = F(s) = N \times T + f(s)$$

where N – is the number of cycles that passed since the beginning of the first cycle.

In this case, for the given N the function $F(s)$ must present a ***one-to-one*** correspondence between the segments $[N \times T, N \times T + T]$ and S.

5. As far as the physical time is a parameter that takes values in a ***numerical axis*** $E_1 = (-\infty, \infty)$ with respect to the ***scale*** of the selected model $\Im = \{M, P, C, R, S\}$, it ***does not present*** *an* invariant, that is a quantity that, in general, preserves its value with a change of model, since no guarantee exists that in a new model the function *f(s)* is the same. In particular, if the clocks based on different models are tuned to have the same ticks, it may turn out that later on they show different time; for example, due to fluctuations in the base processes, or relocation of the clocks.

Thus, although the use of the ***concept of physical time*** has allowed us to reveal the essence of a lot of new phenomena, to create a complicated technical systems and to effectively manage them, ***the concept*** of ***Time still remains indefinite*** in the Western philosophy. Besides, this concept ***is still stuck*** to those ***phenomena*** only which could be ***observed with physical instruments***. And our ***intuitive perception*** of ***time*** is wandering far and far ***away*** from its ***physical essence***.

Meanwhile, for more than a century an ambiguous situation takes place: the trustworthy people including the scientists certify the ***existence*** of ***inexplicable phenomena***, in particular – those which are associated with time, which are ***neither related*** with ***physical reality*** (viz. to a sphere of physical observations and experiments) ***nor treated in physics***. These phenomena are excluded from a set of physical facts on account of the reasonable "internal" cause – at present, physics just in rare cases may observe them with instruments, actually lacking the facilities to reproduce and theories to explain these phenomena. Among them are the confirmed cases of vision of the past and future.

Although these facts have not gained any physical explanation, already their existence has confirmed that the physical models do not suffice for all aspects of time (as general notion) to be explained.

On the other hand, have we to limit our understanding of time by just the physical theories? The more so as they replace each other and do not treat the bulk of the phenomena in question which, in definite cases, can also be quantized. Besides, if the physics considers a series of non-synchronous and non-linear time count systems, why must we demand the processes of other nature to be linear with one of them?

It is clear that we cannot obtain the answers to these questions from the vicious circle of physical and associated philosophical concepts. For this, we have to consider a system of concepts which would allow us to treat the phenomena that were turned down by physics.

Fortunately, to this end there is no need to invent anything new since such system was brought to our civilization at the name of the Secret (or Esoteric) Doctrine, or Theosophy, at the end of XIX century; but, unluckily, it remains "secret" – virtually, since rare scientist would say a word of it, and the most part of those who relate themselves to esoterists prefer more simple systems.

Although ***Theosophy*** does ***appeal*** to ***rely on science***, it is difficult to imagine the opposite – that physics would rely on the former, because the Secret Doctrine deals with the subjects which are not present in physics dealing with a highly formalized concepts and measurable quantities. But this is possible indirectly – on the level of concepts. On the contrary, this very formalization does not give physics the arguments for rejecting the Secret Doctrine, since the most part of the concepts of the latter simply does not defined in the former: a blind cannot talk over a sunset, an ignorant in Chinese cannot discuss Chinese verse.

All the more, we may see that the actual development of physics relative to Time and Space *de facto* follows the way of embodiment of a series of the concepts that were verbally formulated in the Secret Doctrine, but in mathematical models. And this is a general rule that a mathematical model to be preceded with a verbal description.

In reality ***there are no irreconcilable contradictions*** *between* ***Theosophy*** *and* ***physics***: not only there are no objections for a two-way exchange in concepts between Theosophy and physics, this exchange, as we will see below may benefit to both of them: physics, or other science may derive new ideas, whereas Theosophy, as the ancient area of knowledge, may obtain new evidences of its sooth – "new" in a sense that they are expressed in terms of our level of physical knowledge.

During the last decades a lot of various theories were put forward relative to the genesis of solar system, Earth, and life on this planet, both in physics (gravitation, cosmology, etc.) and in the adjacent fields of knowledge. Fortunately, as a matter of fact there is no need to select one of them or invent a new one for gaining better understanding of the general essence of Time and Space. It is enough to look attentively to the already existing paradigm, or system of concepts, although this actually requires some effort.

Publication of the Secret Doctrine [1-7] started since the late 70-ies of the XIX century. It presents two basic paradigms as to the evolution of the Universe, or more exactly – of the Earth and Solar System (Cosmogenesis), and humanity (Anthropogenesis). Pay attention, that some of its concepts pertaining to Time and Space, that were not evident for intuitive perception of the surrounding world, were stated 10 – 15 years before the issue of the first revolutionary works in physics that started to change cardinally the understanding of the nature of Time and Space; as it is shown below, the essence of these concepts, in verbal presentation, corresponds to the essence of those ideas which form the basis of the theory of relativity and other contemporary physical models, but far from being limited to them.

However, in the Esoteric Doctrine the concepts of Space and Time are not presented so as it is accepted to do in a conventional manual on physics or mathematics – as a sequential development of the source postulates (or axioms) by entering the definitions and studying the properties of new concepts that are obtained with the use of binary logic. Among other things, the most important distinctions are as follows: the postulates and properties of the considered objects are published, but not to a full extent; the deduction which is used in the Esotery, in general, is not limited to the binary logic, but presumes "accommodating the extremes"

Concealment of definite concepts, cycles and terms is explained by the esoteric maxim that the ***Time***, in the entirety of its attributes including the duration of cycles, ***is protected*** as ***one*** of the ***greatest mysteries*** of the Esoteric Doctrine, a disclosure of which can cause undesirable consequences. As the knowing of peculiarities of physical time provides us with a key which allows us to monitor the physical (or material) processes, so the knowing of esoterical aspects of Time may give us an instrument for exerting influence to evolutional and other processes, which is not allowable for the modern level of consciousness of humanity.

Accommodation of extremes denotes a possibility of concurrent admission of "opposite" properties which in this case are not considered as mutually exclusive (alternative). For example, with respect to possession of wealth we may divide people into two categories – greedy and lavish (considering the intermediate levels do not change the essence of the example). In this case Accommodation of extremes may denote that a man could be referred to both categories simultaneously, if he, for instance, is greedy with respect to children and lavish – with respect to expenditures in his spare time; so, he is both greedy and lavish.

Other peculiarities in presenting the Secret Doctrine are also present. Nevertheless, it provides concepts which, in aggregate, allow us to form a well-defined paradigms of Cosmogenesis and Anthropogenesis, including the goals, driving forces and other aspects of evolution of Cosmos and humanity.

Cognizance of these concepts may, at least, spare us of false guidelines in our studies, whereas following them, even on a level of general ideas, may open up possibilities for development of new grounded models relative to Time and Space since in Theosophy they make the unity.

In this connection the goal of this work consists in finding a conceptual correlation between the physical and esoterical paradigms of Time and, on this ground, in extending our knowledge relative to this phenomenon; in particular – for obtaining a definition of Time that may be applied, constructively and universally, to the processes of various nature.