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The Ultimate Judge: Time does not Flow since it is the Fourth Dimension of the Real World

By Vesselin Petkov

Since ancient times thinkers have been suspecting that the perceived flow of time does not reflect a true feature of the world and is nothing more than a stubborn illusion. This suspicion was forcefully supported by the ultimate judge - the experimental evidence - by demonstrating that the experiments which confirmed the predictions of the theory of relativity would be impossible if reality were what we all perceive - an evolving in time three-dimensional world with a real time flow. The higher reality, glimpses of which we perceive through our senses, turned out to be a four-dimensional world (spacetime) in which all moments of time exist at once as the fourth dimension.

Eleatic school
Group of Presocratics (tracing back to Parmenides) who think being of the world is unalterable while becoming is just an illusion.

Logical Arguments Imply that the Flow of Time is an Illusion

More than 25 centuries ago the representatives of the Eleatic school of thought (Parmenides, Zeno, Melissus, and Xenophanes) first explicitly argued that the perceived image of the world coming from our senses might be drastically different from the true reality. Parmenides insisted that an analysis of what we *all* perceive would unavoidably reveal that many things about the world, which we regard as self-evident, were illusions and that being (what exists) is eternal and unchanging:

> *"There are very many signs: that Being is ungenerated and imperishable, entire, unique, unmoved and perfect; it never was nor will be, since it is now all together, one, indivisible." (Coxon 2009: 64)*

Dichotomy
is a division into two contrasting pieces of time.

For this reason Parmenides regarded the perceived flow of time (our feeling of a perpetual transformation of the non-existent future into the existent present, and of the existent present into the non-existent past) as self-contradictory (because being is eternal and nothing can come into or go out of existence) and argued that time does not belong to the true reality: "And time is not nor will be another thing alongside Being, since this was bound fast by fate to be entire and changeless." (Coxon 2009: 74)

As the Eleatic view so openly contradicts our perceptual experience it had been mostly ridiculed since the time of the Eleatics. This attitude prompted Zeno to demonstrate to those who regarded motion and change as self-evident that it is their view, which naively reflects what comes from our senses, that leads to contradictions. Zeno formulated a number of paradoxes for this purpose such as the *Dichotomy* - if an object travels from a point A to a distant point B, it has to travel first half of the distance AB, then half of the remaining half, and so on; as the object has to travel an *infinite* number of such distances (since every distance can be divided into two) and as each of these travels needs some time, the object would need an infinite amount of time to travel the infinite number of distances and would never reach B.

Aristotle showed that Zeno had arrived at the paradox, because he explicitly presupposed that space was divisible to infinity, but implicitly assumed that time was not infinitely divisible (if both space and time are infinitely divisible, there is no paradox – if, for example, a distance of one meter is traveled by an object for one second, the object will travel half a meter for half a second and so on, and will not need an infinite amount of time to reach the end point B). In Book VI of his *Physics* Aristotle wrote about Zeno's implicit assumption that time is not infinitely divisible: "This is false; for time is not composed of indivisible nows any more than any other magnitude is composed of indivisibles." (Barnes 1984: §9).

However, when Aristotle discussed the nature of time itself in Book IV of Physics – that of all times (past, present, and future) only the present time (the mo-

ment 'now') is real – his logical analysis inescapably led him to the *opposite* conclusion: that the only real moment of time is "the indivisible present 'now' " (Barnes 1984: §13); Aristotle knew that the duration of 'now' could not be zero, because then time would not exist at all. He realized that he had no choice but to assume that the moment 'now' is indivisible in order to avoid a contradiction in terms – if the moment 'now,' which by definition is wholly present, were divisible, it would contain past, present, and future moments:

> *"All time has been shown to be divisible. Thus on this assumption the now is divisible. But if the now is divisible... there will be a part of the now that is past and a part that is future... It is clear, then, from what has been said that time contains something indivisible, and this is what we call the now." (Barnes 1984: §3)*

The very fact that Aristotle, one of the greatest thinkers of our civilization who single-handedly created the science of logic, was led by the common-sense view (that only 'now' is real) to the inescapable contradiction – the present moment is both divisible and indivisible – implies that that view is wrong. Aristotle seems to have tried to identify the cause of this contradiction. In Book IV of his *Physics* he appears to have considered the possibility that the contradiction was caused by the seemingly self-evident assumption that the division of time into past, present and future reflected an objective fact in the world and wondered whether that division and the very idea of time might exist only in the mind (or the soul): "Whether if soul did not exist time would exist or not, is a question that may fairly be asked." (Barnes 1984: §14).

The Ultimate Judge Rules against the View that Time Flows

In science it is the ultimate judge - the experimental evidence - that decides the fate of a theory and therefore the fate of any view based on that theory. Philosophers seem to believe that they cannot be touched by the ultimate judge. However, as philosophy is the study of the nature of everything that exists it too cannot be exempted from the ruling of the ultimate judge, particularly its branch metaphysics which studies the world (and even more specifically ontology). I think the major reason for the (sometimes) open tension between scientists and philosophers is the position of perhaps most philosophers that metaphysical claims cannot be tested experimentally. Scientists simply do not understand such a position (which prompted some to call it "artistic approach toward the world") - how could metaphysical claims about the nature of time, for example, be exempted from a severe ruling of the ultimate judge specifically on the very nature of time (e.g., how could philosophers ignore experiments which prove that all moments of

time exist equally and therefore there is no flow of time)? Isn't it true that both philosophers and scientists are studying and talking about the *same* thing - time (and whether it flows)?

Time dilation is a phenomenon of different time indexes with synchronously started but relatively moved clocks.

For years, such a ruling exactly on the very nature of time has been continuously delivered - virtually every second global navigation systems (such as GPS - the global positioning system) use (and therefore confirm) the relativistic effect that deals directly with the nature of time - time dilation. Time dilation is also being constantly confirmed in the particle accelerators. Both time dilation and another relativistic effect - length contraction - were tested experimentally by the muon experiment (time dilation in the ground reference frame, whereas length contraction in the muon reference frame); see for instance (Ellis, Williams 1988).

As length contraction and (reciprocal) time dilation are specific manifestations of a third relativistic effect - relativity of simultaneity - all three relativistic effects have been *repeatedly* confirmed by experiment. Now, on the basis of these experiments, I will show why the ultimate judge rules against the view that time flows, that is, why *these experiments would be impossible if reality were what our senses appear to suggest - an evolving in time three-dimensional world with a real time flow.*

This is perhaps best demonstrated by length contraction explained by Einstein's mathematics professor Hermann Minkowski himself who in 1908 reformulated Einstein's special relativity and demonstrated that it is a theory of an *absolute* four-dimensional world (Minkowski 2012), which contains *all moments of time given at once* (since they form the fourth dimension). In the Minkowski four-dimensional world (which we now call spacetime) the ordinary three-dimensional objects of our perceptions (including our bodies) are four-dimensional worldtubes which contain the *entire* histories in time of the ordinary three-dimensional objects (as a visualization of a worldtube consider the film strip of an old movie - it contains the whole story of the main actor *at once*, but we watch on the screen how that story unfolds moment by moment, i.e., how time flows for the main actor).

Upper figure: Fig. 1

Lower figure: Fig. 2

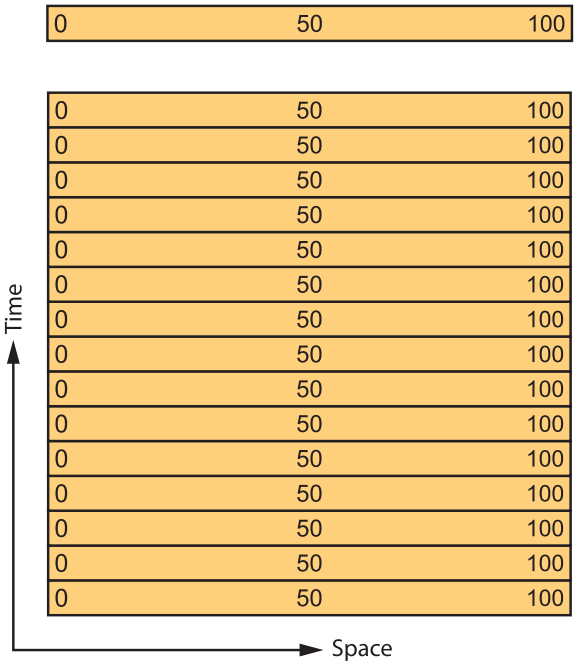
Minkowski's explanation of length contraction (which is the accepted explanation) - that a moving observer A measures a shorter length of a meter stick at rest with respect to another observer B - demonstrates that the worldtube of the meter stick (a four-dimensional object) is intersected by the three-dimensional spaces of the two observers in relative motion at *different* angles and the resulting 'cross-sections' are of different lengths; A's 'cross-section' (the meter stick measured by A) turned out to be shorter than B's 'cross-section' (the meter stick measured by B).

Two things should be kept in mind to understand the physical meaning of length contraction:

(1) *The worldtube of the meter stick must be real in order that length contraction be possible* - only then the spaces of the two observers in relative motion can intersect the worldtube at *two different* 'cross-sections' (measured by A and B as *two* three-dimensional meter sticks, one of which is shorter).

(2) That A and B measure *two* meter sticks is not so surprising when one takes into account that a spatially extended three-dimensional object is defined in terms of *simultaneity* (all parts of a body taken *simultaneously* at a given moment) and also the fact that in the theory of relativity *simultaneity is relative* (what is simultaneous for one observer is not simultaneous for another observer moving relative to the first). So even if we do not mention Minkowski and worldtubes, the very definition of a three-dimensional object implies that while measuring the *same* meter stick, A and B, which move relative to each other (and therefore have *different* classes of simultaneous events), will measure *two different* meter sticks since a meter stick is a class of simultaneous events (which is possible *if and only if* the worldtube of the meter stick is a real four-dimensional object). What is the *same* meter stick is the worldtube of the meter stick, whereas the *two different* meter sticks, measured by A and B, are the two three-dimensional 'cross-sections' resulting from the intersection of the worldtube and the spaces of A and B.

It should be stressed that if the worldtube of the meter stick were an abstract geometric construction and what existed were a *single* three-dimensional meter stick (which constitutes a single class of simultaneous events), both observers would measure the *same* three-dimensional meter stick of the *same* length, i.e. the *same* class of simultaneous events, which means that simultaneity would be *absolute* and there would be no length contraction. So, if the meter stick were

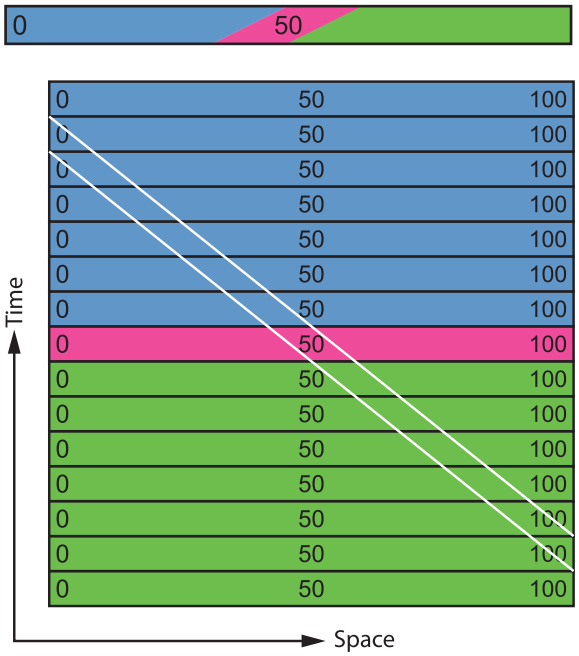


a three-dimensional object, neither relativity of simultaneity nor length contraction would exists, which means that all experiments mentioned above (that repeatedly confirmed these relativistic effects) would be impossible. This conclusion can be easily generalized - as a three-dimensional world is defined as everything that exists *simultaneously* at the present moment (as a *single class of simultaneous events*), if reality were a three-dimensional world evolving in time, then at every moment all observers would share this single three-dimensional world (since nothing else exists); therefore they would share the same single class of simultaneous events, which means that relativity of simultaneity would be impossible in contradiction with the experimental evidence.

This explanation demonstrates how the ultimate judge indisputably ruled against the view that reality is an evolving in time three-dimensional world with a real time flow. To understand this ruling even better, since it has far-reaching implications for our view of the world, it will be helpful to consider the following thought experiment, which visualizes Minkowski's explanation of length contraction.

This thought experiment clearly demonstrates that length contraction of a meter stick would be impossible if the meter stick existed as a three-dimensional body (not as a worldtube). An ordinary three-dimensional meter stick at rest with respect to an observer A is shown in fig. 1. What we see in the figure is what we perceive and take for granted that it is what really exists. According to Minkowski, however, the meter stick exists *equally* at all moments of its history and what is ultimately real is the worldtube of the meter stick as shown in fig. 2 (only part of the worldtube is displayed in the figure).

Assume that another meter stick at rest in another observer's (observer B's) reference frame moves relative to the first one at a distance 1 mm above it. Let us assume that at the event M the middle point of B's meter stick (the mark "50 cm") is instantaneously above the middle point of A's meter stick. Lights are installed at every point inside A's meter stick, which can change their color *simultaneously* at every instant in A's frame. At the event of the meeting M all lights are red in A's frame. At all previous moments all lights were green. At all moments after the meeting all lights will be blue. When A and B meet at event M this and only this event is present for both of them. At that moment all lights of A's meter stick will be *simultaneously red for* A. In other words, at M the present meter stick for A is red (that is, all parts of A's meter stick, which exist simultaneously for A at M, are red). All moments before M, when all lights of the meter were green, are past for A, whereas all moments when the meter stick will be blue are in A's future. Imagine that B's meter stick contains cameras, instead of lights, at every point along its length. At the event of the meeting M all cameras



Upper figure: Fig. 3

Lower figure: Fig. 4

take snapshots of the parts of A's meter stick which the cameras face. At event M all snapshots are taken *simultaneously* in B's reference frame. Even without looking at the pictures taken by the cameras it is clear that not all pictures will show a red part of A's meter stick, because *what is simultaneous for A is not simultaneous for B*.

When the picture of A's meter stick is assembled from the pictures of all cameras it would show two things as shown in fig. 3 - (i) A's meter stick photographed by B is shorter, and (ii) only the middle part of the picture of A's meter stick (as measured, i.e., photographed by B) is red; half is green and the other half is blue. So what is past (green), present (red), and future (blue) for A, *exists simultaneously as present for B*. But *this is only possible if the meter stick is the worldtube* as shown in fig. 4.

For a more detailed explanation of the ruling of the ultimate judge against the view that reality is a three-dimensional world and that time flows see (Petkov 2009: Chaps. 5-6) and (Petkov 2013: Chap. 5); for the most counter-intuitive and provoking implications of the higher four-dimensional reality discovered by Minkowski see (Petkov 2013: Chaps. 8-10). I believe it is clear that refusing to accept and even face the ruling of the ultimate judge only because of the huge challenges it poses, and trying to squeeze Nature into our pre-set and deceivingly comfortable views of the world should not be an option for anyone in the 21st century.

Vesselin Petkov received a graduate degree in physics (University of Sofia), a doctorate in philosophy (Bulgarian Academy of Sciences) and a doctorate in physics (Concordia University, Montreal). He is one of the founders and current director of the Minkowski Institute (minkowskiinstitute.org/).

Bibliographien

Peter Adamson: A Very Brief History of Time - S. 10

Peter, Adamson. 2012. "Galen and Abū Bakr al-Rāzī on Time", In: R. Hansberger and C. Burnett (Hrsg.): Medieval Arabic Thought: Essays in Honour of Fritz Zimmermann, London: Warburg Institute

Ursula Coope. 2005. Time for Aristotle: Physics IV. 10-14, Oxford: Clarendon Press

Richard C. Dales. 1990. Medieval Discussions of the Eternity of the World, Leiden: Brill

Herbert A. Davidson. 1987. Proofs for Eternity, Creation and the Existence of God in Medieval Islamic and Jewish Philosophy, New York: Oxford University Press

S.H. Rizvi. 2006. "Between Time and Eternity: Mīr Damād on God's Creative Agency," In: Journal of Islamic Studies 17: 158-76.

K. Seeskin. 2005. Maimonides on the Origin of the World Cambridge: Cambridge University Press

Alexander Klier: Zeitsouverän arbeiten und leben im digitalen Zeitalter - S. 16

Baumgartner, H. M. 1994. Zeit und Zeiterfahrung. In: ders. (Hrsg.): Zeitbegriffe und Zeiterfahrung. Karl Alber: Freiburg, S. 189 – 216

Bandura, A. 1977. Self-Efficacy: Toward a Unifying Theory of Behavioral Change. Psychological Review, Nr. 84 (2), S. 191-215.

Janich, P. 2013. Die Gedankenleser. Gründe für Grenzen neurophysiologischer Ursachenforschung. In: Welt der Gründe: XXII. Deutscher Kongress für Philosophie. 11.-15. September 2011 an der Ludwig-Maximilians-Universität München. Hamburg, S. 498 – 516 [Fehler hier: im Artikel steht 2013; hier ursprünlich 2012]

Klier, A. 2007. Betriebliche Synchronie. Tectum: Marburg

Klier, A. 2008a. Soziale Zeitautonomie. Zum Zeitmanagement von Projekten, Gruppen und Teams. In: PersonalEntwickeln, 121. Erg.-Lfg.

Klier, A. 2008b. Work-Life-Balance. Zur Verschränkung einer problematischen zeitlichen Trennung. In: PersonalEntwickeln, 126. Erg.-Lfg.

Luhmann, N. 1971. Die Knappheit der Zeit und die Vordringlichkeit des Befristeten. In: Politische Planung. Aufsätze zur Soziologie von Politik und Verwaltung. Opladen: Westdeutscher Verlag, S. 143 – 164

Maurer, A. 1992. Alles eine Frage der Zeit? Die Zweckrationalisierung von Arbeitszeit und Lebenszeit. Edition Sigma: Berlin

Rammert, W. 2006. Technik, Handeln und Sozialstruktur: Eine Einführung in die Soziologie der Technik. http://www.ts.tu-berlin.de/fileadmin/fg226/TUTS/TUTS_WP_3_2006.pdf

Sebastian Knell: Wenn der Tod die Tür eintritt. - S. 20

Bostrom, Nick. 2005. „The Fable of the Dragon Tyrant". In: Journal of Medical Ethics 31: 273-277.

De Grey, A. 2005. „Life-Extension, Human Rights, and the Rational Refinement of Repugnance". In: Journal of Medical Ethics 31: 659-663.

Harris, John. 2007. Enhancing Evolution. The Ethical Case for Making Better People. Princeton, N. J.: Princeton University Press.

Kurzweil, Ray /Grossmann, Terry 2005. Fantastic Voyage: Live Long Enough to Live Forever, New York: Plume.

Knell, Sebastian. 2015. Die Eroberung der Zeit. Grundzüge einer Philosophie verlängerter Lebensspannen. Berlin: Suhrkamp.

Wittwer, Hector. 2009. „Warum die direkte technische Lebensverlängerung nicht geboten ist". In: Knell, S./Weber M. (Hrsg.): Länger leben? Philosophische und biowissenschaftliche Perspektiven: 210-232. Frankfurt/M.: Suhrkamp.

Michaela Ott: Die Zeitphilosophie von Gilles Deleuze - S. 34

Deleuze, Gilles. 1992. Differenz und Wiederholung. München: Fink

Merleau-Ponty, Maurice. 1966. Phänomenologie der Wahrnehmung. Berlin: de Gruyter.

Petkov: The Ultimate Judge: Time does not Flow since it is the Fourth Dimension of the Real World - S. 38

Barnes, Jonathan (Ed.). 1984. Complete Works of Aristotle, Vol. 1, Princeton: Princeton University Press

Coxon, A.H. 2009. The Fragments of Parmenides, Athens: Parmenides Publishing

Einstein, Albert. 1955. Quoted from: Michele Besso, Wikipedia (http://en. wikipedia.org/wiki/Michele_Besso)

Ellis G.F.R. and Williams, R.M. 1988. Flat and Curved Space Times, Oxford: Oxford University Press p. 104.

Minkowski, Hermann. 2012. Space and Time: Minkowski's papers on relativity, edited by V. Petkov, Montreal: Minkowski Institute Press

Petkov, Vesselin. 2009 Relativity and the Nature of Spacetime, 2nd ed., Heidelberg: Springer

Petkov, Vesselin. 2013. From Illusions to Reality: Time, Spacetime and the Nature of Reality, Montreal: Minkowski Institute Press