ACADEMIA | Letters

# *An observer-oriented theory with distorted time, or a system-oriented theory with universal time.*

Tuomo Suntola, Physics Foundations Society

---

We are taught to think that the description of relativistic phenomena requires distorted time and distance. The message of this paper is that in a holistic perspective, time and distance are universal coordinate quantities, and relativity is a direct consequence of the conservation of energy. Instead of the kinematics/metrics-based approach of the theory of relativity, a holistic approach starts from the dynamics of space as a whole and expresses relativity in terms of locally available energy instead of locally distorted time and distance. In such an approach, e.g., the frequency of atomic clocks at different states of motion and gravitation is obtained from the quantum mechanical solution of the characteristic frequencies, and the unique status of the speed of light becomes understood via its linkage to the dynamics of space.

In an observer-oriented solution by kinematics and metrics, the speed of light and the rest mass of particles are conserved » time and distance are functions of motion and gravitation relative to the observer which makes, e.g., clocks measure different time in moving frames.

In a system-oriented solution by dynamics, time and distance are universal coordinate quantities, and the total energy in space is conserved » the rest energy of mass particles is a function of local motion and gravitation, which makes, based on the quantum mechanical solution, the frequency of atomic clocks a function of motion and gravitation.

## From space-time to universal time and metric fourth dimension

In the spacetime concept, line element in the fourth dimension is $ds = c\,dt$, the speed of light $c$ times a time differential $dt$. The fourth dimension is called time but measured in meters [(m/s) s=m]. Honoring the dimensions, rather than 14 billion years of time, we are at a dis-

*Academia Letters, August 2021* 

**Corresponding Author:** Tuomo Suntola, tuomo.suntola@gmail.com
**Citation:** Suntola, T. (2021). An observer-oriented theory with distorted time, or a system-oriented theory with universal time. *Academia Letters*, Article 3416. https://doi.org/10.20935/AL3416.

tance of 14 billion lightyears from a starting point. Such a starting point is common to all matter in space, which means that the observable three-dimensional space forms a hypersphere with the radius of 14 billion lightyears increasing at the speed of light in the fourth dimension. The barycenter of the three-dimensional space is not in space but at the center of the hypersphere in the fourth dimension. Space as the expanding hypersphere offers a system-oriented perspective as an alternative to the observer-oriented perspective of the relativity theory.

The dynamics of spherically closed space can be solved as that of a spherical pendulum; instead of an instant explosion, the big bang, matter in space has got its energy as the energy of motion against the release of gravitational energy in a contraction phase before the singularity turning the contraction into the ongoing expansion. The pendulum solution shows the rest energy of matter as the energy of motion in the fourth dimension balanced by the gravitational energy arising from the barycenter representing the total mass in space.

Maintaining the zero-energy balance, the buildup of local structures in space converts part of the momentum and the energy of motion in the fourth dimension into momentum and kinetic energy in space via local bending of space. Such a process occurs in several steps creating a system of nested energy frames linking the local states of motion and gravitation to the state at rest in hypothetical homogeneous space. The "deeper" objects are in local structures, the higher share of their energy is bound to local motion and gravitation which is observed as reduced rates of internal physical processes like the ticking rate of atomic clocks. There is no need for a separate relativity theory, relativity appears a direct consequence of the conservation of energy - with time and distance as universal coordinate quantities.

## Historical perspective

The Copernican revolution disclosed the structure of the planetary system enabling the study of physical interactions in the system. The system-oriented heliocentric perspective replaced the observer-oriented geocentric Ptolemaic perspective. By analogy, as an alternative to the observer-oriented perspective of the relativity theory, space as hypersphere offers a system-oriented perspective to whole space and allows a straightforward derivation of the dynamics of the contraction-expansion process as well as predictions for cosmological observables and celestial mechanics. The holistic perspective allows major simplification of the cosmological picture and mathematics, without compromising the accuracy of predictions.

Both the zero-energy principle and spherically closed space are well-known ideas. A hypersphere was Einstein's original idea of the cosmological picture of general relativity [1]. The zero-energy universe has been proposed by Dennis Sciama [2] and Pascal Jordan. Combining the two is problematic without the fourth dimension of metric nature.




**Corresponding Author:** Tuomo Suntola, tuomo.suntola@gmail.com
**Citation:** Suntola, T. (2021). An observer-oriented theory with distorted time, or a system-oriented theory with universal time. *Academia Letters*, Article 3416. https://doi.org/10.20935/AL3416.

In his lectures on gravitation in the early 1960s, Richard Feynman introduced spherically closed space as an intriguing suggestion [3] giving a natural explanation to the symmetry of the expansion of space. Also, he pondered the equality of the total gravitational energy and rest energy in space as a great mystery [4] but did not link the idea to spherically closed space.

A detailed analysis of the dynamics of spherically closed space is presented as the Dynamic Universe (DU) model [5]. DU can be seen as a detailed solution combining Feynman's "great mystery" of zero-energy space to the "intriguing suggestion of spherically closed space". Such a solution does not work in the framework of the theory of relativity which is based on the constancy of the speed of light, and time as the fourth dimension. The dynamic solution requires universal time and a metric fourth dimension that allow velocity and momentum equally in the fourth dimension and the three space dimensions. Everything in DU-space is interrelated. The speed of light, as well as the rates of most physical processes, are related to the velocity of space in the local fourth dimension. The energy structure of space is described as a system of nested energy frames with hypothetical homogeneous space as the universal frame of reference to all local frames in space. The wavelike mass substance offers a basis for the ontology behind quantum mechanics.

## The choice

The theory of relativity postulates the constancy of the speed of light and the rest mass. As a consequence, for describing relativistic effects, time and distance are distorted in frames in motion or at a different gravitational potential relative to the observer. In the theory of relativity, distorted time and distance are authorized by the postulated relativity principle which establishes the observer-oriented perspective.

The holistic perspective based on a hypersphere contracting and expanding with the energies of motion and gravitation in balance relies on the zero-energy principle with early roots in Aristotle's entelecheia, the actualization of potentiality. Time and distance are used as universal coordinate quantities essential for human comprehension [6]. Mass is the substance for the expression of energy; mass was energized in the contraction phase preceding the ongoing expansion phase.

Both approaches produce precise predictions. The choice is philosophical - nature is not dependent on the way we describe it.




**Corresponding Author:** Tuomo Suntola, tuomo.suntola@gmail.com
**Citation:** Suntola, T. (2021). An observer-oriented theory with distorted time, or a system-oriented theory with universal time. *Academia Letters*, Article 3416. https://doi.org/10.20935/AL3416.

## References


1. A. Einstein, *Kosmologische Betrachtungen zur allgemeinen Relativitäts-theorie*, Sitzungsberichte der Preussischen Akad. d. Wissenschaften (1917).

2. D.W. Sciama, Mon. Not. R. Astron. Soc. **113** 34–42 (1953).

3. R. Feynman, W. Morinigo, and W. Wagner, Feynman Lectures on Gravitation (during the academic year 1962-63), Addison-Wesley Publishing Company, p. 164 (1995).

4. R. Feynman, W. Morinigo, and W. Wagner, Feynman Lectures on Gravitation (during the academic year 1962-63), Addison-Wesley Publishing Company, p. 10 (1995).

5. T. Suntola, *The Dynamic Universe: Toward a unified picture of physical reality,* fourth edition, Physics Foundations Society, Espoo, Finland (2018), Academia.

6. A. Styrman, *Relativity vs. Absolute Simultaneity: Varying Flow of Time or Varying Frequency?* Physics Essays 31(3), July 2018, DOI: 10.4006/0836-1398-31.3.256 (2018), Academia.





**Corresponding Author:** Tuomo Suntola, tuomo.suntola@gmail.com
**Citation:** Suntola, T. (2021). An observer-oriented theory with distorted time, or a system-oriented theory with universal time. *Academia Letters*, Article 3416. https://doi.org/10.20935/AL3416.