SPACETIME-OPERATORS

CREATIVE PHYSICS 7.

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FOREWORD

We present a **consistent spacetime** whose **spacetime-operators** are involved in physical processes, as opposed to spacetime theories that attribute physical effects to an intangible and immeasurable mathematical product.

We draw conclusions on a logical basis, keeping our feet on the ground. No thought experiments, conjecture, continuum, expansion, or space warping! What may seem implausible at first glance is not supported by thought experiments, but by real experiments.

It will be shown that information (formation) is a fundamental material property, while time has only a limited place among the fundamental quantities, because the information needed to describe quantizations or repetitive motions or collisions overlaps with definitions of time as continuous or elapsed.

Quantization refers to the repetitive motion of elementary parts, the repeated recording of discrete values, such as the motion of gas molecules, collisions, wave motion, or the orbit of celestial bodies. One known tangible case of quantization is the bounce of a ping-pong ball, which we use as a model.

More *than* 90% *of* the known universe[1] is made up of quantizing, colliding helium and hydrogen atoms, ions, molecules and plasma. The rest of matter is also quantized, just possibly less so than gases. The molecules collide and move to form a non-continuous material. This motion is also called thermal motion, but we ignore this because we do not consider heat to be an independent or autonomous physical quantity.

We used to talk about the dimensions of space and the dimension of time, and spacetime[2] , which is neither one nor the other, but the common difference between the dimensions of space and time. Mathematics tolerates such differential equations, but reality has always resisted current interpretations of spacetime. It is no coincidence that the number of theories and discussion papers on spacetime is growing exponentially.

The author has tried to support his claims with factual and logical arguments, but there may still be errors in the writing. It is important that errors are identified and corrected, and any comments, suggestions or rebuttals are welcome at istvan@magai.eu and via the other contact details provided at www.magai.eu.

1 https://www.sciencetimes.com/articles/11524/20170403/hydrogen-is-the-most-common-element-heres-the-reason-why.html

2 https://wigner.hu/s/matolcsi/old/pdf/jegyzet/terido.pdf

WHAT'S WRONG WITH TIME?

Suppose that time passes continuously[3] , while we break it down into periods of time using our calculus. Periods of a given length are used to measure velocity in an inertial frame[4] , which is by definition bounded by the environment and in which a force is required to change the state of motion of the body.

Our predecessors chose time as one of the basic quantities. From the basic quantities, the incremental quantities can be derived by multiplication. In the system of units of measurement, the units belonging to the system can be converted into each other without restriction. No mathematical functions need to be used. This is called the coherence criterion.

In 1960, the international community declared by convention the SI *(Système International d'Unités)*[5] International System of Units. Basic quantities: length, mass, time, electric current, absolute temperature, quantity of matter, luminous intensity, and their corresponding units: metre, kilogram, second, ampere, kelvin, mole, candela.

If we consider that in an inertial frame, time flows inside the wall in its own way, and we only use a section of it, then there is no illegal wall crossing. We do, however, have our own time that cannot be used outside the wall.

If you take another inertial system, independent of the previous one, you can only have joint activity between the two isolated inertial systems by transformation[6] , but then everything is still going its own way and neither system can see into the other.

It is quite different if we do not want to establish a connection between two inertial systems, but if we want to observe both one and the other. The first should be the measured system, the second should be the measuring system with our known timing device. The observer is supposed to observe both and then decide on the time elapsed in the process. Now that's a pretty gross error. Time and its measurement process are thoroughly confused. Time is a basic SI quantity and its measurement is just a photograph for the album. It is a still image of a perceived event in the process of happening.

In addition, the time measurement cannot be repeated like a length measurement. To repeat a time measurement, the change in the environment would have to be reverted back to the starting point in time, which is logically and empirically impossible, and therefore the coherence condition of the SI system is violated.

In practice, we compare the time interval between two selected times to the operation of our timing device. The elapsed time is read from the timer by the observer/instrument, not produced by the process being observed.

The observer presses an imaginary stopwatch when he is convinced that a moving mass has reached a certain point and measures the time elapsed until the mass reaches another point. We say that we have measured the elapsed time, which could be a characteristic of, for example, a movement at an average speed. The measured time is related to the process by the observer, but this does not make the measured time a real part of the observed process.

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3 http://pospet.web.elte.hu/Bevezetes_a_modern_fizikaba_v069.pdf

4 https://hu.wikipedia.org/wiki/Inerciarendszer

5 https://hu.wikipedia.org/wiki/SI-m%C3%A9rt%C3%A9kegys%C3%A9grendszer

6 http://pospet.web.elte.hu/Bevezetes_a_modern_fizikaba_v069.pdf 2.2.1

In the inertial frame, inertial forces act, or we relate changes to an external inertial observer[7] . By definition, in any inertial frame, in any direction, light propagates in vacuum at the same speed[8] . This could only be measured in an absolute vacuum, which does not exist and is therefore only a theoretical limit.

There is another barrier, which stops our attempts to approach the speed of light earlier. One of the cornerstones of the relativity principle is that to accelerate a point of mass m_0 to a velocity v requires kinetic energy E_k[9] [10] . The acceleration is initiated from a stationary position and is related to a fixed coordinate. The *c is* the exact value of the speed of light in vacuum according to the SI 299792458 m/s, which we use in rounded form: c=300000 km/s.

$E_k=\frac{m_0}{\sqrt{1-v^2/c^2}}c^2-m_0c^2$ If the speed v reaches 259807 km/s, then the equation:

$E_k=\frac{m_0}{\sqrt{1-259807^2/300000^2}}c^2-m_0c^2$ after the selected actions have been performed:

$E_k=m_0c^2$ is simplified to a given form <u>at a given speed *v*</u>.

In thought experiments using inertial frames, we are used to thinking that the counterforce of the accelerating force is not much to deal with, even though we can only increase the kinetic energy of a point of mass if there is an external *"launching position"* with an inert mass. If a launching station with an inert mass is subjected to a force, which in our case is the reaction force of another force accelerating the mass, it will also start to accelerate in the opposite direction. This is how firearms recoil when a projectile is accelerated. **It follows that, in reality $E_k=m_0c^2$ the kinetic energy calculated by the equation is twice as high as the kinetic energy required for a point of mass m_0 to reach velocity *v*.**

Kinetic energy cannot be interpreted in itself or in relation to a theoretical coordinate point. It can only be created or transformed into potential energy relative to a real point of mass, and therefore $E_k=m_0c^2$ equation incorrectly links mass m_0 and kinetic energy E_k for acceleration to velocity *v.*

The inconsistency is even more apparent if we substitute the known total rest mass of the universe into the m_0 rest mass point. In this case, it is not possible to use a launching station because there is no matter left to absorb the reaction force. This obviously renders the thought experiment useless.

In a static or slowly changing system, this inconsistency does not cause a numerical measurement problem. We measure distance, mass, elapsed time and that's it, but in a fast moving system[11] it's a different story.

Theories and calculations about space and time become increasingly unreliable as the speed of motion increases. This realisation gave rise to the idea of spacetime[12] as a theoretical tool, which began to present an increasingly realistic picture through thought experiments and conjecture. Numerous validation experiments have also been made, but the debates have not yet settled.

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7 https://wigner.hu/s/matolcsi/old/pdf/jegyzet/terido.pdf 1.1 2.5.3

8 Albert Einstein, Special and general relativity, A speciális és általános relativitás, Gondolat Budapest, 1973.

9 https://fizipedia.bme.hu/index.php/Speci%C3%A1lis_relativit%C3%A1selm%C3%A9let (3.5.12)

10 https://courses.lumenlearning.com/suny-physics/chapter/28-6-relativistic-energy/

11 Fast motion means motion at a speed comparable to the speed of light.

12 https://wigner.hu/s/matolcsi/old/pdf/jegyzet/terido.pdf

WHAT'S WRONG WITH THE MASS?

There are also too many mass definitions and derivations, most of which are not even comparable. Let's start first with point mechanics.

Newton's laws[13] are regarded as axioms of physical practice, i.e. as fundamental laws that do not need to be proved because experience has already proved them. His statements relate to the change in the state of motion of point-like bodies with (inert) mass, the effect of the accelerating force on the mass, the effect-counter-effect and the independence or superposition of the forces.

Newton's laws are fine as long as you are theorising the motion of a point of mass. As soon as we try to interpret the combined effect of several mass points (mass of gas molecules or celestial bodies), or the repeated effect of a mass point, quantization (bouncing, vibration, orbit), then the summation becomes a task requiring considerable creativity.

When examining gaseous materials, we cannot ignore the fact that molecules and atoms move in elastic collisions in the gas space. This motion is also called thermal motion, but we do not do this here because heat treated as a continuum is not suitable for characterizing quantizing elements.

In the interval between collisions, the gas molecules have kinetic energy, which they have received from their environment during the collision, but this energy is inaccessible to the environment, i.e. it *remains "in the dark",* just as dark matter that is likely to be in space but is said to be dark is imperceptible to our instruments. Yet it wouldn't be if the quantization information were taken into account.

The quantizing molecules do not collide to our sensors all at once, but fly around a little freely until they are in turn. **The order is based on an embedded "(in)formation".**

In practical measurements, we tend to say that a lack of matter or energy can be some kind of internal or hidden energy. Thermodynamics considers thermal energy to be such an internal energy, and we only measure its effect on the environment by means of a condensation measurement, from which we calculate "*on average, how much energy flows from the warmer body to the colder body".*

150 years ago, our ancestors thought that heat was a medium (caloric) that flowed, but we now know that there is no such medium. There are molecular or atomic collisions in matter, but they are not treated by thermodynamics as quantizing features caused by particles colliding with kinetic energy. We can calculate the change in internal energy or thermal energy for a given mass using fictitious numerical procedures, specific heat and temperature differences, but we cannot localise, detect, measure or reverse the change.

We cannot repeat a heat transfer experiment because heat is only transferred from the warmer body to the colder one. We cannot restore the initial state, we can only try a parallel experiment with a new similarity between the two, if we want to validate our measurement method. This is the second law of thermodynamics.

In thermodynamic energy conversion processes[14] we do not usually take time into account. Thermodynamics, based on practical experience, uses the SI compatible temperature and mass basis

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[13] I. S. Newton, Philosophiae Naturalis Principa Mathematica (1687) Londini, MDCLXXXVII.

[14] https://www.academia.edu/35859617/Thermodynamics_and_Statistical_Mechanics_An_Integrated_Approach_Robert_J_Hardy_Christian_Binek_pdf?email_work_card=title

sets, but by excluding the time basis set, it violates the coherence condition, i.e. it is not possible to derive the change in time from the change in temperature by multiplication and multiplication.

Based on the above, we must say that thermodynamics is not compatible with the SI system of units. Is it the differential of time or the differential of temperature that is faulty, or perhaps both? Thermodynamics is mainly based on empirical knowledge, and therefore represents experience, if understood correctly.

Under pressure from chemists, the quantity of matter "*mole*"[15] has been included in the SI base quantities, because they don't want to suffer with physical definitions of mass.

Continuum mechanics, based on the conservation of momentum theorem[16] , assumes that *at* "*low velocities*" the inertial mass and the theoretical rest or passive gravitational mass are equal, sometimes identical: $F=m\ dv/dt$. The calculation of the dynamical effects is based on the inertial mass, which is the same as in the theory of relativity[17] which assumes independent dimensions, fields and a definition of continuous energy.

It is here that one of the most significant flaws in continuum theories can be found: the misinterpretation of the relation between the inert mass and the rest mass[18] .

The collisions of gas molecules, the duration of the collisions and the time rate of free-running depend on the kinetic energy, the cross section of the collision characteristic and the free collision distance of the molecules. Since more than 90 % of the known matter of the universe is hydrogen and helium, the characteristics of the motion of their atoms, molecules and ions can be regarded as a sufficiently general rule pervading the material world.

Particles in liquid and solid states also quantize, but to a lesser extent than gas molecules. *The "hidden"* or "dark" part of the universe becomes perceptible and visible during collisions and quantizations, and then starts to move freely again, where only mass attraction or other continuous weak interactions towards the rest mass prevail.

In the environment of molecules, the collision process is the effective part and the free rush is the ineffective part. The average ratio of "*effective / ineffective*" kinetic energy is currently estimated to be 1/20 in the Earth's atmosphere and 1/3 in the average of the known universe, which is decreasing as the universe expands. In the object known as the black hole[19] , the ratio is believed to be greater than 10^5 . The closer the known universe is assumed to be to its theoretical starting point, the higher the average (effective / ineffective) kinetic energy ratio.

It is a fascinating question why the average ratio in the much sparser space is 1/3, where orbit dominates, when in the denser Earth's atmosphere it is only 1/20. This ratio makes it likely that cosmic clumping or densification processes do not just occur in response to gravitational forces, but that quantization information also plays a strong role in the outcome.

So far, we have mainly talked about the collision of atoms, but we have seen that the quantization effect can also be the fluctuations in gravitational field due to the orbit of celestial bodies, and other pulsating, rippling effects. Because of the large distances and weak interactions of known space objects, we have focused here on atomic collisions, which are orders of magnitude more intense.

15 https://hu.wikipedia.org/wiki/Anyagmennyis%C3%A9g
16 https://fizipedia.bme.hu/index.php/Megmaradási_törvények_a_mechanikában
17 Albert Einstein, Special and general relativity, A speciális és általános relativitás, Gondolat Budapest, 1973. P. 32.
18 Albert Einstein, Special and general relativity, A speciális és általános relativitás, Gondolat Budapest, 1973. P.38.
19 https://science.nasa.gov/astrophysics/focus-areas/black-holes

It is assumed that the amount of energy transferred during cosmic phenomena is an order of magnitude smaller than the kinetic energy transferred during collisions, and can therefore be neglected at the Earth scale.

The energy content and reactions of subatomic particles are not included in the estimate of dark matter because they are already represented by gravitational mass in bound form, according to the mass-energy equivalence[20] .

Due to the supposed "*expansion" of the* known universe, the amount of inefficient kinetic energy increases, but the amount of efficient and inefficient kinetic energy and matter is constant. We can also say that the universe, which is said to be expanding, is "*darkening*" as a whole.

We can say that the concept of dark matter was born out of theoretical and measurement errors. It was based on the erroneous hypothesis of the identity of rest mass and inert mass [21][22] [23] . The effect of quantization was not taken into account. We were wrong.

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20 www.vilaglex.hu/Lexikon/Html/TomEnOsz.htm

21 YEARBOOKS OF THE HUNGARIAN ACADEMY OF SCIENCES, SIXTEENTH VOLUME 1877-1882. BUDAPEST 1884. BR.EÖTVÖS LORÁND P. 60.

22 László B. Szabados, One hundred years of general relativity, MTA Wigner Research Centre for Physics, Száz éves az általános relativitáselmélet, MTA Wigner Fizikai Kutatóközpont, 25 January 2015, P. 4.

23 https://fizipedia.bme.hu/index.php/Speciális_relativitáselmélet

KINETIC ENERGY AS A BASIC QUANTITY

To avoid the aforementioned problems of time and mass measurement and derivation, we choose a basis set that can be used equally for dynamic effects, high speed of motion, and realistic material and energy bundles consisting of quantization elements, without transformation. Not only the rate of change, but also the absolute value of the quantity relative to its environment can be determined.

The kinetic energy of a point of mass, which can be determined relative to its environment and satisfies the mass-energy equivalence requirement[24] , is chosen as the base quantity. It is a quantity known and used for centuries in point mechanics. Energy conservation theorems have been imposed on it. Using it, there is no problem in taking relativistic mass forces into account, because kinetic energy is itself a relative quantity that gives a real value in any inertial frame.

The conservation of energy axiom (the first law of thermodynamics) states that the total energy of an isolated system is constant. The change in the total energy of a non-isolated system is equal to the sum of the energies introduced into the system from the outside. We do no different, we just track the effect of the change in kinetic energy from molecule to molecule, between bodies, or even from galaxy to galaxy.

Kinetic/motion energy is a measurable physical quantity that is transferred in practice without loss in the case of gas molecules. During molecular collisions, kinetic energy and potential energy are converted back and forth into each other.

The kinetic energy can be expressed by $E_k = 1/2\ m\ v^2$, where m is the inertial mass of a point of mass (atom, molecule, celestial body) and v^2 is the square of the velocity of motion relative to its surroundings. From the kinetic energy of a point of mass, the other variable can be calculated from the mass or velocity. The amount of kinetic energy in a collision or deceleration can also be determined from the effect on its environment.

If you have multiple mass points or multiple collisions, you will need to introduce information on the collision frequency, because this will determine the average effect, pressure, force that a given kinetic energy has on its environment.

At the same time, the kinetic energy will exert a larger average force, or pressure, or momentum integration on its surroundings if the centre of mass bounces more frequently in a narrower gap. For those who are surprised by this finding, the following bouncing experiment is provided, which anyone can repeat if they have any concerns.

The importance of energy is shown by the lobby of quantum physicists who introduced the quantity "*electron volt (eV)*" into the SI measurement system - as a non-coherent quantity. Of course it is not coherent with embedded temperature and time! Unfortunately, the wrong of the contradictory quantities was chosen for the SI! Thus quantum mechanics remains an outcast from the physics of the macro world.

It is proposed to include kinetic/momentum energy in the basic quantities of the SI system. At the same time, the use of time and temperature quantities should be restricted to static and low velocity states, where the results are numerically consistent with those calculated from point mechanics.

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24 https://hu.wikipedia.org/wiki/T%C3%B6meg-energia_ekvivalencia

BOUNCING EXPERIMENTS

Figure 1 shows an experiment that anyone can repeat at home if in doubt. Many of us have noticed that a ping-pong ball dropped on the table bounces more and more frequently until it stops completely. The ball moves slowly as it is lost. This process is analysed using a data logger and a piezoelectric force gauge.

A ping-pong ball is dropped from a height of 80 mm onto the force-sensing bumper by releasing the upper bumper. The four vertical guide rods ensure the vertical movement of the ball. Bouncing occurs with decreasing amplitude bouncing off the force sensor surface until the bouncing stops due to losses. This process takes 1.8 s for a ball dropped from a height of h = 80 mm. A piezoelectric (dynamic) force transducer is fixed on the bottom stop, and its electrical signal is processed by a PC via a data logger.

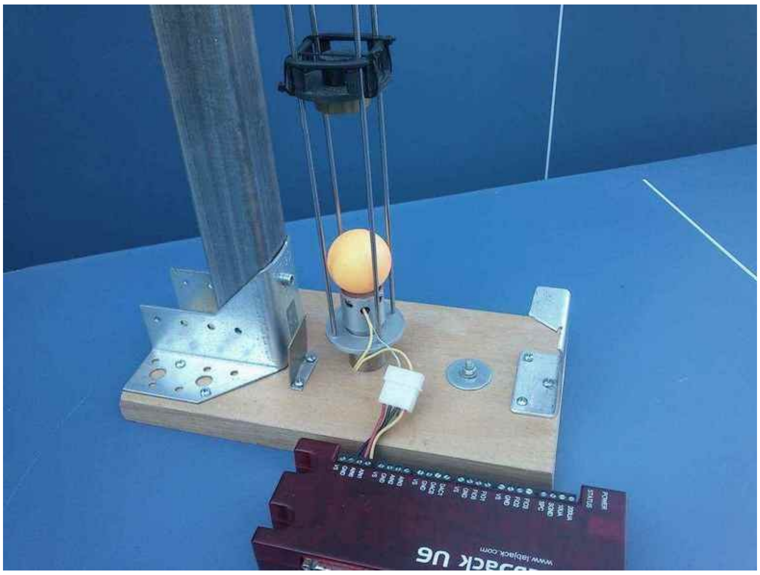

Figure 1, Dropped ping pong ball

Figure 2 shows the stress signal versus elapsed time as a function of force. The positive values above the time axis show the deceleration force of the keeper on the ball, the negative values below the axis show the acceleration force of the rebound as a function of elapsed time. (For a ping-pong ball of mass $m=2.8$ g, the maximum velocity v=1.26 m/s according to the energy conservation equation $mgh=1/2mv^2$ and the length of the impact process t=0.0004 s are used to calculate the average value of the deceleration force F=8.82 N of the first impact using the momentum conservation equation $Ft=mv$.

The maximum impact force of $F^* = 1.414F = 12.5$ N is equivalent to the amplitude of 3.2 V *in Figures 2 and 3* due to the near-sinusoidal run-off.)

The collisions shown in *Figure 2* follow each other with decreasing amplitude and smaller pauses as the ball has less kinetic energy after bouncing. The initial period time decreased to the 30th part after 1.4 s, i.e. the ball bounced 30 times more frequently at the end compared to the first.

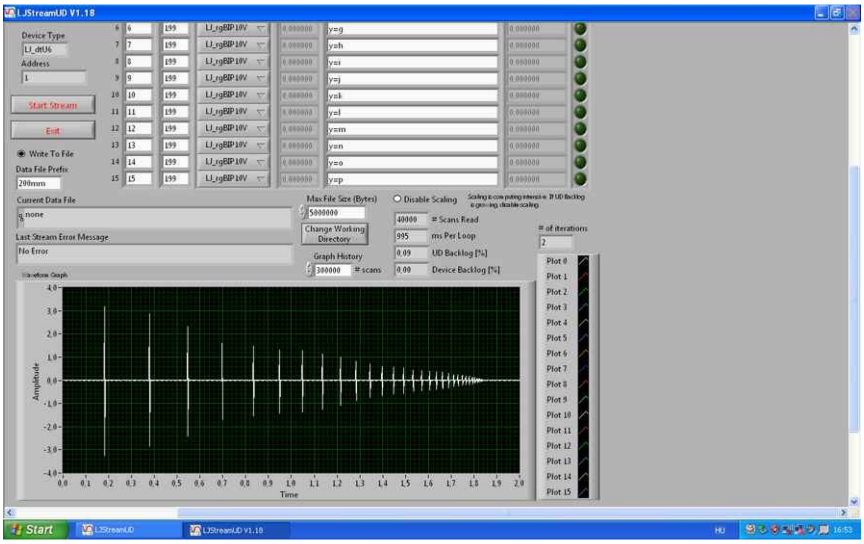

Figure 2, Force - time function at 80 mm drop

Figure 3 shows the magnified force-time function for the first impact after a drop of 80 mm. The other curves have a similar shape but with smaller amplitude.

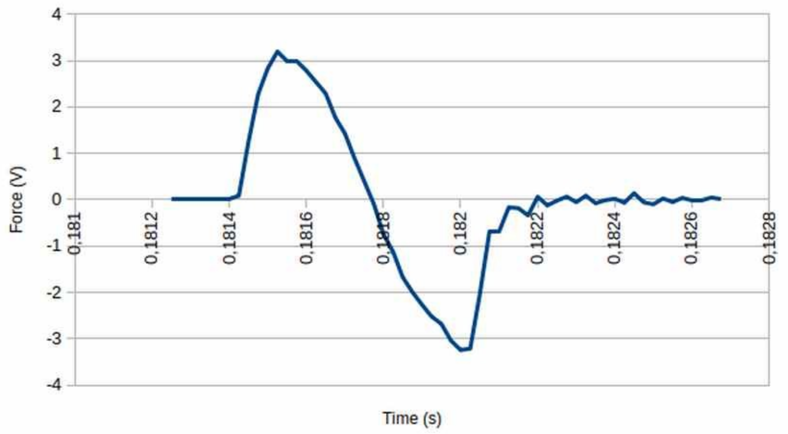

Figure 3, Force . time of impact after 80 mm drop

Results:

The magnitude of the deceleration impulse given off by the ball is obtained by integrating the positive part of the time function of the force. Integrating the negative part of the function gives the acceleration impulse returned. The difference between the two is the deformation loss. In the table below, we cut two equal parts from the bounce time of the 80 mm drop. The first section starts at 0.08775 s. The magnitude of the momentum transmitted by the ball to the sensor during each period is calculated by numerical integration over the period based on the samples taken.

Time period:	0,08775 - 0,79375 s	0,794 - 1,500 s
Impulse series integral (Ns)		

Equal momentum series integrals were obtained over two equal time intervals of *t=0.706 s* (within 0.5% error), despite the fact that the maximum momentum of the ball impact decreased from an initial 12.5 N to 2.23 N. The corresponding kinetic energy reduction ratio was $12.5^2 / 2.23^2 = 31.4$, jointly caused by drag and deformation losses. If this test had been carried out with a sensor capable of measuring static force, the potential energy accumulated during collisions could have been measured, which, because of the energy loss, would have given the same result.

While the ball is bouncing, it must receive momentum from its surroundings in the collision process, the time integral of which is sufficient to lift it against gravity. The only open question was whether the integral of the momentum series would change in the meantime. The kinetic energy decreased significantly while the pressure towards the environment, i.e. the time-summed/integrated momentum, did not change.

Part of the kinetic energy from the bounce was used for drag and deformation losses, which were dissipated into the environment, but the residual kinetic energy of the bounced ball, due to the accelerated bounce, continued to exert unchanged static pressure on the keeper, which is also part of the environment. The static pressure corresponds to the potential energy measured towards the environment, which is not reduced during decelerating motion but more frequent bouncing. The displacement of the pressurised surface in the direction of pressure represents work. Finally, it is worth asking whether static pressure, potential energy, kinetic energy and the momentum integral can form a consistent physical system.

What exactly happens in a collision? A ball of mass *m=2.8 g* collides with the force measuring impactor of mass *380 g* at a velocity *v=1.26 m/s* with kinetic energy $E=1/2mv^2 = 0.0022$ *J.* During the impact, the shell structure of the ball compresses like a spring. The potential energy stored in the deformed spring due to the force *F* is *E=1/2Fs, which* is converted back to kinetic energy at the time of ejection, minus losses. (The relative displacement of the keeper is also included in the deformation losses.)

The force accompanying the release of the kinetic energy of the colliding ball pushes the collider, which can be investigated by another kinetic method. This method is based on the momentum or conservation of momentum principle. The momentum of the ball is defined by $P=mv$ where v is the velocity of motion. The momentum exerted by the ball is $P=Ft=0.0035$ *kgm/s, where* F is the average force and t is the time of impact.

In an elastic collision process, the sum of kinetic and potential energies is constant. No matter how fast or slow the transformation occurs, the end result is always the same. This is why we have chosen kinetic/kinetic energy as the base quantity for our study.

The average force acting continuously on a unit area of surface is called pressure (static pressure in a flowing medium). A surface moving under pressure does work on its surroundings, so the pressure is called potential energy (energy = work capacity). The time integral of the force is just equal to the momentum, or momentum series, acting on the surface. The compressive force of pressure is expressed in (*N*). The impulse is expressed in (*kgm/s*), or (*Ns*). If the integration of the momentum series (collision of gas molecules) is carried out for just 1 s, then the magnitude of the momentum with a value X (*Ns*) will also be a force with a value X (*N*). This is the pressure force of the pressure.

Our problem statement is also supported by the literature[25] , only the "*energy-momentum space" of* the diagram of Figure 2 used there does not solve the quantization problems.

Repeating our measurements with different drop distances and integration lengths gave the same results.

To generalise: if a ball bouncing with kinetic energy reduced by environmental braking has the same cumulative effect (momentum, pressure, acceleration) on its environment as it had before the kinetic energy was removed, it follows that the energy delivered to the environment by friction between individual impact events and the potential energy delivered to the environment by the entire momentum sequence are not additive (subtractible) quantities.

We have a ball moving in slow motion, whose kinetic energy is also decreasing, but the potential energy it exerts towards its surroundings (the striker/keeper) remains unchanged. This result proves that there must be something else in the system that has a decisive influence on the energy balance.

This influence is called information (in-formatio). The key to a consistent description of bounce is quantization-information, which in this case is the change in bounce frequency.

It can be seen from the above that the static pressure created by the quantization and collision of mass points towards the environment, i.e. the potential energy, cannot be determined by the kinetic energy of the colliding element, because the integral of the momentum series in the non-energy measure is the determinant.

We have previously stated that the conservation of energy theorem states that the kinetic energy of the mass points before and after the ideal collision is unchanged, but we must add that the macro potential energy, which varies as a function of the quantization information, cannot be left out of the equation. If this energy was not generated "*out of nothing"* but satisfying the first law of

[25] https://fizikaiszemle/archivum/fsz1102/bokor1102.html Figure 2

thermodynamics, then we must confirm that the quantization information is equal to energy and its effect must be included in the energy balance.

In contrast, the usual thermodynamic explanation is that a bouncing ball loses energy through external and internal friction, which is converted into heat ($Q=C_p\ mdT$) *and* released into the environment. When the kinetic energy ($mgh=1/2mv^2$) generated from the positional energy is fully converted into heat, the bouncing stops. A critical element of these calculations is the determination of the specific heat C_p at constant pressure and the temperature change dT.

In this explanation, the frequency of bouncing is irrelevant. There is also no consistent theory for the static pressure run-off that accompanies the bounce. This deficiency, in the case of energy conversion processes in flowing media, can be partially filled by algorithms with complex empirical elements.

The above experimental setup is modified by not creating the motion of the ball by freefall, but by using the acceleration force of a preloaded spring release to provide the initial kinetic energy. (see *Figure 4*) After launch, the ping-pong ball bounces between the upper and lower bumpers until it slows down enough to reach the upper bumper. From then on, it produces a movement similar to the previous free-throw version.

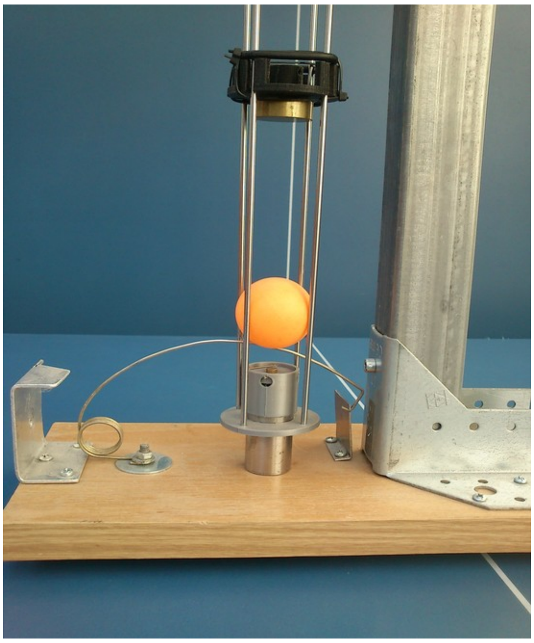

Figure 4, Spring launch

In the present experiment, we seek to find the answer to the question of how much momentum series integration is produced by a ball of the same initial velocity, i.e. the same kinetic energy, bouncing in different slots of different sizes, over the integration time of 0.25 s.

Numerical integration results:

Bounce gap size:	100 mm	160 mm
Impulse series integral (Ns)	573	367

It can be seen that a ball bouncing at the same initial velocity in the narrower gap generates, as expected, a larger momentum integral towards the environment.

The integral of the momentum series is also proportional to the force exerted on the environment (per unit area), which can also be called static pressure. The applied force, or pressure, is a potential energy that can do work by displacing the pressurized part of space towards the environment.

It is worth mentioning that the literature also uses the kinetic energy of gas molecules to describe the pressure generated by a set of molecules. For example, Dr. Árpád Veress in his textbook Heat and Flow Theory I[26] in the chapter on the interpretation of pressure in kinetic gas theory refers to the relation formulated by R. Clausius that "*the pressure of a gas can be calculated as the sum of*

26 Dr. Árpád Veress, Thermodynamics I. Thermodynamics Part 1, BMEKORHA104, BME, Hő- és áramlástan I. Hőtan 1. rész, BMEKORHA104, BME 2019.02.04.

the kinetic energies of the molecules in a unit volume".

We have no problem with this seemingly plausible, theoretical definition until we want to add up the kinetic energy of molecules. Molecules can move in all directions in space and sometimes collide elastically. We usually refer to the pressure per unit surface area, against which the gas molecules occasionally collide and bounce. By pressure we mean the average force exerted per unit area, a quantity often used in kinetics.

Averaging, or summing, is also "*difficult*" because not all molecules hit the wall at the same time (not even for the sake of measuring pressure), so the sum of the molecular kinetic energies quoted above is not in itself sufficient to determine the effect on the environment, i.e. the pressure.

We could say that the hidden part of the kinetic energy is certainly the stored heat, but thermodynamics cannot give the absolute amount of heat, it only calculates numerically the change in heat as the product of the empirical specific heat, the temperature difference and the rest mass when heat is transferred. Without heat exchange or temperature change, the kinetic energy remaining in the gas medium remains hidden to thermodynamics.

A further problem is how long to count and wait for the molecules to collide with the measuring surface to sum up their kinetic energy. A molecule may collide several times or not at all. During the collision process, the kinetic energy decreases (sometimes to zero) and then increases again. What effect does this energy conversion process have on the environment?

When molecules are closer together, i.e. the average free collision distance is smaller, collisions occur more frequently even if their kinetic energy, calculated *from their "forward motion",* remains unchanged or possibly decreases. More frequent collisions imply a higher combined force, a higher pressure, over a given sampling period.

From our ping-pong ball experiment above, we can see that R. Clausius' statement quoted above about the collision frequency of molecules cannot be interpreted without knowing the information.

As we have seen, the effect of all the kinetic energy of the molecules never appears at the pressure measurement surface at the same time, so only a small fraction of it creates the (static) pressure. The small fraction is given by the ratio of molecules in collision to molecules moving freely.

In contrast, the time integral of the collision momentum series is proportional to the pressure, which implies that kinetic energy and collision momentum are not alternative or mutually deducible quantities, despite the fact that much of the literature based on the continuum principle incorrectly deduces one from the other by simple summation.

Based on our repeatable and reproducible experiments, it can be stated that the change in the frequency of quantization events, i.e. the reporting of quantization information, allows a consistent determination of the energy transferred to or received from the environment, or the work done.

Quantization information is an integral part of the environmental, macro energy balance.

In systems containing quantizing elements, we cannot speak of independent matter, energy, information.

The quantization information is not carried by bits, scraps of paper or memory, but is contained and transmitted by matter itself, in a process, from discrete event to discrete event. We can also say that after one collision of a bouncing ball or a gas molecule involved in a series of collisions, we do not know what cumulative effect (pressure, work, acceleration...) it will have on its environment until the next collisions occur.

The material and energy systems and their components that we observe and manipulate cannot be studied independently and without knowledge of their antecedents, because the processes of the quantizing events are the combination of the information that is decisively incorporated into the preceding events and the external, manipulating information that creates the continuation.

There is no material process without embedded information, since the effect of matter and/or energy on its environment, its potential or kinetic energy, is determined by the embedded information.

Based on the above, we need to distinguish between the energy balance of quantization events that are part of a physical process and the energy balance of a complex process that is influenced by information accompanying multiple quantization events.

Seeing the results of our ping-pong ball experiment, we can say that quantization information can change the complex, macro energy balance by "*reorganizing the hammering"* through more or less frequent quantization.

This phenomenon calls for the introduction of a new spacetime based on information and kinetic energy!

SPACETIME AND INFORMATION

The known literature on spacetime is so vast that we cannot attempt to summarise it here. We will merely refer to the fact that spacetime is the result of the joint differentiation of three (or more) spatial dimensions and their associated (fourth) time dimension[27] . Spacetime is a mathematical product that provides a way to explain certain phenomena and opens the door to imagination and fiction. Its use requires numerical procedures constructed on the basis of experience.

Relativistic space-time cannot be derived from the coordinates and geometry of space, nor from the concept of time. It is not a measurable quantity and is therefore not compatible with the SI system of units. We usually talk about spacetime[28] as a mathematical quantity, as a common differential of the dimensions of space and time.

Another formal problem is that space and time are not independent variables due to the dynamic properties of the motion process, so their joint differential is not a consistent quantity. For example, we associate to the space dimensions the velocity of motion and the acceleration inertia, which are time-dependent variables. To formulate a consistent differential equation, each dimension/variable would have to be independent of the other.

If the time differential is wrong in principle, corrections must be introduced to obtain results that can be validated by practice. This is what constants and numerical procedures are for. Data repositories, tables and design aids abound. Numerical methods work, just don't question the principles, they say.

We argue that the continuum-based relativistic spacetime theories are so far removed from measurable reality that we cannot use them as a basis for formulating our consistent theory. We need a different definition of spacetime if we are to treat quantities and changes as actual physical phenomena.

In the previous chapters, we have detailed how problems with time and mass have triggered a chain reaction of corrections, whereby dilations, contractions, transformations and a mass of empirical data ensure that numerical results approximate reality.

What if we started from kinetic energy instead of time? If we wanted to differential time coherently, all we would have to do is express the velocity v *from* the kinetic energy $E = 1/2mv_k^2$ and differential the time $x/v=t$, where x is the distance travelled between quantizations. For slow moving systems, nothing would change numerically.

Kinetic energy is inherently a relative quantity and is subject to the law of conservation of energy. To extract it, no contraction or dilatation must be calculated. The various theories of relativity do not question its existence or its effects, they merely derive it incorrectly. Kinetic energy in any inertial frame, and in interactions between inertial frames, can be interpreted without transformation. Quantum mechanics and point mechanics make full use of it. For real bodies, extended matter, it is necessary to introduce the effect of information embedded in matter.

Because of the quantization effects, information is an indispensable basic quantity if we want to resolve the contradictions between quantum mechanics and macro physics (including relativity models).

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27 Kornél Sailer, Introduction to Quantum Mechanics, University of Debrecen, EFT, Bevezetés a kvantummechanikába, Debreceni Egyetem EFT Debrecen 2002-2008.

28 https://fizipedia.bme.hu/index.php/Speci%C3%A1lis_relativit%C3%A1selm%C3%A9let

Quantum mechanics has already taken a step forward by incorporating the quantity of energy called "electronvolts, eV" into the SI system. All that is needed is the addition of a spacetime-operator containing the quantization information to make it consistent with the macro system.

The introduction of spacetime in the last century was a seminal scientific event, but shouldn't a derivation closer to the scientific knowledge of the time be found?

Time and temperature did it 100 years ago as a basic quantity, but quantization-driven science is breaking down the scientific structure built on continuum principles.

A. Einstein also defined space-time as a continuum, which quantum mechanics has nothing to do with.

INFORMATION DISSEMINATED IN THE FORM OF MATERIAL

We first look at quantizing, colliding gas molecules with kinetic energy.

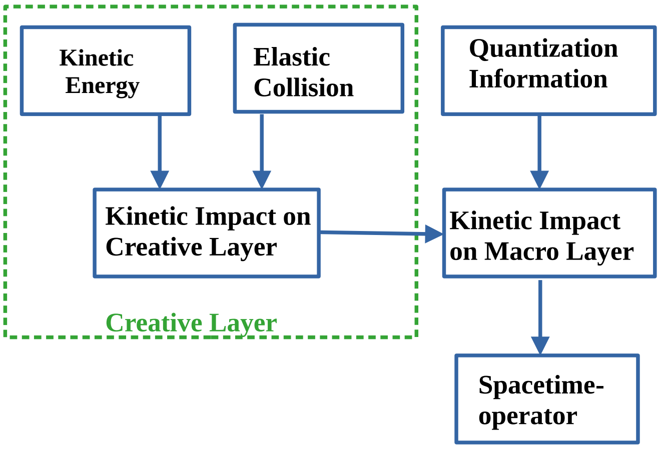

Figure 5: Impact process

A molecule moving with kinetic energy collides elastically with its environment. (See *Figure 5*) This process creates a kinetic effect/impact that can be consistently described and calculated in the given situation using the tools of point mechanics (e.g., Newton's laws), which we call **the Creative Layer**. At the Creative Layer, we do not yet know what the effect will be at the macro level. The circumstances of the prior and current collisions carry **quantization information.** The macro-layer kinetic impact on the environment can only be interpreted by considering the quantization information, since the quantization characteristic information also directly influences the macro-level impact on the environment. Quantization information includes the frequency of collisions, the change in frequency, the length of the collision process relative to free motion, the relationship between the creative levels associated with the molecules, and any other characteristics that occur at the macro layer. **The consistent function obtained at the macro layer is called the spacetime-operator.** Several creative levels and several spacetime-operators can exist in the same physical space.

Spacetime-operators can be functions describing the change in physical quantities of a set of gas molecules, such as kinetic energy, static pressure and density change functions. In the field of cosmology, functions describing the motion of celestial bodies can also be spacetime-operators, such as functions describing the change in mass attraction (gravity), kinetic energy, orbital curvature.

The spacetime-operators mentioned above exist in nested scopes but independently, because, for example, the motion of celestial bodies does not change the elasticity of the collisions of gas molecules or atoms in or around them. Note that a numerous cosmic and subatomic phenomena can be related by spacetime-operators. In such cases, other interactions can also form additional spacetime-operators. For example, due to the nature of the interaction, gravitational functions form global spacetime-operators, while molecular kinetic energy spacetime-operators act locally from their immediate surroundings. Temperature radiation can also form an independent spacetime-operator of unlimited extent, but quantized locally.

We don't simplify the physical phenomenon, i.e. reduce it arbitrarily to our methods of investigation, but find the creative level suitable for a consistent description of the phenomenon, and at that level we investigate without loss of information or generation of erroneous, phantom information. By phantom information we mean when the information obtained as a result of a false hypothesis or incorrect reduction creates a system that is inconsistent with real physical phenomena. Examples include enthalpy and entropy variation, which are based on continuum theory and contain many inconsistent elements.

As a generalization, at a purposively chosen creative layer, some physical phenomena can be described independently, without the influence of other phenomena, i.e., no additivity or external interaction correction or transformation is needed to describe them.

On a scale from nano to macro, the use of space-time operators is not a problem. Consistent spacetime "interlaces" the universe through its spacetime-operators, without the need for strings or space-filling media. This interweaving can be a myriad of processes, where the effect propagates as collisions or quantized events. Collisions were discussed earlier. A quantized event can be a myriad of dynamic effects: changing force field, circulation, wave motion, radiation emission absorption. Hence, the individual spatial domains under consideration and the reference frames relative to them cannot be considered independent.

Molecules have collided before and will collide later, so they carry information about their surroundings and transmit information to their surroundings in an exponential manner. The rate (speed) of propagation of the effect and information transmitted through collisions is the same as the rate (speed) of transfer of kinetic energy of the molecules. The propagation of information and effect through the global gravitational spacetime-operator is in principle at the speed of light, but we will come back to this.

Both the information and the physical effect are transmitted undamped by elastic collisions. The physical effect includes the information and the kinetic energy transferred, which together describe the resulting effect on the environment in **a consistent space-time. The effect of a single collision of an average molecule can be described consistently using point mechanics, but the effect of successive collisions, or collisions of several molecules, can only be treated in consistent spacetime using spacetime-operators.**

Consistent spacetime is not a rubber sheet to be bent, twisted or stretched, but a **process marker that links matter, energy and information.**

The information somehow, somewhere - initially - got into the material system and we inherited it. Matter and energy somehow relate to their environment, an outward effect that is not fully determined (deterministically) by the presence of matter and energy. Information cannot be perceived, but its carriers can. **The transmission of information is a series of quantizing elements that propagate inexorably as long as matter exists.**

The information associated with the presence of matter and/or energy not only links individual phenomena or events to each other, but also to a process. **The information acts separately from the matter and energy, but the result already inheres the matter, energy and information inextricably** as the starting point for a future event, where the combination of information from the environment and the information brought in creates the new result, which as part of the process has a new effect on the environment.

It is not energy that is inherited into energy, and it is not information that is inherited into information, but the matter-energy-information system is modified by the information received. This claim is supported by the combined energy scales at the part-unit and macro scales that have been established.

The problem arises when describing changes in the electromagnetic field, the propagation of electromagnetic waves, or the wave nature of particles using continuous functions (wavelength, frequency, momentum, field, configuration space...). According to our quantization derivation above, neither the transfer of kinetic energy of a set of molecules, nor the change of entropy of a set of molecules can be considered as a continuous function, and the dimensions or field equations of the associated space are cross-correlated with each other through the *"time-dependent"* information. The differential equations or integrals so constructed are inconsistent.

The probability of encountering a molecule on Earth that has never collided with another molecule is negligible. If we take into account the effect of mass attraction, we can in principle rule out the possibility that a molecule has not interacted with its environment.

Behind the "*mysterious*" entanglements described in quantum mechanics, it is not necessary to look for hidden forces or information, because the supposed dependence is provided by the spacetime-operators. **Once an event has occurred, it can, without any trickery or guesswork, be related by a space-time operator to the next event.** Two different spatial parts can be connected, entangled, over time by several spatio-temporal operators, possibly at different creative levels.

In the case of liquids, solids and plasmas, the time dependence of the interaction of molecules, atoms and ions (which move by heat) is also valid, but there are other forces besides collisions that complicate our energy transfer system, but they and their effects can be described at the appropriate creative levels.

spacetime-operators, with their propagating effect, cover the entire known universe. This means that every atom is somehow connected to all the others, i.e. they cannot be independent. Nor can we find independent physical phenomena or processes. The concepts of "*accident*" and "*left alone*" should also be reinterpreted. As humans we may feel random or infinitely lonely, but our atoms and molecules are not.

Let's see how we can apply what we have written about embedded information. It is a well-known phenomenon when cooling or reducing the specific entropy of a hot gaseous medium flowing in an uninsulated pipe causes an increase in the total pressure. [29][30]Based on the laws of thermodynamics built on continuum mechanics, one would have guessed that the energy exception would cause the total pressure to decrease, or at least remain unchanged, because the amount of molecular kinetic energy that creates the pressure has decreased, but this is not the case. The total pressure increases despite the cooling.

The total pressure would decrease if the flowing gas were heated. This makes caloric engineers used to closed systems and pistons shake their heads in disbelief. However, empirical tabulated calculations of the problem can be found [31][32] , but the search for a theoretical explanation is futile.

It is much simpler to get the same result if we use the consistent spacetime relation. In this way, we can also add a consistent physical theoretical background.

Cooling, i.e. reducing the kinetic energy of the gas molecules, makes them less able to bounce off each other and the tube wall than before. *They "shrink"* as they flow. Because of the reduced average free collision distance due to the reduced kinetic energy, more molecules per unit measuring surface are involved in collisions, which compensates for the pressure drop due to deceleration, but also because the molecules collide more frequently due to the reduced distances, which has an overall pressure-increasing effect. In pressure sensing, they are slower, but there are

29 P. Balachandran (2010) Gas Dynamics for Engineers, 144p. Table 4.1
30 J. M. Powers (2005) Lecture Notes On Gas Dynamics, University Of Notre Dame 116p.
31 Lajos Lengyel, Max Planck Institute for Plasma Physics, BME, ARA 1993. point 6.P.2
32 P. Balachandran, Gas Dynamics For Engineers, 152p. PROBLEMS 1.

more of them and they collide more often. Detailed calculations are given in chapter 5 of Creative Physics 6[33] .

The change in collision information has created or reduced the ability to work, or "energy", in the macro environment. This would seem to contradict the known laws of continuum mechanics, but this conflict arises because the effect of quantizing events remains hidden to the observer assuming continuity.

It is now well known that there is no continuum of matter or change in our material world. We can only find discrete matter and a series of quantizing events. Theories of continuity and equipartition are no longer adequate for a realistic interpretation of these.

We propose the use of consistent spacetime instead of relativistic spacetime models. Consistent spacetime can represent any process realistically using its spacetime-operators. It can be interpreted identically at the macro and cosmic levels of quantum mechanics, and can give real results in relativistic systems.

33 https://www.researchgate.net/publication/364737444_KREATIV_FIZIKA_6_

SUMMARY

We are looking for a tool that can consistently describe static and dynamic and fast-moving material entities, quanta, and macro systems.

To do this, we do not use numerical procedures, space-twisting, or string theory, but we examine events **in consistent spacetime,** using **spacetime-operators.**

We show that information built into macro systems is worth energy. **We can also say that quantizing matter and energy interact with its environment through its (in)formation.** The same quantizing matter and energy, in a different formation, has a different external macro effect.

The tangible effect of the formation is that if 100 soldiers casually walk across a bridge, nothing interesting happens. If they step at the same time, the bridge can collapse. It was frightening when we tried the effect on a suspension bridge.

In quantum mechanical measurements, the energy of particles is most often measured in electron volts, and is also determined by collisions and absorptions, which is fully compatible with our spacetime-operators used to characterise the kinetic energy of quantizing particles.

A big leap forward for quantum mechanics is that the embedded information, or spacetime-operator, associated with quantum events allows us to interpret quantum phenomena and events at macro and cosmic scales, and vice versa.

Using consistent spacetime, several previous conjectures[34] , which have been attributed to mystical quantum entanglements[35] , can be proven.

We can also detect the actual force or momentum integral of the collision of the components and the frequency of collisions with a suitable measuring device. The previously used measurements and tools remain largely usable at low speeds in addition to the space-time operators.

Even thermodynamics, which has an empirical basis, does not use time to describe cycles. We don't use time as a continuum, but neither do we use the fictitious quantity of temperature, which is the cornerstone of thermodynamics. Instead, we use spacetime-operators to describe energy conversion processes, taking into account the information that governs the cooperation of quantizing particles.

If we derive time and other physical quantities from real kinetic energy, then there is no need for transformations and empirical corrections.

Of course, numerical procedures that have been validated in practice can still be used, but consistent spacetime often makes up for their missing theoretical foundations.

We can end the debate about whether there are random events, because spacetime-operators provide the information coupling of all known material particles. There is no independent object, no random event.

Consistent spacetime is not a mathematical product, like relativistic spacetime[36] , but **a process indicator** based on the conservation of energy, which combines **matter, energy and information**.

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