An undiscovered world is hiding in plain sight

An essay by C. Johan Masreliez 2020

The following essay summarizes the authors private research and ideas on physics arrived at during the period 1995-2020.

Introduction

We have always tried to make sense of the world in which we live. We have attempted to build an image in our minds of the true essence of the world. Things we do not know or cannot understand, we try to explain by imagination and speculation. During the past few hundred years, we have formalized this undertaking by introducing Science to help us in this quest of understanding. However, Science is a double-edged sword because it systematically documents past experiences while often discouraging new ideas. This is particularly true in academia where learning often is becoming dogmatic as based on established by consensus. This essay suggests that this scientific, epistemological approach to Science may have led to wrong ideas about the world.

A significant omission in physics

Isaac Newton's achievements stand alone in their impacts on modern physics, closely followed by a cadre of researchers led by Albert Einstein. However, there are reasons to suspect that all is not well with our current understanding of the world.

For example, current Science ignores the fundamental question of what "Time" is and what is causing it to pass. Newton assumed that the passage of Time always has been the same, and Einstein thought that the progression of Time is "an illusion, although convincing."

Newton's laws of motion implicitly assume that the duration of today's second is the same as the duration of all seconds in the past while overlooking the possibility that the pace of Time might be slowly changing with the cosmological expansion.

With his General Relativity (GR) theory, Einstein tried to model the world by four-dimensional differential *geometry*. However, geometry does not cover the concept of "motion" since no point ever can move in geometry. Therefore, GR cannot model the progression of Time. By GR, the world is "frozen," giving no clue as to why Time is passing.

We have failed to treat the progression of Time as a physical process that might be understood. We have misunderstood our world by overlooking this fundamental aspect of our existence!

An ancient worldview

We have always believed that the world is like a fixed "stage" upon which life plays out. *However, the world is changing with the passage time, and the old world is physically gone forever.*

It should not come as a surprise that the progression of Time changes the world. Nobody will deny this, but we still believe that material objects remain the same, except for wear and tear. Furthermore, when we look out into the cosmos, we see different worlds depending on their distance back in Time in the belief that these past worlds were physically the same as today. However, we have not grasped the full implication of this observation. We still believe that the ground we walk on today is the same as it was in the past, although older.

However, here the author will suggest that the cosmos might not remain the same but could be recreated or "updated" with the progression of Time via a process that changes the scale of all existence.

We may live in a scale-expanding universe!

A Scale Expanding Cosmos

For 25 years, the author has investigated a new cosmological model based on the joint expansion of both Space and Time. While Space expands, making the meter grow gradually more extended, the second simultaneously expands by increasing its duration. The Scale Expanding Cosmos (SEC) model investigates this possibility.

The SEC model differs from the Big Bang (BB) model. By the BB model, only Space expands, while Time, and the duration of the second, always remain the same. However, by the SEC model, both Time and Space expand, and as inhabitants, we expand together with the cosmos. Regardless of its scale, the world always looks and behaves the same to us. You might reject this new idea. However, the author has in several papers and books shown that the SEC model in every aspect is superior to the BB model.

If the scale-expansion is geometrical (exponential), so that the scale of all existence expands by a tiny fraction every second, epochs of equal time differences will stand in the same relative

relations. This geometric expansion mode avoids the problem of cosmological creation; scale-expansion may be perpetual without beginning or end.

We may live in a world without beginning or end.

By the now widely accepted BB model, the cosmos expands in Space but not in Time, which means that Time must have had a beginning. This beginning of the world creates an irresolvable problem since we rightly may wonder what happened before this beginning. On the other hand, by the SEC model, the cosmological scale expansion may be perpetual without any beginning. Furthermore, the BB model does not agree with our observations, and it implies several contradictions and conundrums. During the past twenty-five years, the author has shown that the SEC model in all aspects is superior to the BB model. The SEC model passes several astronomical tests designed to challenge various competing cosmos models. In contrast, the BB model does not pass any of these tests and leaves several unexplainable discordances, for example, Dark Energy and Dark Matter, while the SEC model does not require them.

Cosmological scale-expansion would mean that the world perpetually is "reproduced" or "updated" with an ever-increasing scale. As inhabitants, we expand together with everything else in the world, and locally in Space and Time the cosmos always appears to remain the same to us. This expansion is quite slow; the scale doubles in about four billion years.

Since cosmological scale-expansion in principle might continue perpetually, it would eliminate the logically impossible creation of the world. It would also obsolete speculations regarding what might have existed before its creation. The Greek philosopher Parmenides (500BC) argued that nothing can ever be created out of nothingness, which logically makes the creation of the world impossible. Therefore, he argued that the world must always have existed, and the SEC model agrees with this conclusion.

In the spring of 2015, the Russian Academy of Sciences (RAS) published my work in the form of a Technical Monograph: "The Progression of Time-New Ideas in Physics". With this recognition by the RAS, the SEC model was officially recognized, although not yet generally accepted.

However, here in the West, this work has scarcely been noticed. Editors of mainstream journals might have come to realize that these findings threaten the very foundation of Western scientific thinking established by giants like Galileo, Newton, and Einstein. A theory that disagrees with the current scientific dogma might be unacceptable to these editors.

However, several unresolved problems persist with the currently adopted worldview based on the Big Bang creation. The Time has come to shed a few misconceptions!

The problem with "Time"

The main problem with current physics is that it implicitly takes for granted that the pace of Time always has been the same. Here is what Newton says about Time in his "Principia":

"Absolute, true and mathematical time, of itself, and from its own nature flows equably without regard to anything external, and by another name is called duration: relative, apparent and common time, is some sensible and external (whether accurate or unequable) measure of duration by the means of motion, which is commonly used instead of true time ..."

We see that Newton does not explain the fact that Time progresses, or consider what might cause it to pass, but accepts the "equably flowing time" as a fact. He bases his contributions to physics on this postulate of "absolute time". Science, as we currently know it, is based on the above Newtonian postulate "Absolute Uniform Time".

However, if such a uniform temporal reference does not exist in the universe, the foundation of Science would be severely undermined. This daunting prospect, which the SEC model implies, might seem abhorrent to those who prefer to ignore this possibility since it would invalidate several laws of both classic and modern physics. For example, the world may exist perpetually, which would disqualify the current rejection of the “Perpetual motion.”

Explaining the progression of Time

We know that we live in a world that always is changing, while we experience the cosmological scale-expansion as the progression of Time.

The expanding cosmological scale causes the progression of Time.

This direct and straightforward explanation for what is causing Time to pass has previously been beyond reach because we have always thought of the world as being the fixed "stage" upon

which life plays out. Upon this static stage of world-existence, there seemed to be no reason why Time should progress.

However, realizing that we all may participate in a perpetual scale-expansion that paces out the progression of Time, adds new aspects to our existence, which revolutionizes our worldview. Many of us may find it hard to embrace this new insight, while others will welcome it because it better explains our dynamic existence. This new worldview means that we are living with, and participating in, a physical process of scale-expansion that causes the passage of Time.

There are also factual aspects of this new insight, which will have revolutionary consequences for both Science and technology.

Because we have not understood Time, we have not understood the process of "motion." We must rethink our situation as inhabitants of the world based on new guidelines.

All is Motion

Everything that exists is in motion, whether in Time or in Space or both in Time and Space. The Greek philosopher Heraclitus of Ephesus stated that "All is motion."

"No man ever steps in the same river twice, for it is not the same river, and he' is not the same." //www.brainyquote.com/quotes/heraclitus_107157

If we do not know what causes the Time to progress, we do not understand motion.

This essay makes this shortcoming apparent, and we will realize the extent to which modern physics has fallen short. We will come to understand that we have inherited a fundamental misconception regarding the world, which has been part of humanity from its very beginning and which became part of classical physics via Galileo and Newton.

It is interesting to note that the ancient Greek philosophers better recognized some aspects of motion. For example, in discussing an arrow in flight, Aristotle argued that a moving arrow is at rest in its own Space at every moment during its fight. This observation was pertinent!

Moreover, Zeno (500 BC), with his paradoxes, challenged our understanding of motion. For example, in his "Flying Arrow Paradox," he argued as follows:

An arrow on a flight toward a target must pass a point halfway to the target. Moreover, after passing this halfway point, it must pass a point at half of the remaining distance. It must then pass halfway points of the remaining distances and so on. It will have to pass an unlimited number of these halfway points with ever-decreasing time intervals. The ancient Greeks thought

that something must be wrong with this reasoning since it seems that the arrow would never reach its target, but how can we explain this?

With the development of calculus invented by Newton and Leibnitz, we thought we had found a possible explanation to Zeno's paradox by making the increments arbitrarily small. However, later we found that according to quantum theory, intervals in Time and Space cannot become arbitrarily small due to Heisenberg's uncertainty relation. By this relation, increments in Space and Time lose their meaning when they become very, very tiny.

Nowadays, we heavily rely on methods based on differential calculus and Special and General Relativity when scientifically treating motion. However, these relativity theories both make use of geometry. Since no point can move in geometry, Einstein's relativity theories cannot model motion *as a physical process*. Nevertheless, we rely on these theories today, and it seems that we have no inkling to why they might be insufficient.

Since we are still missing an explanation to motion, current theories of motion are inadequate.

Explaining the progression of Time

We saw that the scale of existence might change without changing the four-dimensional geometry of GR. However, such "motion in scale" of all four spacetime dimensions cannot be modeled by traditional GR since it takes place "beyond space and time." However, noting that an incremental scale change will not alter our relative perception of Space and Time, we might think of the progression of Time as occurring in a stepwise manner so that all motion occurs via small and rapid incremental steps. Motion may then be modeled via a sequence of "frames" like in the movies. In movies, each frame is a "snapshot" of an instant in Time. Taken together in sequence, they create the impression of motion.

Similarly, we may view reality as a sequence of snapshots. This idea may appear a bit farfetched, but it allows us to model the new five-dimensional world via four-dimensional GR frames combined with incremental scale adjustments. As we shall see below, this will also help explain Quantum Mechanics (QM), since QM then may be derived from General Relativity (GR).

This approach suggests that motion in Space and Time may be the consequence of the existence of a dynamic scale.

There would be no motion at all without the progression of Time, and no progression of Time without cosmological scale-expansion.

Some consequences of cosmological scale-expansion

If the cosmological scale keeps increasing perpetually, things in the world would, in a relative sense, appear to have been smaller in the past. However, if we had lived in the past, everything in the world would have seemed the same to us. According to General Relativity, this relative scale difference would also mean that light arriving from the past will lose energy and become redshifted, much like light is redshifted by a gravitational field.

The cosmological scale-expansion explains the redshifted light from distant sources.

On the other hand, on the very much smaller atomic scales, electrons keep whirling around their atomic nuclei. How can they keep doing this; what makes them move? There has not been any explanation to this. However, scale-expansion is a physical process active at all levels from atoms to galaxies that may keep everything in the world in motion, including these atomic electrons. We now know that vibrating zero-point energy fills the interstellar vacuum. However, what is causing this has been a mystery. The incremental cosmological expansion might be the source of the zero-point vacuum energy!

Without an expanding scale, Time would not progress. Such a world would be "frozen," making all motion impossible. General Relativity (GR) agrees with this because GR is based on differential geometry, and, as already mentioned, no point can move in geometry. Therefore, GR cannot explain the *physical process* that is causing the progression of Time. The passage of Time is a process of the dynamic scale of existence beyond the four dimensions of Space and Time modeled by GR, making the world five-dimensional.

Einstein may have realized that something important was missing in his GR theory of Space and Time. However, stubbornly believing in this theory, he thought that the progression of Time merely is an illusion:

"The distinction between past, present, and future is only a stubbornly persistent illusion."
Albert Einstein

Well, this is not true! The progression of Time is not merely an illusion; it is the most obvious physical aspect of our existence, which keenly is experienced by us all! It is the most basic of all

physical processes. Now, when we have found that the cosmological scale-expansion may make time pass, new exciting possibilities emerge.

Why the world is "Quantum Mechanical."

The incremental scale-expansion that makes time pass induces oscillating modulations of the scale of spacetime relative to a co-expanding observer, which means that vacuum becomes an active physical medium. These modulations may correspond to the Quantum Mechanical wavefunctions for which no previous explanation has been available.

The QM waves may be derived from GR by analyzing a line-element of GR with an oscillating scale. If the frequency of this scale-oscillation equals the Compton frequency, which is oscillation associated with all matter particles, we may derive the de Broglie matter-wave from GR as being caused by the motion of a particle. The de Broglie/Bohm "pilot function" may then be derived from the geodesic of GR!

This scale-oscillation also satisfies the Schrödinger equation.

Consequently, QM may be derived from GR if the cosmological scale oscillates! This derivation provides the missing connection between QM and GR.

Hence, the Compton wave is associated with a particle's motion in Time, while its motion in Space induces the de Broglie waves as phase modulation of the Compton wave. The particle/wave controversy of QM theory disappears by noting that both types of waves always are present for any particle in motion.

The QM waves of quantum mechanics are modulations of the scale of spacetime.

Since both the Compton wave and the de Broglie waves are modulations of the scale of spacetime, they exert influences beyond the four-dimensional spacetime of GR. They may act instantaneously over vast distances, which explains the "non-local" aspects of QM. The motion of particles may be guided by these quantum waves via gradients in the scale, much like how gravitation influences motion. The mysterious double-slit experiment may now be explained. A

stream of particles creates interference fringes on a projection screen even when these particles arrive at the screen sequentially one-by-one.

A particle's matter-wave interferes with the two slits and guides the particle.
Matter-waves might also lock electrons in their orbital shells around the atom nuclei.

Time, motion and energy

We know that "time" is strongly related to "energy." Kinetic energy would not exist without Time. A slowing pace of Time would make the duration of a second last longer and therefore cause the particle to travel farther in a second. Therefore, if the pace of Time were to slow down, the kinetic energy would increase!
Hence, energy may be "generated" by slowing down the pace of Time! If the duration of a second slowly increases with the cosmological expansion, it would explain how the cosmos continually generates its energy.

Special Relativity

Ever since the Special Relativity (SR) theory was published in 1905, people have argued over this theory because it does not make logical sense. Time-dilation is a good example. SR states that Time progresses slower for clocks in motion. SR also postulates that all clocks in uniform motion are equivalent and should locally run at the same pace. Therefore, time dilation is an unexplainable phenomenon; obviously, Time cannot run at the same pace and yet slow down. However, many experiments have confirmed that time dilation for a clock in motion is a fact. Clocks are observed to go slower in motion.
SR introduces the notion of "relative time" since it appears that each "inertial frame" has its own separate Time. (An inertial frame is a coordinate system in constant motion without acceleration.) Since the Time appears to run slower in motion, we may wonder if aging might proceed at different paces in various frames of motion, although this would disagree with one of the central postulates of SR; that all inertial frames are equivalent. This conundrum has led to the speculation that a traveling twin might be younger on his return compared to a stationary sibling. Even Einstein thought that this would be the case.

We may find the explanation to this inconsistency when taking a critical look at Einstein's 1905 paper on Special Relativity. In deriving the mathematical transformation, which relates the coordinates of a moving frame to those of a stationary frame, an undetermined constant appears. *Einstein found this constant by assuming that spatial increments perpendicular to the motion remain unaffected by the motion.*

This assumption leads to the Lorentz Transformation (LT) published in 1894 by Lorentz. Einstein may have determined the constant in his transformation so that it agrees with the LT. Another transformation had been published earlier (in 1887) by the German physicist Woldemar Voigt. Voigt's Transformation (VT) differs from the LT by a scale-factor that depends on the velocity; it is $[1-(v/c)]^{½}$ which is the same as the factor appearing in time-dilation. This scale-factor is constant if v is constant.

The VT implies that a moving frame appears to have a contracted scale, which would explain the time-dilation since changing the scale for a moving frame in a relative sense changes the *apparent* pace of Time. According to GR, a constant scale factor for the line-element does not change its equations of motion. This is consistent with the fact that the geometry may be the same regardless of scale. Like with the cosmological scale-expansion, each moving frame will locally appear to be the same for a comoving observer but will differ in scale *in a relative sense*. *The scale acts in a "fifth dimension" beyond the four spacetime dimensions*.

Voigt's transformation would also work when used in SR. It has the advantage of eliminating the Twin Paradox since it makes clear that Time merely *appears* to slow down in a moving frame, which does not belong to the same four-dimensional manifold of GR as the stationary frame does. Lorentz later admitted that he would have used Voigt's transformation rather than his own, had he known about it at the Time of suggesting the LT!

In the SEC model, scale-contraction during relative motion also includes Time, which accounts for the time-dilation. There is symmetry between Space and Time because there is relative scale contraction when in motion, whether in Time or Space.

Moving frames are not in the same 4D manifold as a local stationary frame.

They are physically not "in the same 4D world" of Space and Time. An additional dimension beyond the four dimensions of spacetime is required to model the world. This fifth dimension is the scale of 4D spacetime. The Twin Paradox disappears, since time-dilation now may be

explained as an *apparent* rather than actual phenomenon caused by the differing scale of a clock in motion!
The returning twin will not be younger!

The origin of the inertial force

There is another even more important advantage of Voigt's transformation-it would explain the source of the inertial force, which appears in Newton's second law of motion, F=am. This force F that resists acceleration has since the Time of Newton remained unexplained!
Since the scale increases with the cosmological expansion, past epochs have smaller scales, and we may wonder if the scale also changes during acceleration. The author investigated this possibility by assuming an arbitrary dynamic scale-factor S for a flat spacetime line-element of GR and then evaluating its geodesic, which is the trajectory followed by a particle falling in a gravitational field. I found that an accelerating particle will always be on a geodesic if the dynamic scale of the accelerating frame is $S=[1-(v/c)^2]^{½}$!
Since the velocity changes during acceleration, Voigt's scale-factor becomes dynamic, and according to GR, an accelerating object creates a dynamically induced gravitational-type field, the "inertial field." With this field, we find that the corresponding geodesic for motion by GR becomes an identity!

Therefore, Voigt's line-element with a dynamic velocity v will also explain the inertial force. With this new interpretation, an accelerating object will always be on a geodesic of GR.

On the surface of Earth, the temporal metric for relative locations will, according to GR, be scale-contracted by the factor $1-2GM/(r\cdot c^2)$. Similarly, past locations in an accelerating trajectory will scale contracted by the factor $(1-v^2/c^2)$
The relation below confirms the similarity of gravitation and inertia when:
$GM/r=v^2/2$
This relation tells us that the gravitational potential equals the inertial (kinetic energy) potential.
A local gravitation field, or "inertial field," is induced by the acceleration that changes the scale and causes the inertial force that resists acceleration. Previously we have not known the origin of

the force F in Newton's second law, F=am. However, we now realize that inertia is a gravitational-like phenomenon induced by acceleration.

Regardless of the magnitude and the direction of the acceleration, an accelerating object will always be on a geodesic of GR and will then be in a situation comparable to a stationary object suspended in a gravitational field. Therefore, Inertia and Gravitation are two phenomena both caused by spacetime curvature. Einstein was right in assuming that an accelerating box in outer Space acts like in a local gravitational field. However, he might not have realized that acceleration formally may induce a relativistic spacetime field.

Both Newton and Einstein assumed that the inertial force relates to the gravitational force, but they did not know why this should be the case. Newton did it when he put the gravitational force equal to the inertial centrifugal force for the Moon's motion around the Earth, and Einstein did it in his thought experiment of an accelerating box in outer Space.

In retrospect, Henrik Lorentz later admitted that he would have used Voigt's transformation instead of his own if he only had known about it at the time.

Summary and final comments

The most apparent failure of current physics is its missing treatment of "time." Physics does not tell us anything about the nature of Time or why it progresses.

From the beginning, Special Relativity has been criticized for its concept of "relative time," claiming that Time runs slower for clocks in motion than for a stationary clock. This claim clashes with the opposing postulate that all inertially moving clocks are identical and should have the same pace of Time. The obvious explanation to this discordance is that a moving clock somehow differs from a stationary clock in a relative sense, but not in a real sense. In other words, motion causes an *apparent* temporal difference, but in the past, we have not known why. This essay suggests that the difference lies in the relative scale of spacetime for a moving clock. Motion causes this relative scale to contract, and we see a distorted view of the real spacetime in a moving frame. This relative scale-contraction causes both time-dilation and length-contraction, while local conditions in the moving frame do not change. This explanation would be impossible if the world were four-dimensional in which intervals in Time and Space would be comparable regardless of motion.

We can eliminate the Twin Paradox by introducing the scale of spacetime as a fifth additional dimension. This would allow us to use Voigt's Transformation (VT) rather than Lorentz's Transformation (LT) in Special Relativity, implying an apparent contraction of the metrical scale of moving frames.

Ironically the VT was published in 1887 preceding the LT, which was published in 1894. If Lorentz had been familiar with the VT at the time, he might have used it instead of the LT since both transformations conserve the laws of physics. And, if he had done this, Einstein may also have used the VT. Then we would then have found the origin of the inertial force a hundred years ago!

The additional scale dimension resolves the Twin Paradox since a moving frame no longer belongs to the same spacetime as a stationary frame. There is no longer a mystery why clocks in moving frames appear to run slower! As an additional bonus, a dynamic spacetime scale that changes during acceleration would explain the inertial force as being a gravitational-type force!

Lorentz Transformation may have been a mistake, which has caused much confusion!

Finally, let us address the General Relativity Theory (GR), which unfortunately suffers from a similar problem. This theory is based on four-dimensional differential geometry, which is mathematically tricky, and which may deter many from analyzing it. However, the main problem with GR is not its complicated mathematics but the fact that it cannot model "motion," simply because no point ever can move in geometry. GR gives a "frozen" 4D picture of the world where nothing moves and where a word-line stretching from the past to the future represents Time without indicating the progression of Time. We may liken this description of the world to a "terrain map," showing hills and valleys but no motion. The terrain map would show how a rolling ball would move downhills.

Similarly, GR models motion by a geodesic line, which shows how a test particle would move in a gravitational field. However, why there is motion at all is not explained.

As was the case with SR we may add a fifth scale-dimension to GR and model the progression of Time via the cosmological expansion of this "scale of existence." Furthermore, we can let this scale-expansion model the cosmological expansion as being motion in scale rather than motion in space. There are several advantages to this approach:

1. It gives a cosmological model that better agrees with our observations.

2. It eliminates Dark Energy and Dark Matter (They are consequences of using the wrong cosmos model.)
3. It explains what makes Time progress.
4. It resolves the Twin Paradox
5. It explains the inertial force.
6. It allows perpetual existence.

By this new thinking, the world is sequentially "reborn" at each instant, and motion takes place via a sequence of "snapshots" of a four-dimensional world like the frames of a movie camera. The past is gone forever in a world of perpetual renewal.

Let me conclude this essay with the following thought experiment:
As far as we know, all atoms and matter are associated with waves. Let us assume that all existence ultimately consists of waves of various kinds.
These waves have amplitudes, wavelengths, and periods. Now consider one such wave of general nature and let us double both its amplitude and its wavelength and period. In other words, let us increase their scale. If the scale also increases for all other waves of existence, a world would be created with a larger scale, which physically would be the same for an inhabitant.

This reasoning supports the possibility that the scale of all existence might be changing in the cosmos.

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A little about my background:

I was born in 1939 and grew up in Sweden where I in 1963 graduated from the Royal Institute of Technology in Stockholm with an MS degree in Technical Physics. After graduation, I worked as an engineer at a couple of firms in Sweden before joining the Boeing Company in Seattle in 1967. During a leave of absence from Boeing, I earned a Ph. D. degree from the Electrical Engineering Department at the University of Washington. My thesis was in the area of robust statistical estimation theory and resulted in "Masreliez's Theorem". I then became an Affiliate, Assistant, Professor at the EE Department at the University of Washington for a year.

I returned to Boeing, and after a total of nine years at Boeing, I worked briefly at Honeywell Marine Systems in Seattle before starting my own company, Analytic Technology Corp, in 1978 together with my wife. We produced and marketed electronic equipment based on my own patents. We sold Analytic Technology in 1995. Since then I have been developing the Scale Expanding Cosmos model and investigating its implications.