The observable universe is the cat's box

A relativistic theory of the observable universe, uncertainty, and local expansion

El universo observable es la caja del gato

Una teoría relativista del universo observable, la incertidumbre y la expansión local

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Octubre, 2025
Preprint - vixra.org

Abstract (English)

By folding a sheet of paper, we prove that length contraction (special relativity) and spacetime curvature (general relativity) are the same geometric effect seen from inverted observers. In a dynamic universe, light travels the same proper distance for all observers. The observable universe radius ($8.88*10^{26}$ m) equals the central black hole event horizon scale ($2GM \approx 10^{27}$). Mass is spherical self-interaction; time is work done by self-observation. Constants (π, G, c, e) are determined per ds with intrinsic uncertainty. Key equations treat radii and masses as critical quantized values—absent from literature. No citations. Only geometry and motion.

Resumen (Español)

Doblando una hoja de papel, demostramos que la contracción de longitudes (relatividad especial) y la curvatura del espacio-tiempo (relatividad general) son el mismo efecto geométrico visto desde observadores invertidos. En un universo dinámico, la luz recorre la misma distancia propia para todos. El radio del universo observable ($8.88*10^{26}$ m) equivale a la escala del horizonte de sucesos del agujero negro central ($2GM \approx 10^{27}$). La masa es autointeracción esférica; el tiempo, trabajo de autoobservación. Las constantes (π, G, c, e) se determinan en cada ds con incertidumbre intrínseca. Las ecuaciones clave tratan radios y masas como valores críticos cuantificados—un enfoque inédito. Sin citas. Solo geometría y movimiento.

Traditionally, the theory of everything is considered to be the unification of general relativity with quantum mechanics. If only it were that easy. It involves dealing with relativity, general relativity, classical mechanics, quantum mechanics, mathematics, and human errors.

The theory I am going to present is based on the following points:

1. In a universe where everything is in motion, we can never know with complete precision either the length or the mass. This is the uncertainty principle deduced directly from relativity.

2. Spacetime is created by the two relativities; each object and each particle has its own spacetime, in such a way that in the expression **P = m * v**, when you increase the velocity you get (special) relativity, and when you increase the mass you get general relativity. It can be seen that, to maintain the coherence of the system, the observers must be inverted, so that if we perceive the curvature of spacetime by observing the trajectory of light as it passes by a star, a passenger in a spacecraft at relativistic speeds sees the curvature of the light when tracing the path it has followed. Light curves in relativity.

3. A body or particle, simply by virtue of having mass, already dilates time thanks to the following relationship.

$$v^2 = \frac{GM}{r}$$

   From this, we can derive the following principle of equivalence: Time dilation is equivalent to a velocity.

4. We will define mass as the interaction of particles with themselves due to their spherical geometry. In this way, when a particle acquires relativistic velocity, it overlaps with itself due to the contraction of space. This is why its energy increases to infinity. In a massive object, this overlap arises naturally and is equivalent.

5. Gravity is created by probability surfaces. The first surface starts from the length that the particle or object would have if it were a black hole. In this way, gravity affects the particle itself, and its Lorentz factor is well known.

$$\sqrt{1 - \frac{v^2}{c^2}} \Rightarrow \sqrt{1 - \frac{2GM}{c^2 r}} \Rightarrow \sqrt{1 - \frac{r_n}{r}}$$

The consequence of all this is that the event horizons of black holes are a little longer than the theory predicts, and therefore the observable distance of the universe for us is determined by the mass of the central black hole in our galaxy. Sagittarius A* has a mass of 8.55×10^{36} kg, so we have:

$$L = \frac{L_0}{\sqrt{1-\frac{v^2}{c^2}}} \Rightarrow L = \frac{2GM}{c^2\sqrt{1-\frac{v^2}{c^2}}}$$

The observable distance of the universe is 8.8×10^{26} m, and the result of 2GM is 10^{27}. The number of paradoxes this simple calculation resolves and the amount of information it provides about our universe is so vast that it could fill hundreds of articles.

Note: $1 - \frac{v^2}{c^2} = \frac{1}{c^4} \simeq 1.23 * 10^{-34}$; $h=6.6*10^{-34}$ j*s

6. We define time as the change that the particle or object undergoes when observing itself, since the mere act of observation changes the particle forever. In each observation, in each **ds**, both the mathematical and physical constants of the particle and the object are determined, because infinite constants cannot be determined in finite times.

$$R_0 = \frac{\Delta G}{\Delta c^2} m_0$$

This formula is Newton, Einstein, and Heisenberg, and it redefines time as work. This is why the universe is expanding in an accelerated manner depending on local conditions. An accelerated universe is a universe that is being created, that is converting time into energy at the only point where the uncertainty of uncertainties in length and mass can be converted into energy: the interior of black holes. As we will see, in an accelerated space where **t = 0** and therefore **dt = ds**, energy is created from the uncertainties in lengths, masses, time, energy, and velocities—all of them intrinsic characteristics of particles and what relativity tells us about.

Another important issue to keep in mind is that photons do exhibit time, but since they cannot interact with themselves—cannot observe themselves due to their linear (or non-spherical) geometry—they do not change. That is why the critical factor for change in them to occur is the uncertainty in wavelength, as we will see.

Relativity

Relativity is the approach of a particle with spherical geometry toward a linear geometry. When it acquires velocity, the intersection points of the parallels move apart, and the object lengthens. Since the intersection points of parallels in a linear geometry are at infinity, we can never reach it; that is why the speed of light can never be attained. As we will see in a moment, the increase in energy is a consequence of the contraction of space due to the overlap of the particle—thus an effect, not a cause, as is commonly believed.

The other characteristics of relativity can also be obtained through this geometric approach. One of the most curious aspects of relativity that is rarely mentioned is that when a particle has velocity, light forms an angle with you, acquiring X and Y components. Since the measured distance is **S = ct**, where **t** is the time for the external observer, we obtain a small paradox: light travels the same distance for all observers. Note: I will limit myself to two dimensions to facilitate the calculations and understanding.

$$S = \sqrt{S_x^2 + S_y^2} = ct$$

How is this possible? Because $\mathbf{S_x}$ compresses and time dilates for the external observer.
The Lorentz factor for a particle or object with mass is:

$$m\neq 0 \quad X=vt \ ; X^2+Y^2=C^2t^2 \Rightarrow \quad V^2t^2+Y^2=C^2t^2 \Rightarrow \quad Y^2=t^2(1-V^2/C^2) \Rightarrow \quad Y/t = \sqrt{1-\frac{v^2}{c^2}}$$

Newton considered time to be absolute, the same for all observers. Einstein, that time is relative, intertwined with space. However, the existence of a particle with maximum speed for all observers and zero time fits with an **intrinsic time** for each particle. The problem with an absolute time for all observers is that it implies time is external to the particle itself, to the system itself. The problem with a relative time is that it fails to fully explain why, while 10 minutes have passed for one observer, 100 years have passed for another. A **proper time**, intrinsic to the particle itself and defined as the change produced by its own displacement, is what fits with the equations we have just seen.
Because the time for the particle is determined by $\mathbf{S_x}$, by the distance it travels. And we will use this same concept to explain the passage of time in general relativity.

General Relativity

Nothing could be further from my intention than to derive the equations of general relativity, but I will deduce their effects on space and time. As in (special) relativity, the most important thing is that light travels the same distance for all observers. In essence, what we have is the following:

1. The distance that an external observer measures from Earth is **ct**.
2. The distance that the light measures is $S = ct + \frac{GMt^2}{r^2}$
3. The distance measured by an internal observer is $S_x\sqrt{1-\frac{2GM}{c^2r}}$

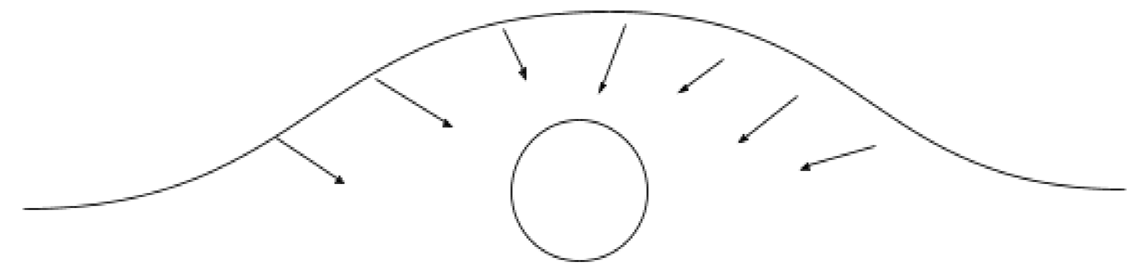
We know that for an object trapped near a black hole, time is so dilated that while one second passes for it, thousands of years pass for us. However, black holes move at 600 km/s, so the object trapped in its gravity travels thousands of light-years in seconds. This is because, for it, space is contracted. This double effect of lengthening and contraction is what we perceive as curvature.

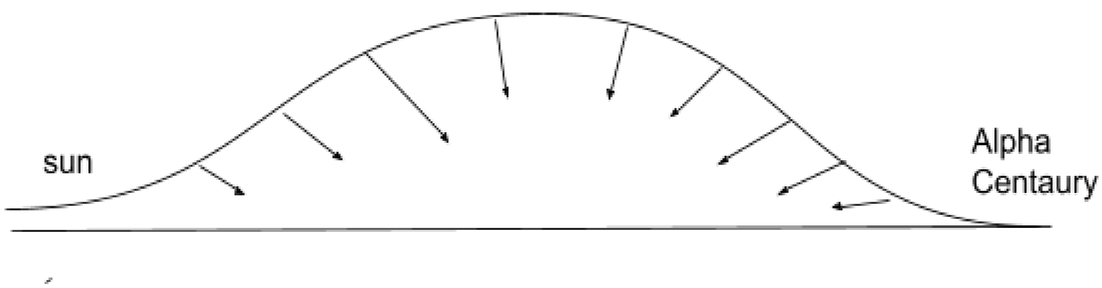
What I really want to highlight is that $S_y = \frac{2GMt^2}{r^2}$, where **t** is the time for us, such that the curvature we see actually spans thousands of light-years. This is why thousands of years pass for the observer on Earth, while for the internal observer, their proper time is once again related to $\mathbf{S_x}$.

It was this idea of uncertainty in length and contraction in space that led me to wonder whether the distance of the observable universe is related to the event horizon of the central black hole. The idea is that the radius of the event horizon must be slightly larger than we think due to the uncertainty in length, and at the same time, the contraction of space indicates that the particle located at the event horizon must also be at the edge of the universe. So I equated the observable distance to the length of a relativistic body, with the Lorentz factor as the unknown, thanks to the equivalence of dilated time with velocity. Since **2GM** using the mass of the central black hole in our galaxy is very close to the observable distance, my hypothesis is that the maximum value of the Lorentz factor is $\mathbf{1/c^2}$ and that we have not yet reached the limit of the observable universe.

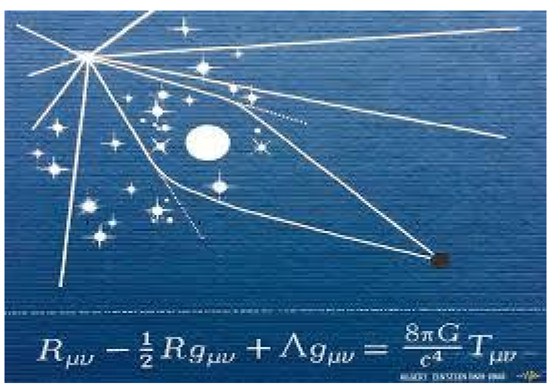
As I have already defined that curvature is the product of lengthening for some and contraction of space for others, in relativity we can assert that if a passenger in a spacecraft that accelerates and decelerates traces the trajectory followed by a photon traveling from point A to point B, the path drawn is a parabola.

Trayectoria del fotón en la relatividad general para nosotros





Trayectoria del fotón visto por un pasajero en una nave que acelera y frena



Take a sheet of paper and mark two points on it. Now fold it to bring them closer together. What we have just done is the **space contraction** produced by velocity. The fold is the **light path** for the **internal observer**.

In general relativity, what changes is that the fold is seen by the **external observer**. This is the **observer inversion**: the same geometric effect—contraction for one, curvature for the other. Because in a **static universe**—and as is currently believed—light indeed travels different distances for different observers. However, they are not taking into account the **space**

contraction of the internal observer due to **time dilation**, which, through **observer inversion**, restores the invariance of the proper distance traveled by light in a **dynamic universe**.

Uncertainty Principle

I said in the introduction that the uncertainty principle is relativistic and actually deals with lengths and masses rather than positions and momenta, because in a universe where everything is in motion and nothing stays still, we can never know their length or mass with complete precision. The uncertainty principle that everyone knows is derived directly, as we will see below.

1. A particle is not in two places at once; it has a longer length. An electron, for example, as a wave, has its entire orbit collapsed, as if it were not moving. As a particle, it has momentum, and that is why we never know where it is. Following this idea, particles are not in two points at once; they are in any two points among the infinite points that define a spherical surface. This phenomenon is what we know as gravity. The Moon is in infinite places at once.

2. It is said that inside black holes, matter is compressed into the smallest possible space, something that violates quantum mechanics because particles cannot be localized. No. Matter is distributed along a string determined by

$$L = \frac{G}{c^2}M$$

   The uncertainty, as we have already said and as I will now explain, comes from the values that the constants take in each observation.
   It is also possible that instead of a string, it is a surface of radius **L**, and that the difference between a non-rotating black hole and a rotating one is due to the distribution of the mass that composes it, since being on a spherical surface it would have angular momentum

created by the displacement of matter across its surface. In a string, matter moves along it, which is why it would have no rotation at all.

3. Quantum entanglement occurs when two particles share the same spacetime. In this way, when a change occurs, it is reflected in both ends simultaneously. The clearest example is once again the spaceship. Imagine it has a relativistic length, spanning galaxies, but at the same time is contained in an incredibly small space. If you flip a switch, for example—something that produces a change at both ends at once—it will be instantaneous even if those ends are separated by light-years.

But relativity also tells us about time and energy, and indeed, $\Delta t \Delta E \geq \frac{h}{2}$ exists as well. Likewise $\Delta L \Delta E \succ 0$, or in other words, energy exists in the vacuum.
To conclude, not knowing the exact length of a particle is what we call wave-particle duality.

$$\Delta L = \frac{L_0}{\sqrt{1-\frac{v^2}{c^2}}} - L_0 \,;\, \Delta M = \frac{M_0}{\sqrt{1-\frac{v^2}{c^2}}} - M_0 \,;\, \Delta E = \frac{E_0}{\sqrt{1-\frac{v^2}{c^2}}} - E_0$$

$$\Delta(L-L_0)\Delta(M-M_0)>0$$

$$\Delta\left(\frac{L_0}{\sqrt{1-\frac{v^2}{c^2}}}-L_0\right)\Delta\left(\frac{M_0}{\sqrt{1-\frac{v^2}{c^2}}}-M_0\right)>0$$

$$\Delta\left(\frac{L_0}{\sqrt{1-\frac{v^2}{c^2}}}-L_0\right)\Delta\left(\frac{M_0}{\sqrt{1-\frac{v^2}{c^2}}}-M_0\right)V\geq\frac{h}{4\pi}$$

For a massless particle, we obtain an equation that precisely matches the conversion of a photon into an electron and its antiparticle pair.

$$m=0 \Rightarrow \Delta(\lambda - r_0)\, \Delta\left(\frac{hf}{c^2} - 2m_0\right)c \geq \frac{\hbar}{2}$$

As we indicated in the presentation, the critical factor for change to occur is the uncertainty in the wavelength. The process takes place when the particle interacts with itself, and it is impossible to predict when it will occur.

The uncertainty principle is related to the intrinsic constants of the objects and of the particle itself.
Some relationships that interest us are:

1. $\Delta L \Delta M \succ 0$

2. $\Delta L \Delta E \succ 0$ Extremely important relationship because it is the one that tells us that the vacuum is full of energy.

3. $\Delta t \Delta E \geqslant \frac{h}{4\pi}$ Relationship that indicates that the vacuum energy fluctuates.

4. $\Delta x \Delta p \geqslant \frac{h}{4\pi}$ The one everyone knows.

Theoretically, the interior of a black hole is exactly the same as the orbit of an electron. We have a string defined by the relation **GM/c^2**, and the particles move along it in such a way that we do not know their position. For rotating black holes, it is very likely that the mass is distributed over a spherical surface.

Has anyone noticed that these uncertainty principles mean that every time you observe the universe, you encounter more time, more energy, more velocity, and more mass?

Mass and Time

In a theoretical framework like this, mass can only be the interaction of the particle with itself due to its spherical geometry. But far from being a problem, this is an advantage. The mere observation of a particle changes it forever. But to produce a change, you need to do work; you need energy. If gravity is a force capable of exerting itself on the particle itself, capable of making changes to it simply by observing it, then these changes represent the particle's proper time.

$$E=mc^2$$

$$W=F*S$$

$$F=m*a$$

$$W=m*a*s=\frac{GmM}{R^2}ds$$

$$mc^2=\frac{GmM}{R^2}ds$$

$$R=\frac{G}{c^2}m$$

This equation written in this way means nothing, but we still had to add the uncertainty.

$$R_0=\frac{\Delta G}{\Delta c^2}\,m_0$$

The mathematical and physical constants of objects and particles are determined in each observation. This means that, for example, π sometimes has 60 decimal places, other times 10,000. The uncertainty arises because, in each observation (ds), **nature selects a finite and variable value for π, G, c, e, ħ….** That is why we can never know mass or length with infinite precision.

Mathematicians do not know how to define pure chance. Quantum mechanics, particle physics, and nuclear physics speak of pure chance, since we never know when a particle might decay or turn into an electron-positron pair. If nature determines the mathematical and physical constants in each observation, the only thing we can know are the average times, the half-life of nuclear elements. The event occurs when nature observes a critical value. Or, for example, the number of primes you will find in an interval before checking them one by one. Because the probability that a number is prime is determined by the relation **1/ln(n)**. Since we do not know with complete precision what value of **e** nature has taken for each value, the conclusion is that prime numbers are purely random. Ordered, but purely random.

But the best is yet to come. By treating time as work—a constant change—the immediate deduction is that the universe is expanding at an accelerated rate, because it converts time into energy. The process of energy creation in the universe occurs inside black holes, where the uncertainty in the constants affects mass and length, causing the string to vibrate. It's like a gigantic cosmic particle accelerator, but with one particularity: energy is created.

The proof is the universe expanding in an accelerated manner locally, as it is a direct consequence of mass, black holes, and the initial conditions, just as observations indicate.
In summary: Particles change because the energy they contain performs work on themselves. Sometimes they have more length, sometimes less. Sometimes more mass, sometimes less. Sometimes more energy, sometimes less. We can only know the average. In a static universe, it would eventually convert all matter into gravitational waves. But in an accelerated expanding universe—and thus capable of generating energy—this is the foundation of all the physics we know.

Let us focus on the uncertainty principle: "we cannot know both the position and the momentum at the same time." My time equation reflects a vibration, a purely random momentum. But this pure randomness allows particles to absorb all kinds of gravitational waves. They lose energy every time they observe themselves, but they also absorb it. This continuous loss and gain of energy is the basis of all quantum fluctuations and derives directly from the fact that the universe determines both physical and mathematical constants by eye each time it observes. Because even with infinite dimensions or universes, it is impossible to determine π with infinite precision, by definition.

Traditionally, it is considered that there are 3 spatial dimensions and one temporal. String theory considers 9 or 10 spatial dimensions. I have even read a theory with 3 temporal dimensions. Particles with spherical geometry have 2 degrees of freedom—surfaces and radii—because lengths do not determine surfaces at the relativistic and quantum level. Massless particles, and thus of linear geometry, have 3: X, Y, and Z.
I have not simplified the universe by using only two dimensions; I have described it as it is. Light moves in both special relativity and general relativity with one extra dimension, and it is only necessary to resort to the Z-axis if you seek precision or in extreme phenomena such as black holes, their interiors, or the motion of one photon relative to another. That is why the

universe seems so strange and disconcerting to us: because we believe we are three-dimensional, and we really are not.

The equations of motion of one photon with respect to the other are:

$$X=v_1t \qquad\qquad X=v_1t \qquad\qquad V^2t^2+\frac{G^2M^2t^4}{R^4}=c^2t^2 \;;\; R=ct$$

$$Y^2+Z^2=v_2^2t^2 \quad\Rightarrow\quad \frac{GM}{R^2}t^2=v_2t \quad\Rightarrow$$

$$(V_1^2+V_2^2)t^2=C^2t^2 \qquad\qquad (V_1^2+V_2^2)t^2=C^2t^2$$

These equations say the following:

1. Two photons emitted at the same time and from the same place do not necessarily arrive at the same destination at the same time, as occurs, for example, in general relativity.

2. Two photons emitted at the same time and from the same place do not necessarily follow the same path, as occurs, for example, in general relativity and quantum mechanics.

3. The trajectory of one photon with respect to another is circular, until something, such as gravity, perturbs its motion and causes one photon to move faster than the other.
   The displacement of a photon inside a black hole is very similar. The photon accompanies the black hole on its journey as it spins tirelessly, tracing a helical trajectory. That is why they do not escape. But there is a small nuance that changes everything: the interior of black holes is accelerated

4. It is very likely that for a particle or spacecraft as close as we want to the speed of light, photons begin to orbit around it while moving in parallel. What relativity says is that photons form a 90-degree angle with respect to a ship traveling at the speed of light, and yet they arrive at their destination at the same time, as if space were compressed into a plane. But this perspective does not take into account how gravity lengthens space, nor the Z-axis.

The origin of the universe and of galaxies.

Since the observable distance is explained by the mass of the galaxy's central black hole, it is clear that the Big Bang does not work. Nor would it explain why the vacuum—space itself—is filled with energy as it is. This means the universe neither expanded at the beginning nor could it be doing so now. I will not go into details because, honestly, I do not know.
I can, however, go into details about how galaxies originated, even if only superficially for now. The Milky Way was born from a great explosion. The question I asked myself is: What happens when a piece of matter travels faster than light along some axis? Because there is indeed a place in the universe where this is possible—inside black holes. And the answer is that you end up with a piece of relativistic-mass matter that has traveled billions of light-years in space and billions of light-years in time (or perhaps not that many, but the idea is this). That is why galaxies are separated by millions of light-years and why they appear connected. That is why there are so many different galaxies, and why supermassive black holes were born—from gigantic explosions caused by the disintegration of relativistic matter that gave rise to their host galaxies. My hypothesis is that galaxies without a central black hole formed from matter that lacked the critical mass to create one.
But this should not be surprising. Only a living universe can create life.

Conclusions

1. Both the uncertainty principle and wave-particle duality are deduced directly from relativity.

2. Mass is a direct consequence of the spherical geometry of particles.

3. Mass creates space and time. In the relation **P = m * v**, when we increase velocity we get (special) relativity, and when we increase mass we get general relativity.
   In general relativity, light curves for us, external observers, when passing near a star. In (special) relativity, light curves for the spacecraft passenger.

4. Time is a consequence of the changes produced by self-observation—the work that particles perform on themselves as they move through the universe. This concept makes no sense in a static and limited universe, where particles would eventually turn into

gravitational waves. It only makes sense in a universe that creates energy, that is expanding at an accelerated rate, that is being created right before our eyes.